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Abstracts and Programme

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ABSTRACT PRESENTATION PROGRAMME

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A-1

EEG epileptoid signs during sevoflurane induction in children: a comparative study between incremental and rapid induction

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Background: Sevoflurane (S) has become the volatile agent of reference in pediatric anesthesia. However epileptogenic effects of high concentrations (8%) of S have been suspected during induction (1). Using moderate inspired concentrations of S (6%), this study compared epileptoid EEG signs of S under rapid induction (**Ri**) versus incremental induction (**Ii**) in children.
Materials and Methods: After IRB approval and informed consent, 60 children (2–10 yr) scheduled for tonsillectomy were included. After premedication with midazolam, patients were randomly assigned to receive, in N_2O–O_2 (50–50), **Ri** with 6% of S (n = 30, 19 ± 6 month, mean ± sd) or **Ii** with 2% (2 min), 4% (2 min) and 6% up to visualisation of central pupils (CP) (n = 30, 19 ± 5 month). In both groups tracheal intubation was performed at CP without any additive agent. Clinical events, bispectral index (BIS), heart rate (HR), expired fraction (Fe) of S, and EEG were continuously recorded using AS5 Collect (Datex-GE). Epileptoid signs were assessed by a blinded neurophysiologist, from baseline to tracheal intubation. Major epileptoid signs were defined as polyspike, rhythmic polyspike and periodic discharge with or without burst suppression (BS).
Results: Induction was well tolerated in both groups. During **Ri**, the loss of eyelash reflex (LER) and CP occurred earlier, the BIS at LER was lower, the nadir of the BIS occurred earlier and was lower than during **Ii** (T1). Major epileptoid signs were markedly more frequent during **Ri** than during **Ii** (T2).
Conclusion: Compared to **Ii**, **Ri** with 6% of S, is associated with more frequent EEG epileptoid signs. Our results suggest that the speed of S induction may influence the occurrence of major EEG epileptoid signs.

T1	t LER (s)	BIS LER	t nadir (s)	BIS nadir	t CP (s)
Ri	52 ± 19	75 ± 19	148 ± 40	16 ± 3	300 ± 80
Ii	84 ± 22***	85 ± 10*	220 ± 38***	22 ± 10**	377 ± 40***

T2	Polyspike n(%)	Rhythmic polyspike n (%)	Periodic discharge with BS; n (%)
Ri	20 (67)	12 (40)	21 (70)
Ii	11 (36)*	0 (0)***	1 (0)***

*p < 0.05, **p < 0.01, ***p < 0.001, **Ii** vs **Ri** (ANOVA).

Reference:

1 Vakkuri, Acta Anaesthesiol Scand 2001; 45:805.

A-2

Xenon induces late preconditioning in rat heart in vivo – involvement of COX-II

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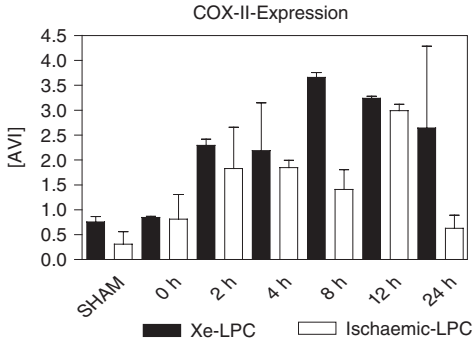
Background and Goal of Study: In myocardial preconditioning (PC) *early* and *late* PC (LPC) are distinguished. *Late* PC occurs 24 h after the stimulus and lasts for 2–3 days. One key step in signal transduction is increased expression of Cyclooxygenase-2 (COX-II). The anaesthetic gas Xenon (Xe) was shown to induce *early* PC (1), but is unknown whether Xe could also induce *late* PC and whether COX-II might be involved.
Materials and Methods: After approval by the local authorities, 44 male Wistar rats were chronically instrumented with a coronary artery occluder. After a recovery of 7 days, animals of the ischaemic LPC (i-LPC) group underwent 5 min of coronary occlusion to induce LPC (n = 4). The animals of the Xe-LPC (n = 4) group were treated with Xe inhalation (70Vol% for 15 min). In the NS-398-Xe-LPC group animals were treated with the specific COX-II inhibitor NS-398 (5 mg/kg BW i.p. n = 4) prior to Xe-LPC. The animals of the controls (CON) were not further treated (n = 4). 24 h later all animals underwent 25 min of myocardial ischemia followed by 2 h of reperfusion under α-chloralose anaesthesia. Infarct size (IS) was assessed by TTC staining. To investigate COX-II expression by PCR LPC was induced by coronary occlusion or Xe-inhalation and hearts were excised at different time points (see results; each n = 2). Data are mean ± SD, Statistics: ANOVA and bonferroni's multiple comparision test as post-hoc test (IS measurements).
Results and Discussions: IS in CON was 67 ± 6%. Both, i-LPC and Xe-LPC reduced IS (31 ± 6% and 35 ± 10%, both P < 0.001 vs. CON). Treatment with NS-398 abolishes the cardioprotective effect of Xe-LPC (IS: 59 ± 7%, P < 0.001 vs. Xe-LPC). Two hours after either treatment, we could detect an increase in COX-II expression, which was higher in Xe treated animals (see Figure).



Conclusion(s): We could demonstrate for the first time that Xe induces LPC, and that an increased COX-II expression is an essential step in Xe induced LPC.

Reference:

1 Weber NC, Br J Pharmacol 44(1):123–32.

A-3

Pharmacokinetic/pharmacodynamic modelling of Rocuronium in children with Duchenne muscular dystrophy

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Background and Goal of Study: Rocuronium (ROC) shows a prolonged onset and duration of neuromuscular block (NMB) in children with Duchenne muscular dystrophy (DMD).[1] In the this study we performed a pharmacokinetic-pharmacodynamic modelling of ROC in DMD and healthy patients.
Materials and Methods: After approval of the local Ethics Committee and signed consent, 20 children with DMD (group DMD, 13 ± 2 yrs., 56 ± 11 kg) and 20 healthy children (group CON, 14 ± 3 yrs., 55 ± 18 kg) were investigated. After administration of 0.3 or 0.6 mg/kg ROC, NMB was monitored using acceleromyography. According to a standard protocol, twitch response at the adductor pollicis muscle was measured after single twitch stimulation of the ulnar nerve. An input–output model with two pharmacokinetic compartments, an effect compartment and a sigmoid Hill equation was fitted to the individual data. Differences between groups were analysed with the Mann-Whitney-U test.
Results and Discussion: Whereas the half-maximal dose ED_{50} and the Hill exponent γ showed no difference, we found a significant lowered k_{e0} in DMD children compared to healthy subjects. The ratio EC_{50DMD}/EC_{50CON} was 0.71 ± 0.16 (SE).

	DMD	CON
k_{e0} (1/min)	0.066 ± 0.028**	0.24 ± 0.10
Hill exponent γ	3.8 ± 2.2	6.2 ± 4.3
ED_{50} (mg/kg)	0.18 ± 0.10	0.21 ± 0.09

**p < 0.01 DMD vs. CON; data are shown as mean ± SD.

Conclusion: The prolonged onset and duration of NMB in DMD children can be explained by a slower exchange between plasma and effect site compartment. Moreover, the concentration at the effect site necessary to achieve half maximum effect is less than in healthy patients. This might be due to altered structure of the motor endplate.

Reference:

1 Wick S, Muenster T, Schmidt J, et al. *Anesthesiology* 2005; 102: 915–919.

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A-4

Validation of the electrical hyperalgesia model in human volunteers: Effects of oral pregabalin and the NK1 antagonist aprepitant

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Background and Goal of Study: Central sensitization is a key mechanism of neuropathic pain. The electrical hyperalgesia model invokes central sensitization experimentally and could be used to detect efficacy of novel treatments in humans. To assess its predictive value, we have investigated pregabalin, a standard neuropathic pain treatment, and aprepitant, an NK1 antagonist, as an example of a drug class active in animal models but not in pain patients. Furthermore, we explored if combinations of either of these drugs with the COX-2 inhibitor parecoxib could improve its efficacy.
Materials and Methods: This was a double-blind, two-period, placebo-controlled, incomplete block design study in 32 healthy volunteers. In a baseline session, the intensity of intradermal electrical stimulation required to cause ongoing pain of 6 on the 11 point numeric rating scale was established; this evoked stable areas of pinprick hyperalgesia and dynamic touch allodynia. The same stimulation was used in the two subsequent sessions. Subjects received oral pregabalin or aprepitant (titrated to 300 mg and 320 mg, respectively) and placebo for 6 days prior to testing. On the day of testing, ongoing pain and sensitization were assessed over 3 hours; at 2 hours subjects received either parecoxib (40 mg) or saline i.v.
Results and Discussions: Pregabalin significantly reduced the areas of hyperalgesia and allodynia vs. placebo ($P < 0.0001$); no significant effect on the area of hyperalgesia or allodynia vs. placebo was observed with aprepitant. In the group that received pregabalin + parecoxib, the area of allodynia was significantly reduced ($P < 0.0001$) and the area of hyperalgesia insignificantly attenuated ($P = 0.09$) vs. placebo + parecoxib; no efficacy improvement was observed with aprepitant + parecoxib. There was no significant effect on ongoing pain with any of the treatments. The side-effects of the treatments were mild and consistent with those observed in the clinic.
Conclusion(s): The model can serve to predict efficacy of analgesic treatments in early clinical development and provide hints on the mechanism of action in humans. It can also be useful for exploring efficacy of analgesic combinations to provide a rationale for patient studies.

A-5

Postoperative pain in the brain – an fMRI study in human volunteers

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Background and Goal of Study: Postoperative, incisional pain is a unique but common form of acute pain. However little is known about cortical activation and the functional significance of distinct brain regions for postoperative incisional pain. In the present study, we examined for the first time the activation of the brain during and after a surgical incision in human volunteers using fMRI.
Materials and Methods: Images were taken on a 3T Philips scanner before, during (0–4.5 min) and after (4.5–10 min, 24–29 min, 44–49 min) an experimental incision (4 mm) in the anterior aspect of the right forearm of 30 volunteers (25.1 ± 5 J, right-handed); 14 volunteers (25 ± 4 years) were scanned before and after a sham procedure. Psychophysical tests (non-evoked pain, area of mechanical hyperalgesia) were performed between the scans (block design). During the last fMRI block (49–54 min) mechanical stimulation was performed in 9 volunteers after incision and 7 volunteers after sham procedure.
Results and Discussions: Several brain areas were activated during and after incision but not during and after sham procedure. During incision (0–2 min) there was an exclusive and significant activity of frontal brain regions (BA6 ipsi- (i) and contralateral (c), BA7 and 8i and BA9i and c), areas responsible for the assessment of pain intensity. Starting with 2 min after incision additional activity of the limbic system (BA23c) was observed. Peak brain activity occurred 4.5–10 min after incision (BA6i, 8i, 9i, 23c, 39i, 40i); subsequently neuronal activity decreased. Correlation analysis of brain activation and non-evoked pain during and after incision indicated certain brain areas important for incision-induced non-evoked pain (e.g. Thalamus, BA9i, BA40c, BA45i). Activity of different brain areas (e.g. BA4c, BA9c and Globus pallidum) during mechanical stimulation 44–49 min after incision showed a significant positive correlation to mechanical hyperalgesia in the same volunteers.
Conclusion(s): An incision activates certain brain areas with a very distinct temporal and spatial activation pattern. Correlation analysis with psychophysics revealed an involvement of different brain areas for non-evoked pain and for mechanical hyperalgesia after incision. Thus, different supraspinal mechanisms may be involved in the generation of resting and ambulatory pain after surgery.

A-6

The role of controlled anticoagulation with heparin in aneurysmal subarachnoid hemorrhage

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Background and Goal of Study: The rapture of aneurysm in subarachnoid hemorrhage (SAH) results in the activation of coagulation system paralleled with topical release of proinflammatory mediators and proteolytic enzymes [1]. The depletion of the coagulation factors is followed by the disseminated intravascular coagulopathy syndrome. Controlled therapy with heparin might be of value in preventing the reological and coagulation disturbances in SAH [2]. Therefore, the aim of our study was to assess the efficacy of heparin in patients with SAH and cerebral vasospasm.
Materials and Methods: We enrolled 101 patients with aneurismal SAH to the prospective observational study. The patients were assigned either to standard "triple-H" (hypertension, hypervolemia and hemodilution) therapy (3-H, n = 51; 45 ± 11 yrs.; 25M/26F) or "triple-H" therapy combined with continuous controlled heparin infusion (4-H, n = 50; 43 ± 13 yrs.; 24M/26F). Data were compared using Student's *t*-test paired when appropriate and χ^2 test. $p < 0.05$ was regarded as significant.
Results and Discussions: The severity of SAH as assessed by Hunt-Hess and Fisher scales did not differ between the groups. Transcranial Doppler scan showed an increase of the ischemic threshold by 20% as determined by the peak velocity of basal blood flow in the 4-H group ($p < 0.01$). The incidence of ischemic events and hydrocephaly reduced by 17.2% and 15.6%, respectively, in the 4-H group compared with the 3-H group ($p < 0.05$). Addition of heparin to routine therapy resulted in the decrease of the mortality rate from 27.5 to 10% ($p < 0.05$).
Conclusion: The results of study demonstrated the beneficial effects of anticoagulant therapy in patients with SAH. Further randomized controlled studies required to evaluate the role of "quad-H" approach in this field of acute neurological care.
References:
1 Frankiewicz T, *Neuropharmacology* 2000; 39: 631–642.
2 Romner B, et al., *Acta Neurochir Suppl* 2001; 77: 237–241.

Evidence Based Practice and Quality Assurance

A-7

Our patients' fears regarding anaesthesia: a survey of 350 patients

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Background and Goal of Study: To record down our patients' fears regarding anaesthesia in order to help them decrease preoperative anxiety.
Materials and Methods: 350 questionnaires were gathered and answered by patients preoperatively, after the anaesthesiologist's preoperative visit. Patients (women and men 15–67 years old, ASA I–III) answered 15 fixed questions related to their possible fears of the anaesthesia they were to be given. There were three answer choices: No fear, Medium fear, Great fear.

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Results and Discussions: The results are shown below as percentages (%) of the patients:

Fear of:	No fear (%)	Medium fear (%)	Great fear (%)
Postoperative pain	16.6	55.1	28.3
Postoperative nausea	39.4	51.1	9.4
Postoperative vomit	49.1	42.3	8.6
Needles	42.3	42.6	15.1
Inability to wake up	34.0	43.4	22.6
Anaesthesia failure	57.4	30.3	12.3
Waking up in the middle of surgery	58.3	29.1	12.6
Prolonged sleep postoperatively	51.7	38.9	9.4
Inadequate postoperative care	53.7	40.6	5.7
Possible staying in ICU	70.3	23.1	6.6
Affecting judgement and thought	68.6	28.6	2.9
Becoming paralyzed	66.6	23.4	10.0
Anaesthesiologist's presence or not in OR	48.9	33.4	17.7
Disclosure of personal matters	80.9	15.1	4.0
Anaesthesiologist's inexperience	80.0	16.0	4.0

A large percentage of the patients (61.1%) discuss their fears mostly with relatives (52.5%) and less with the anaesthesiologists (21.2%) and the surgeon (16.6%) in contrast to the rest (38.9%) of patients who discuss their fears with no one.

Conclusion: Studying carefully our patients' concerns we believe that it is possible to limit them with proper preoperative information. An important contribution to this is the consistent and responsible preoperative visit.

Reference:

1 Anesth Analg. 1991 Aug;73(2):190–8.

A-8

What our patients want to know about anaesthesia

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Background and Goal of Study: Almost all patients want to be informed about the anaesthesia given to them. The aim of the survey is to learn what they want to know about anaesthesia before entering to operation room in our hospital.

Materials and Methods: We studied 350 questionnaires that were answered by our patients preoperatively. Patients (women and men 15–67 years old, ASA I–III) answered fixed questions aiming to detect what they want to know about anaeshesia. There were two answers choices: yes or no.

Results and Discussions: 71.3% of our patients answered that they didn't have adequate knowledge and were interested in having an informative leaflet regarding anaesthesia, whilst 17.7% were not interested and 10.7% didn't care at all.

The details of anaesthesia, that our patients wanted to know (in order of precedence) are shown below:

Do you want to know:	Yes (%)	No (%)
When you are allowed to get up	89.6	10.4
The duration of anaesthesia	85.5	14.5
Whether you feel pain after the operation and what kind of medicine you can have	84.1	15.9
Whether you will have drips, catheters when you wake up and how long	79.1	20.9
Different methods of anaesthesia	73.3	26.7
Details of any preoperative drugs	70.1	29.9
When you are allowed to drink and eat	69.9	30.1
Details of **all** possible complications of anaesthesia	69.3	30.7
Where you will recover from anaesthesia	64.6	35.4
Details of any needles, drips used for giving you anaesthesia	59.7	40.3
Details only of **common** complications of anaesthesia	14.8	85.2
Details only of **dangerous** complications of anaesthesia	11.9	88.1

Conclusion: Patients' desire for information about anaesthesia is thus more than obvious. Since verbal information about all these issues is rather impossible in daily routine, we should consider the preoperational distribution of an information leaflet.

Reference:

1 Anaesthesia 1991 May;46(5):410–2.

A-9

The effect of hypothermia on natural killer cell activity and on the susceptibility of lung metastasis in rats

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Background and Goal of Study: Animal studies indicate that surgery induced suppression of blood natural killer cell activity promotes tumor metastasis. This study evaluated the effect of hypothermia on the activity of natural killer cells and on host susceptibility to metastasis. The involvement of adrenergic mechanisms was also considered.

Materials and Methods: Male wistar rats remained awake in their cages (control group) or were anesthetized with 40 mg/kg sodium thiopental and maintained for 2 h at core body temperature of 32°C (hypothermia groups) or 38°C (normothermia group). Blood was drawn so natural killer cell activity could be assessed after 2 h, or rats were injected with 10^5 syngeneic MADB106 tumor cells after 2 h, 4 weeks later for counting of metastasis. In the third experiment, Rats were injected with radiolabeled 10^5 syngeneic MADB106 tumor cells, lungs were removed at 9 h later for assessment of lung tumor retention, or 3 weeks later for counting of metastases.

Results and Discussions: Hypothermia could significantly suppress NK activity as compared with that in the normothermic and control groups ($P < 0.05$). The numbers of metastasis in the hypothermic group increased from 3.5 ± 2.3 to 11.55 ± 6.27. Lung tumor retention was increased from $0.136\% \pm 0.61\%$ to $0.318\% \pm 0.19\%$. Nadolol significantly decreased the effect of hypothermia on tumor retention.

Conclusion: Hypothermia under thiopental anesthesia suppressed natural killer cell activity in rats and increases the susceptibility of lung to tumor metastasis, the mechanisms might associate with adrenergic reaction.

References:

1 Ben-Eliyahu S, Guy Shakhar, Ella Rosenne, et al. Hypothermia in Barbiturate-anesthetized rats suppresses natural killer cell activity and compromises resistance to tumor metastasis. Anesthesiology 1999; 91:732–40.
2 Page GG, Ben-Eliyahu S, Liebeskind JC, et al. The role of LGL/NK cell in surgery-induced promotion of metastasis and its attenuation morphine. Brain Behav Immun 1994; 8:241–50.

A-10

The prevalence of depression prior an elective surgery

H. Chrona[1], P. Daras[1], S. Papanastassiou[1], A. Tselebis[2], D. Bratis[2], G. Moussas[2], A. Palgimesi[1]

[1]Department of Anaesthesiology, General Hospital of Nikaia, Piraeus; [2]Psychiatric Department, General Hospital of Sotiria, Athens, Greece

Background and Goal of Study: The prevalence of depressive symptoms among the population of Greece varies between 5.4% to 7.4% according to relevant studies (1, 2). A scheduled operation is undoubtedly a significant factor of depressive symptoms development. The aim of this study was to investigate the symptoms of depression among patients scheduled for elective surgery.

Materials and Methods: 64 patients (ASA I–III) who were undergoing a low, intermediate or highly invasive scheduled operation filled out the BDI (Beck Depression Inventory) questionnaire (3) 24 hours before surgery. Their age, gender and medical history of previous operations were recorded. Data were analyzed using t-test, χ^2, ANOVA and Pearson Correlation statistical methods with $p < 0.05$ accepted as statistically significant. Results are presented as Mean $\pm$ SD.

Results and Discussions: The mean age of the sample was 46.12 ± 10.12 years. There were no statistical differences according the gender (t-test, $p > 0.05$) between men (46.79 ± 9.6 years) and women (45.52 ± 10.8 years). In addition, there was no numeric difference (χ^2, $p > 0.05$) according the gender, between patients that had a previous operation. The mean BDI score was 8.71 ± 7.45 while in 24% of the patients appeared samples of depressive symptoms. The invasive form of the operation and the ASA physical status of the patient (ANOVA, $p > 0.05$) had no effect on BDI score. On the contrary, patients that had an operation in the past present higher BDI score (11.4 against 4.01: t-test, $p < 0.05$). Women appeared to have higher BDI score than men (11.1 against 6.01: t-test, $p < 0.05$). Age seems to have no correlation with depression (Pearson Correlation, $p > 0.05$).

Conclusion(s): During the preoperative period the prevalence of depression increases significantly, although more vulnerable seems to be women and patients that had a surgical procedure in the past.

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1 Madianos M, Stefanis C, Soc Psychiatry Epidemiol 1992, 27: 211–219.
2 Mavreas VG, Beis A, Mouyias A, et al. Soc Psychiatry 1986, 21: 172–181.
3 Beck AT & Steer RA (1987) Manual for the Revised Beck Depression Inventory. San Antonio TX: Psychological Corporation.

A-11

Anxiety disorders during the preoperative period

H. Chrona[1], P. Daras[1], S. Papanastassiou[1], A. Tselebis[2], D. Bratis[2], G. Moussas[2], A. Palgimesi[1]

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Background and Goal of Study: Anxiety disorder is the commonest psychiatric diagnosis in the Greek population and its prevalence is about 8% (1).

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Scheduled surgery works as a potential anxiety attack factor for the patient. The aim of this study was to investigate the anxiety symptoms among patients scheduled for elective surgery.

Materials and Methods: 64 patients ASA I–III who underwent a scheduled minimally, moderate or highly invasive surgery, filled out the Spielberger State – Trait Anxiety questionnaire 24 hours preoperatively. This questionnaire differentiates the state anxiety from the personality's trait anxiety (2). Patients' age, gender, and medical history of previous operations were recorded. T-test, χ^2, ANOVA and Pearson Correlation were used for statistical analysis with $p < 0.05$ accepted as statistically significant. Results are presented as Mean $\pm$ SD.

Results and Discussions: The mean age of the sample was 46.12 $\pm$ 10.12 years with no statistical significant difference according to the gender (t-test, $p > 0.05$). In addition there was no difference according to the gender between patients who had a previous operation (χ^2, $p > 0.05$). The mean State Anxiety score was 41.53 $\pm$ 14.35 and the mean Trait Anxiety score was 39.97 $\pm$ 10.71. The overall Anxiety score of the scale was 81.5 $\pm$ 22.54 with a 24% of the patients presenting pathologic values. The anxiety scores were not significantly different according to the type of surgery or the ASA physical status of the patient (ANOVA, $p > 0.05$). Females had higher State anxiety scores than males (47.45 against 34.94: t-test, $p < 0.05$). Age seems to have no correlation with anxiety symptoms (Pearson Correlation, $p > 0.05$). High positive correlation was found between State and Trait Anxiety pathologic scores (Pearson Correlation, $p < 0.01$).

Conclusion(s): State anxiety disorders are common among patients preoperatively and more vulnerable seems to be females. Probably this should be taken into account for the preoperative assessment in order for supportive psychological interventions to be developed.

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A-12

Written anaesthesia consent: what Greek patients understand and require?

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Background and Goals: Informed consent for anaesthesia is a relatively new concept. This trend is well established in the U.S.[1] and some parts of Europe[2,3] but is still quite "young" in Greece. Written consent is obtained from our patients the last two years, following comprehensive written information and oral explanation of requested details.

This study examines understanding and response to the information offered in writing and orally, during the preanaesthetic visit in this specific Greek population.

Materials and Methods: We studied 60 patients ASA 1–3, scheduled for minor to major surgical or gynecological procedures. During the preoperative evaluation, the anaesthetist explained the recommended anaesthetic plan and the potential risks. Patients were asked to sign the consent form and answer a questionnaire form concerning their own understanding and fears.

Results: The majority of the patients (98.4%) read the consent form, accepted the potentials complications (93.23%) and consented for anaesthesia (100%). 50% refused detailed information of the anaesthetic procedure (anaesthesia machine and drugs or handling of postoperative pain). 71.1% asked about the possibility for blood transfusion while 84.75% wanted to know the exact duration of the surgical procedure. Finally 91.31% of the patients appreciated the key role of the anaesthetist during the procedure.

Conclusions: All our patients consented to receive anaesthesia but didn't ask many details for the anaesthesia process. Main concerns appear to be blood transfusion and duration of the surgery. They believe that the anaesthetist has a mandatory role during the surgical procedure.

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A-14

Preoperative assessment: herbal medicines use

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Background and Goal of Study: The consumption of herbal medicines has increased significantly. People consider this consumption as something "natural", but there are data that show that these are bioactive products and have major adverse effects when taken in the preanaesthetic period or together with anaesthetics. This study was carried out in our hospital with the purpose of quantifying the consumption of herbal medicines in patients evaluated in the preoperative period.

Materials and Methods: For twelve weeks, all patients evaluated in the preanaesthetic consultation have been directly questioned about their regular medication and about the consumption of herbal medicines whenever it wasn't spontaneously referred.

Results and Discussions: Seventeen percent of the evaluated patients were taking herbal medicines. Only one patient admitted spontaneously the use of herbal medication on a regular basis. Almost all of them stated that it was self-prescribed. Patients who referred this consumption were predominantly in the 40–60-year-old range, and mostly female. It was verified that the consumption of herbal medicines is frequent, that in its majority herbal medication is self-prescribed and that patients don't recognize it as part of their regular medication.

Conclusion(s): Herbal medicines use is common in preoperative patients. It is associated with potential adverse reactions and drug interactions, being thus mandatory that anaesthesiologists have a solid knowledge of these products and become aware of its use in the preoperative assessment in order to optimise their patients' preparation.

A-15

Performance improvement project assessing patient satisfaction on 3075 patient at tertiary hospital

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Background: Understanding patient satisfaction is important in attempting to improve anesthetic care. Knowledge about patient recollection of anesthesia is important. It can provide insight into what patients consider important for their satisfaction.

Goal of Study: To evaluate the relationship between patient satisfaction and patient recollections of feeling in the pre induction and the immediate post anesthetic period.

Materials and Methods: A prospective study of 3075 consecutive patients undergoing anesthesia for non cardiac surgical procedures. Age ranges from 18 to 81 years. Male to female was 51 to 49. During a routine postoperative assessment. Patients were asked what they remembered about how they felt during pre induction period and on emerging from anesthesia. The level of their satisfaction was graded to five grades. Data was collected and encoded in excel file. Statistical analyses were performed using spss program to investigate the relations between the variables. Correlation between pairs of variables was evaluated using Kendall's Tau.

Results and Discussions: Patients recollections of feeling cold during the preinduction and recollection of pain sore throat cold nausea and vomiting in the post anesthetic period are strongly correlated to the level of satisfaction $r = 0.507$, $p = 0.0001$.

Conclusion(s): Reducing the incidence of minor anesthetics would improve patient satisfaction.

A-16

A comparison between the ASA classification and 48 binary risk factors in elective surgical patients as predictors of mortality

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Background and Goal of Study: The physical status may influence patient outcome after surgery. Optimal preoperative risk stratification should lead to an improved allocation of anaesthesiological resources.

Materials and Methods: The existing ASA classification of the physical patient status is well established. Besides the ASA classification 48 dichotomous risk parameters such as metabolic disorders, coronary artery disease etc were also assessed at the preoperative clinical consultation. The generated records were linked with the administrative database of the hospital. Therefore, mortality within 24 hours and 30 days after surgery was linkable with the two different classifications strategies. The following definition of relative risk was used for the binary criteria's: (sum of records with positive criteria/number of patients died with this criteria)/(sum of records with positive criteria/number of patients survived with this criteria). Using this formula, a value <1 defines a protective factor.

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Results and Discussions: In 25883 consecutive patients for non emergency surgical interventions, both classifications systems were used and files could be analyzed. The overall mortality within 30 days was 1.07% and mortality within 24 hours was 0.22%. Hypovolemia, sepsis, arterial hypoxemia or hypercarbia turned out to be the risk factors with the most impact on 30 day mortality. 30 day mortality for patients with ASA IV was 22.63%, for ASA IV 70.59% within. When ASA classification is compared with the 48 risk parameters used in this study, the predictive value for mortality of this system is not improved by the more differentiated 48 binary risk parameters. For example, 10% of the patients died within 30 days had no risk factor identified preoperatively and only in 6% of all survivors no binary risk factor was identified.

Conclusion(s): The ASA classification underlies also a subjective variation by the anaesthetist. The enlargement of the ASA classification by neither one of the 48 risk factors could improve the prediction of mortality.

Reference:

1 Anaesth Intensive Care 1996; 24:685–693.

A-17

Lung cancer resection in patients with a history of myocardial infarction: perioperative risk

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Background and Goal of Study: The association of lung cancer and previous myocardial infarction (MI) is common and can increase operative morbidity and mortality. The aim of this study was to evaluate the incidence and clinical implications of postoperative complications after lung resection, as well as to identify possible risk factors in patients who previously suffered from MI.

Materials and Methods: A retrospective study was done in patients with previous MI after lung cancer resection for a three year period. We recorded age, sex, body mass index, smoking, comorbidity as well as extent and duration of surgery performed and both intraoperative and 24 hours time blood loss. Postoperative complications and fatal outcome as a separate complication were recorded within 30 days after thoracotomy. Fishers exact test or chi-square test were used for statistical analyses.

Results and Discussion: Total of 37 patients, 28 male and 9 female, were analyzed. 25 patients (67.57%) suffered from anteroseptal MI, while 12 patients (32.43%) suffered from diaphragmal MI. Lobectomy was performed in 20 patients (54%), pneumonectomy in 11 patients (29.7%), while 6 patients (16.2%) underwent wedge resection. Postoperative cardiovascular complications occurred in 11 patients, 9 of which with prior anteroseptal MI and two patients with prior diaphragmal MI. Four patients had postoperative pulmonary complications (10.81%). Five patients (13.51%) died, four of which with prior anteroseptal MI. There was a significant correlation between age (>65) and postoperative complications ($p = 0.0105$), as well as the extent of resection (pneumonectomy, $p = 0.0002$), procedure duration >180 min ($p = 0.0002$) and blood loss >1500 ml/24 hrs (Hi = 4.259; $p < 0.05$). The results of the study show that patients with prior MI are at significantly high risk of developing postoperative complications in lung resection. Contributing risk factors are: smoking (100%), comorbidity (91.89%) and high ASA score (III/IV).

Conclusion: The incidence of lung resection postoperative morbidity and mortality are significantly high in patients with MI history. Age, type and extent of surgery, as well as the procedure duration and blood loss are still the most significant risk factors.

A-18

Effect of perioperative blood glucose level on long term outcome: risk for development of diabetes mellitus and cardiovascular events

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Background and Goal: Perioperative hyperglycaemia is a known risk factor for wound infections and cardiovascular complications [1]. In a retrospective analysis we investigated the influence of perioperative hyperglycemia on the development of diabetes mellitus (D.m.) and risk for cardiovascular events after 5 years follow up in vascular surgery patients.

Materials and Methods: 498 patients who underwent abdominal aortic aneurysm or carotid artery surgery in the years 1999 and 2000 were included. The medical records were analyzed for history of cardiovascular disease, D.m., highest blood glucose levels at 6 perioperative days and parameters of anesthesia. Five years after surgery the patients were contacted by mail or phone and questioned for cardiovascular events, history of D.m., and actual medication. From 474 (95%) patients complete datasets were obtained. Data are shown as mean ± standard deviation, statistical evaluation by regression analysis.

Results: Included patients were 67 ± 9 years old at time of surgery, 378 (80%) were male. 98 patients (21%) had a known history of D.m. at time of surgery. The mean blood glucose was 113 ± 36 mg/dl (preoperative, n = 214), 151 ± 64 (intraoperative, n = 384), 192 ± 56 (post anaesthesia care unit, n = 165), 202 ± 62 (ward, n = 341), 169 ± 56 (1st day, n = 284), 152 ± 55 (2nd day, n = 131), 148 ± 59 (3rd day, n = 73), 166 ± 49 (4th day, n = 37) and 182 ± 77 (5th day, n = 25). After 5 years follow up, 31 (8.2%) previously non-diabetic patients developed D.m. Perioperative blood glucose levels of these patients were not different from patients without D.m. (in average 160 ± 33 vs. 153 ± 39). Cardiovascular complications were not different in normo- (n = 183) and hyperglycemic (n = 251) patients (hyperglycemia defined as blood glucose > 150 mg/dl): renal insufficiency 15 (8.2%) vs. 22 (8.8%); stroke 38 (20.8%) vs. 43 (17.1%); myocardial infarction 3 (1.6%) vs. 5 (2%); death 37 (20%) vs. 56 (22%).

Conclusion: This retrospective analysis could not show that perioperative hyperglycemia is a predictor for development of diabetes mellitus or a significant risk factor for cardiovascular complications during 5 years after vascular surgery.

Reference:

1 Ley et al. Anaesthesiol Intensivmed Notfallmed Schmerzth 2005; 40: 230–246.

A-19

Prospective analysis of perioperative blood glucose monitoring and treatment of patients with known Diabetes mellitus in an university hospital

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Background and Goal: Patients with known Diabetes mellitus (D.m.) are at risk of perioperative derailment of blood glucose (BG) levels to hypo- and hyperglycemia [1]. This study assessed prospectively the BG monitoring and therapy of patients with history of diabetes undergoing general-, vascular-, cardiac- and trauma surgery in an university hospital before introduction of standard operating procedure for these patients.

Materials and Methods: 222 patients (of total 2706 undergoing surgery) had a known history of D.m. and were included. BG measurements and derived therapy was documented. All data are mean ± standard deviation. BG unit is mentioned as mg/dl.

Results: 222 (8.2%) of all patients undergoing surgery had a known history of D.m., 10 (4.5%) had a type 1 and 212 (95.5%) a type 2 D.m., and 98 (44.1%) used insulin. Mean age was 69.9 ± 10.3 years. At the day of surgery only 11 (5%) patients injected insulin in the morning. Fasting blood glucose level was measured in 115 (51.8%) patients, with a mean BG of 142 ± 42. After induction of anaesthesia in 190 (85.6%) metered patients mean BG was 146 ± 54. Highest BG during surgery was 193 ± 53. In 23 (10.4%) patients no additional BG was measured after induction of anaesthesia. 139 (62.6%) patients received insulin during surgery but in 46 patients (33.1%) BG was not controlled after insulin administration. In 175 (78.9%) patients the postoperative BG was 162 ± 45. On ward, in 68 (30.6%) patients BG was not measured at the day of surgery. Only 77 (34.7%) patients got minimal number of BG measurements at important time points and only 6 of theses patients (2.8%) also had BG in near normal (80–150) range.

Conclusion: Patients with known history of diabetes mellitus were undermonitored and insufficiently treated during the perioperative period. There is great need for standard operating procedures regulating time points for BG measurements and insulin therapy scheme for correction of peri- and intraoperative hyperglycemia.

Reference:

1 Ley et al. Anaesthesiol Intensivmed Notfallmed Schmerzth 2005; 40: 230–246.

A-21

Recovery from neuromuscular blockade: a survey of practice

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Background and Goals: Studies consistently show that 5–10% of patients in the immediate post operative setting have evidence of residual neuromuscular

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blockade (NMB) (1,2). Assessment of NMB using clinical signs is both unreliable and impractical. In an attempt to establish current practice and attitudes, we undertook a survey of practice among anaesthetists in three hospitals in the UK.

Materials and Methodology: A questionnaire was distributed to all anaesthetists in 3 large departments in the South of England. The respondents were asked to supply details regarding their use of peripheral nerve stimulators and the parameters they considered suitable for extubation. For those anaesthetists who did not use a monitor, information was sought regarding the clinical tests routinely performed at the end of surgery.

Results and Discussion: A total of 243 questionnaires were circulated and 157 replies received (65%). 146 (93%) used a peripheral nerve stimulator at some time in their routine practice. 51 (33%) used a quantitative nerve stimulator on a regular basis. Only 16 (10%) used a quantitative nerve stimulator for all cases in which NMB was applied. In accordance with most standard texts, 117 (74%) aimed for a train-of-four (TOF) ratio of >70% prior to extubation. However, only 39 (25%) aimed for a TOF of 90%, in line with more recent literature (3). Despite proven fallibility, a large proportion of respondents relied upon simple bedside tests such as sustained head lift (40%) and a normal pattern of respiration (40%). Despite several recent publications demonstrating unequivocal advantages in using objective monitoring only 38 (24%) of respondents felt that there use should be mandatory.

Conclusions: 1) There is a lack of appreciation of the limitations of assessment of neuromuscular function by non-quantitative means. 2) There is a serious deficiency in the familiarity and use of such monitors. 3) At present in the UK there are no published guidelines advocating the objective assessment of neuromuscular function despite commercial availability of such devices. In the light of our findings it may be appropriate to re-assess the applicability of using routine monitoring in this area.

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A-22

Procedure-specific postoperative pain management (PROSPECT) recommendations: a rigorous methodology to minimise bias

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Background and Goal of Study: PROSPECT is a web-based initiative (www.postoppain.org), led by an expert Working Group (WG) of surgeons and anaesthesiologists. Its aim is to formulate robust evidence-based recommendations for procedure-specific postoperative pain management. Building on previous experience, the PROSPECT methodology has been recently revised to increase the rigour and transparency of the systematic review process and of the formulation of the consensus recommendations.

Materials and Methods: This refined methodology was formulated by the WG and first applied in the 2006 update of postoperative pain management for laparoscopic cholecystectomy.

Results and Discussions: Formulation of the recommendations begins with a procedure-specific systematic review, including the following elements (refined features are indicated in brackets): 1) comprehensive literature search in MEDLINE, EMBASE, the Cochrane library, and secondary literature; 2) study inclusion/exclusion: only randomised controlled trials, reporting pain in the relevant procedure, are included; 3) study quality assessment (and assignment of levels of evidence, carried out independently by 2 reviewers; assessments are made available to all members of the WG and users of the review); 4) qualitative and quantitative analyses. The WG evaluates the validity of outcome measures, agrees on supplementary transferable evidence from similar procedures and provides expertise from clinical practice. Best practice consensus recommendations are then formulated and graded according to the level and source of evidence. This process is more rigorous and reduces the potential for bias: the WG's comments on the review are collated by a moderator, according to the Delphi method, before discussion of the draft recommendations. Where consensus is not reached by group discussion, a modified Nominal Group Process is used, which involves iterative rounds of discussion and voting, until consensus is reached.

Conclusion(s): The improved methodology should help fulfil the core aims of PROSPECT and give users added confidence in the evidence-based recommendations.

A-23

Predicting outcome of emergency aneurysm surgery in a District General Hospital

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Background and Goal of Study: The operative mortality for ruptured abdominal aortic aneurysms (RAAA) is high and the decision to operate is difficult. Hardman developed a five point predictive mortality score in patients with RAAA. This has been validated in tertiary centres[1]. We aimed to assess validity of such a scoring system in a District General Hospital (DGH) in the UK and analyse blood product usage.

Materials and Methods: A retrospective case note review was undertaken for patients presenting to theatre with RAAA in a DGH over a six-year period from 1999 to 2005. Data was collected on five risk criteria: age >76 years; haemoglobin <9 g/dl; creatinine >190 μmol; documented loss of consciousness; ischaemic ECG. We recorded 1- and 30-day operative (op.) mortality, blood product usage and time delay.

Results and Discussions: 79 patients with confirmed RAAA went to theatre. Mean age was 73.24 years. 63 (73%) had all five risk criteria recorded. 30-day mortality was 32.9% overall and those of scores ⩾3 had 100% mortality Table 1. Average blood usage was noted Table 2 and time from admission to theatre; 172 minutes (10–720), for cases with ⩾364 min (20–120).

Table 1. Operative mortalities by number of risk criteria

Hardman Score	No. of cases	30-day op. mortality	Hardman 30-day op. mort.
0	19 (24%)	3 (15.8%)	16%
1	25 (31.6%)	8 (32%)	37%
2	27 (34.2%)	7 (25.9%)	72%
3	8 (7.6%)	8 (100%)	100%

Table 2. Blood product usage (unit) by number of criteria

Hardman Score	Blood	FFP	Platelets
0–2	7.45	3.47	0.58
⩾3	12	5.4	0.6

Conclusion(s): The Hardman preoperative risk scoring criteria are transferable to a DGH. The average time to theatre from admission allow ample time to collect data. We showed patients with a score of ⩾3 used more blood products. Increased usage of such criteria may facilitate patient selection and more appropriate use of resources.

Reference:

1 Hardman DTA, Fisher CM, Patel MI, Appleberg M et al. J Vasc Surg 1996; 23: 123–129.

A-24

The incidence of myocardial ischemia in major orthopaedic surgery is correlated with quality of care

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Background and Goal of Study: The aim of this study was to assess the impact of the quality of care on perioperative myocardial ischemia detected by serial measurements of troponin (TnIc).

Materials and Methods: During two years, TnIc was measured for the first three postoperative days in patients undergoing major orthopedic surgery in a multidisciplinary hospital. After 16 month of study, postoperative cares were improved in a "quality insurance fashion" focused on oxygen therapy, fluid management and aggressive control of the blood glucose level. Myocardial ischemia incidence was compared between the two phases of the study.

Continuous variables were explored using the t-test and non parametric variables with Kruskall-Wallis test.

Results and Discussion: 233 patients were enrolled including 158 scheduled arthroplasties, 39 hip fractures, 27 reoperations of arthroplasty, 9 others major surgeries. TnIc concentrations greater than the pathologic threshold were detected in 15 (6.4%) of the patients (9/15 on first postoperative day, 14/15 on 2nd postoperative day). 4 had electrocardiographic or clinical signs of myocardial ischemia. There were no statistically significant differences between the two study phases neither in population characteristics nor in type of surgery. By contrast, after postoperative care improvement postoperative

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myocardial ischemia incidence decrease from 9.2% to 2.9% (12/118 vs 3/100 p = 0.017).
Conclusions: Myocardial ischemia is common in a non select major orthopaedic surgery population, mostly asymptomatic. Such a phenomenon is well correlated with postoperative-care quality.

A-25

QUIP: Quality improvement in postoperative pain

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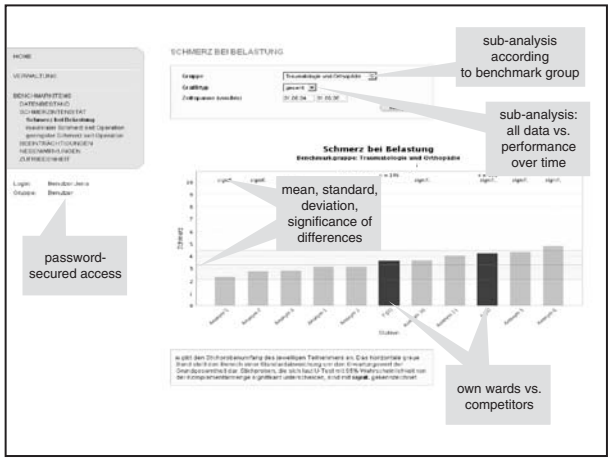
Background and Goals: Surveys from various countries show that the quality of acute pain management is far from being satisfactory. Regular measurement and feedback of quality indicators is recommended to overcome these deficits (1). Therefore, a project to improve quality of postoperative pain was developed over the past 3 years.
Materials and Methods: A set of outcome and process parameters of postoperative pain management is obtained from a random sample of surgical patients on the first postoperative day. These data are sent to a "benchmark server" for analysis and peer comparisons. Finally, immediate feedback is transferred to the local multidisciplinary pain management teams by means of a pass-word secured, inter-active webside.
Results and Discussions: Up to now, more than 8000 data sets are recorded, analyzed and fed back to thirty participating wards in six hospitals. Due to this large data base, it is possible to compare specific subgroups (i.e., visceral surgery) and even tracer surgeries (i.e., knee replacement). An example of a web-based feedback is shown in the Fig. Chances in daily practice are mirrored in the outcome parameters: After replacement of one analgesic by another, pain intensity and functional interference increased clinically meaningful and significantly in one of the participating hospitals. Moreover, analysis of variance allows to identify the relative influence of different parameters on patients' satisfaction with pain management: Pain on movement and patients' complain not to have received enough analgesics revealed to be the most important factors.



Conclusions: This project allows short-term on-line analysis, internal and external benchmarking. It is possible to identify effects of pharmacological and non-pharmacological interventions and to compare departments on the basis of "tracer" surgeries.
Reference:
1 Gordon DB et al. APS recommendations for improving the quality of acute and cancer pain management. Arch Intern Med 2005, 165: 1574–1580.

A-26

The Gini coefficient: operation room management provides data for the measurement of the variety and diversity of procedures per surgical subspeciality

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Background and Goal of Study: General hospitals are under pressure especially under establishing of new payment models like such guided by DRG (Diagnosis Related Groups). Therefore, a general trend for specialized surgical centers is obvious (1). The knowledge of the level of standardisation is for this reason important and allows stratetigcal management of surgical subspecialities.
Materials and Methods: The Gini coefficient (Range: 0–1) is a measurement of the level of standardisation when a economical ABC analysis is performed. Low Gini values are typical for a low level of standardisation. All surgical cases coded by ICD-9-CM in one of the 8 central operations rooms in a Swiss general teaching hospital over a period of 30 months were included. The database was analysed by the ABC method (2) Due to the ABC analysis the Gini coefficient (3) for each speciality was specified.
Results and Discussions: 3412 operations done by seven specialities were evaluated. The Gini coefficient (GC) is for the Pareto distribution 0.86. The Neurosurgery has just a value of 0.34, means nearly each operation is unique. The highest level of standardisation reached the vascular surgery with a GC of 0.68. Compared with other industries the degree of standardisation in our general hospital is low as measured by the the GC. The coefficients per displine are shown in the table.
Conclusion(s): The GC is valuable and objective measurement of the different procedures and standardisation of surgery of given surgical subspeciality. It can be calculated from the operation room management (ORM) database and allows an objective analysis of the variety of surgical procedures per subspeciality. For the first time the GC was applicated in a ORM setting.
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A-27

Late cancellations in ENT surgery – reasons and costs

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Background and Goal of Study: Late cancellations of scheduled operations are a major cause of inefficient use of operating-room time and a waste of resources. The cancellations can be grouped into hospital and patient related and medical reasons. High cancellation rates have earlier been reported in ENT surgery. The goal of this study was to find out how large a proportion of the scheduled operations are cancelled in a large ENT hospital. Further, to reveal the reasons for cancellations and their costs.
Materials and Methods: A study was performed in the Department of Otorhinolaryngology, Helsinki University Hospital, Helsinki Finland. The OR lists were reviewed 11.4–17.6.2005. Reason for every cancellation that occurred in the afternoon before the scheduled operation or later was confirmed. Demographic and operation related data was gathered. The cost for every cancelled operation was estimated using the internal billing system of the hospital.
Results: During the observation period, there was 50 working days with 951 scheduled operations, of these 59 (6.2%) operations were cancelled in 57 patients, mean 1.18 cancelled operation/day. Mean age of these patients was 35 yr., 37 (65%) were males. In the age group 0–4 yr. 10 (17%), and in the age group 40–44 yr. 7 (12%) operations were cancelled. Cancellations occurred most frequently on Wednesdays, 18 (30.5%). Of the cancelled operations, 44 (75%) were scheduled for general and 15 (25%) for local anaesthesia. Patient related reasons for cancellation were recorded in 34 (57.6%), hospital logistics in 11 (18.6%), and medical reason in 10 (17%) of the cases. The commonest single reason for cancellation was patient's illness, 22 (37.2%). The commonest diagnoses for cancelled operations were septoplasty 9 (15%) and tonsillectomy 8 (13.5%). The cancellations resulted in 41165€ losses, which was 5.1 % of the total costs of all operations in the observation period.
Conclusions: Late cancellations are common in ENT surgery resulting in high costs. Approximately 1/3 of the cancellations might be avoided with more careful preoperative assessment, better hospital logistics and patient information.

A-28

Improved postoperative outcomes with preoperative statin therapy: a meta-analysis

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Background and Goal of Study: Statin therapy is well established for primary and secondary prevention of cardiovascular disease[1]. Growing evidence suggests that statin therapy also reduces postoperative morbidity and

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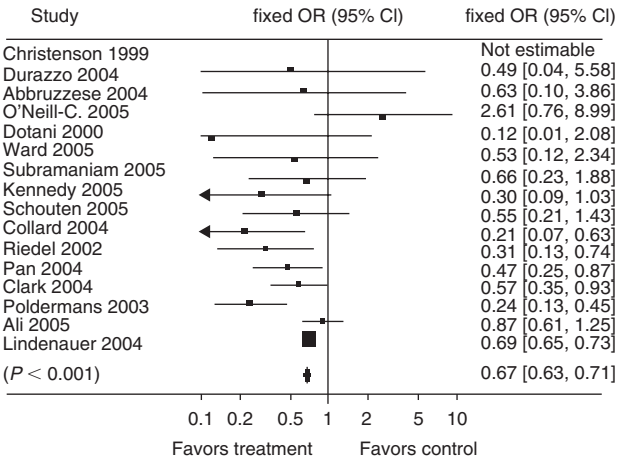
mortality[2]. We performed a meta-analysis to determine whether preoperative statin therapy is associated with improved outcomes after cardiac, vascular, and noncardiovascular surgery.
Materials and Methods: A systematic literature search and meta-analysis (fixed-effects model) evaluated the effect of preoperative statin therapy on postoperative outcomes. Two authors independently abstracted data (n = 224,080 patients) from 13 retrospective and 3 randomized prospective trials.
Results: Depending upon the type of surgery, preoperative statin therapy was associated with a 1.0%–4.9% absolute reduction ($P < 0.001$; Figure) and a 33%–57% reduction in the risk of mortality. The incidence of stroke among statin users was also significantly reduced after vascular surgery (2.0% vs. 3.3%; $P = 0.03$) but not cardiac surgery (2.7% vs. 3.2%; $P = 0.26$).



Conclusion: Statins may reduce postoperative mortality. Our data suggest that preoperative statin therapy should be continued in the postoperative period. Forest and Funnel plot inspection suggest heterogeneity and publication bias and the need for larger, randomized prospective studies.
References:
1 Shepherd J. *Atheroscler Suppl* 2004; **5**(3): 115–23.
2 Durazzo A. E. *J Vasc Surg* 2004; **39**(5): 967–75.

A-29

Is there an alternative to succinylcholine for rapid sequence intubation? Meta-analysis of randomised trials

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Goal of Study: To compare non-depolarising muscle relaxants (NDMR) with succinylcholine for rapid sequence intubation.
Method: Systematic review of randomised trials. The number of patients having good or excellent intubation conditions was analysed. Statistical difference between NMDR and succinylcholine was expressed as relative risk (RR) with 95% confidence interval (CI). We also computed the number of patients needed to be treated with a NDMR to produce one failure (i.e. not good/excellent) that would not have occurred had succinylcholine been used (NNF). Identical condition between NDMR and succinylcholine was defined as RR = 1 and NNF =∞. Data were combined using a fixed-effect model.
Results and Discussion: 19 trials (2,286 adults, 206 children) were analysed. In adults induced with thiopental, the RR to produce good/excellent intubation conditions with rocuronium 0.6 mg/kg (n = 156) was 0.75 (95%CI 0.65–0.86), NNF 4; with 0.9 mg/kg (n = 64), RR was 0.97 (0.88–1.08), NNF 45; with 1.0 mg/kg (n = 257), RR was 0.99 (0.95–1.04), NNF 140; and with 1.2 mg/kg (n = 40), RR was 1.0 (1.0–1.0), NNF ∞. In adults induced with propofol, the RR to produce good/excellent intubation conditions with rocuronium 0.6 mg/kg (n = 419) was 0.99 (0.94–1.04), NNF 88; with 0.9 mg/kg (n = 30), RR was 1.0 (1.0–1.0), NNF ∞; and with 1 mg/kg (n = 272), RR was 0.96 (0.91–1.01), NNF 26. Atracurium, vecuronium, and rapacuronium did not show worthwhile efficacy. In children, RR 1.0 and NNF ∞ were achieved with rocuronium 1.2 mg/kg with thiopental induction (n = 20), with rocuronium 0.6 or 0.9 mg/kg with propofol induction (n = 20 each), and with two rocuronium-mivacurium combinations (n = 20 and 26, respectively).
Conclusion: In conjunction with thiopental, rocuronium showed dose-responsiveness; with 1.2 mg/kg only, intubation conditions were indistinguishable from succinylcholine. In conjunction with propofol, efficacy of rocuronium seemed to be enhanced; however, data were inconsistent and dose-responsiveness could not be established. Data in children are too sparse to draw meaningful conclusions.

A-30

Anaesthesia-related mortality in Estonia – the safety has significantly improved over the years

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Background and Goal of Study: There is still no consensus about definition of anaesthesia-related death. Reported incidence, based mostly on confidential and voluntary data, remains widely variable. It makes possible even claims of absence of improvement of safety in last 40 years[1].
Materials and Methods: The Society of Estonian Anaesthesiologists has collected annual surveys from all hospitals of the country since nineteen sixties. The present study is retrospective analysis of data from last 15 years, the time of largest changes. Death was considered anaesthesia-related, when tanatogenesis originated from specific complications during or immediately after anaesthesia (no matter when the patient actually died) in the absence of lethal surgical misadventures or casual events (bleeding, pulmonary embolism, acute myocardial infarction, etc.).
Results and Discussions:

Time period	Deaths/total anaesthesias	Incidence	Mortality rate ratio (95% CI)
1991…1995	29/302 600	1:10 400	1
1996…2000	15/418 806	1:27 900	0.37 (0.20…0.69)
2001…2004	8/378 519	1:47 300	0.22 (0.10…0.48)

The main identifiable causes of mortality were respiratory events, hypoxia; cardiovascular events and relative overdose or ill-advised choice of anaesthetic agents and or techniques. Superior safety of regional anaesthesia over general anaesthesia could not be demonstrated.
Conclusions: Safety of anaesthesia has significantly improved in Estonia over the last 15 years. National registry is a valuable tool for continuous evaluation of the quality of anaesthesia service in a country.
Reference:
1 Lagasse R. Anesthesia safety: model or myth? Anaesthesiology 2002; 97:1609–1617.

A-31

Incident anaesthesia management media disclosure

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Background and Goal of Study: In 2002 two anaesthesia related deaths were reported by the media. Conflicting versions, comments and interpretations were put forward by different experts, scientific societies representatives, the Portuguese Medical Association and Health authorities. How the professionals, their representatives and the media handled the event.
Materials and Methods: Review of published materials regarding these events and the time frame of publication. Clipping of specialized and non specialized media published, radio and TV. Over fifty individual news were reviewed.
Results and Discussions: Studies and enquiries were announced but their final results were never disclosed. Conflicting and/or misleading reports were disclosed at different time trough different media channels. Some conclusions were drawn before complete evaluation of the facts and were released to the media.
Conclusion(s): Avoid the announcement of actions (studies, surveys, results, enquiries, reports) before they are concluded. Avoid jumping to conclusions without full assessment of all features of the events. Need for coordination between concerned professional organizations. Need for training in managing media disclosed events.
Reference:
1 Clipping "memorandum".

A-32

Analysis of the anesthetic activity in public hospitals in Catalonia during the year 2003

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Objective: To analyze the anesthetic activity carried out in public and financed hospitals of Catalonia in 2003 by means of an extensive survey (ANESCAT) analyzing the differences according to the size of the classified centers by the number of beds.
Material and Methods: Out of a total of 603.189 anesthesias estimated by ANESCAT to have been practiced in Catalonia in the year 2003, a total of 381.581 procedures carried out in public and financed hospitals were analyzed (63.2% of all anesthesias: 44.73% financed, 18.53% I.C.S. (Institut Català de la Salut)). Centers were grouped according to size: hospitals of less than 250 beds, from 250 to 500 and above 500 beds. Data is expressed as median (percentile 10–90%).
Results: Significative differences were observed in the following contingencies: ASA equal or superior to IV was represented by a 12% in hospitals of >500 beds while it was only of a 2.3% in hospitals of <250 beds. Ambulatory surgery, with 37.5% of activity was greater in hospitals of <250 beds, and ambulatory preoperatory consult was more frequent, with a 50.6% in hospitals of 250–500 beds, being carried out in a 38.5% in the anaesthetic room in hospitals of <250 beds. With regard to the type of anesthesia, regional prevails in hospitals of <250 beds with 44.1% whereas it was only 31% in hospitals of >500 beds, and general anesthesia was the other way round with 41.2% in hospitals of >500 beds as opposed to 28% in the ones of >250 beds. Specialized techniques of postoperatory analgesia were performed in 7.9% of patients in hospitals of >500 beds and in 3.9% of the hospitals of >250 beds. 15.2% of the patients in hospitals of >500 beds and 4,5% in hospitals of <250 required postoperatory critical care (resuscitation or ICU). Regarding the type of surgery, heart and chest surgery are much more influential in the activity of the centers of 250–500 and >500 beds, whereas obstetrics, ophthalmology and traumatological surgery have more influence in the activity of the hospitals of <250 beds.
Conclusions:
Greater activity in financed hospitals: 269.813 anesthetic procedures (44.73% in all Catalonia) in 2003. Greater complexity (ASA ⩾ IV) in hospitals of >500 beds. Lower percentage of Major Ambulatory Surgery (30.2%) in hospitals of 250–500 beds. In 38.5% of cases preanesthesia is still performed in the anaesthetic room. Programmed activity is >75% in the three types of hospitals.

A-33

Is intrathecal clonidine added to local anaesthetics really useful in perioperative setting? Benefits and risks. A systematic review of randomised trials

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Background and Goal of Study: Clonidine, when added to intrathecal local anaesthetics, prolongs postoperative analgesia. The effect of intrathecal clonidine on sensory and motor block, dose-responsiveness, and adverse effects is not well understood.
Materials and Methods: We systematically searched for randomized trials including an inactive control group, and testing the adjunction of clonidine to intrathecal local anaesthetics, in surgical adult patients. We excluded trials testing intrathecal clonidine alone, continuous intrathecal anaesthesia, intrathecal opioids, obstetrics, or including ⩽10 patients/group. The effect of the dose of clonidine on sensory and motor block, and adverse effects was analysed using a linear regression model.
Results and Discussions: We analyzed data from 21 trials (1,241 patients, 615 received clonidine). Within a dose-range of 0.2 to 2.7 μg/kg, clonidine significantly, and in a dose-dependant manner, prolonged the duration of analgesia (from 53 to 123 min), time to 2-segments regression (from 15 to 57 min), time to regression to L2 (from 12 to 68 min), and duration of Bromage-3 motor block (from 33 to 94 min). Time to onset of complete sensory or motor block, and cephalic spread of the block were not affected. The risk of intraoperative pain was decreased (relative risk: 0.28, 95%CI 0.16 to 0.49, number-needed-to-treat 6) but the risk of arterial hypotension was increased (relative risk: 1.78, 95%CI 1.63 to 3.31, number-needed-to-harm: 7), with no evidence of a dose-response. The risk of bradycardia and sedation was not increased.
Conclusion: Intrathecal clonidine added to local anaesthetics prolongs the duration of analgesia and the regression of sensory and motor block. These effects last from 10 min to 2 hours. The risk of intraoperative pain is decreased, but the risk of hypotension is increased.

A-34

Mortality after fractured neck of femur is not necessarily affected by delayed surgery

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Background and Goal of Study: 'Early' surgery is one of many factors claimed to be helpful in reducing postoperative complications and mortality after fractured neck of femur. Delay may be acceptable if the time is used for resuscitation and to optimize treatment of comorbid conditions. This is a study of outcomes in a hospital where careful preoperative preparation is standard even though it may delay surgery. Our goal was to assess whether our patients presenting for early surgery have improved survival rates compared to those where there was a delay for good medical reasons.
Materials and Methods: This is a retrospective analysis of routinely collected anonymous audit data for 216 patients. Follow-up was for at least one year. Results are presented for patients grouped by the time in hours between hospital admission and surgery. Graphpad Instat© software was used for statistical analysis.
Results and Discussions: The overall male to female ratio of 1:2.6 was not significantly different between the groups. Nor was there an excess mortality in males. The mean age was 80.8 ± 10.1 years and there were no significant differences in age distribution between the groups. The age for survivors was 79.6 ± 10.9 and non-survivors was 83.9 ± 7.2 (p 0.0003). 102 of the 216 patients were operated on within 24 hours of admission. The Table shows percentage mortality at 30, 90, 180 and 365 days after surgery.

	<24 h	24.1–48 h	48.1–72 h	72.1–96 h	96+ h
30 d	5.9%	7.4%	3.7%	0%	7.1%
90 d	12.9%	22.1%	22.2%	20%	7.1%
180 d	17.8%	27.9%	25.9%	40%	21.4%
365 d	26.5%	33.8%	29.6%	40%	35.7%

The chi squared test shows that early surgery does not have statistically significant benefit however long after surgery mortality is measured.
Conclusion(s): Although 'early' surgery has theoretical benefits, the results of delayed surgery may be acceptable if the interval between admission and surgery is used constructively to minimize the risks of anaesthesia and surgery.

A-35

Factors with influence in the productivity of anesthesiology departments in University Hospitals – an European survey

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Background and Goal of Study: Studies about productivity in Anesthesia are scarce in Europe. The aim of this study was to determine the influence of some factors – previously considered as relevant (1) – in the Department productivity of University Hospitals.
Materials and Methods: English language questionnaire, sent by postal mail to the Anesthesia Head, with possibility of internet access and response. Inclusion criteria: all University Hospitals in the former European Community with 15 countries and Norway.
Results and Discussion: We received 39 answers from 202 sent questionnaires (19.3%). The most important findings are: 1 – Europe don't have standard tools for quantification of anesthesia work. This is currently measured by surgical productivity. Even there, tools are different from Country to Country and frequently inside the same Country, rendering benchmarks imprecise. 2 – For similar resources, the number of produced anesthesias varied significantly, and this variability can not be explained exclusively by differences in type and duration of surgeries. The difference between minimum and maximum values is 13 times in annual elective anesthesias per staff Anesthesiologist and 5 times in annual elective anesthesias per operating room suite. 3 – In all hospitals, Anesthesiologists are salaried workers, and salary is independent of productivity in 59.5% of cases. Incentive programs are associated with an OR elective productivity 38% higher than that of hospitals with fixed salaries. 4 – Prohibition of hospital Anesthetists to do private medicine is not related – if an isolated measure – with better productivity. 5 – In 27.8% of hospitals, anesthesia doctors take care of more than one operating room with the aid of non-medical anesthetists. In this situation, the number of anesthesias per Anesthesiologist is 73% higher. Unexpected was the finding that the number of anesthesias per operating room is also 24% higher.
Conclusion: The vast variability observed in productivity of Anesthesia Department suggests this area as an important one for new studies. The

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development of tools to an independent and specific measurement of anesthesia work is recommended as a first step to allow benchmarks among hospitals of different European countries.

Reference:

1 Abouleish AE et al. Anesth Analg 2003; 196: 802–812.

A-36

The antiemetic portfolio: a tool to implement antiemetic algorithms

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Background and Goal of Study: Postoperative nausea and vomiting (PONV) has been recognized as an important determinant of patient satisfaction with perioperative care. The growing interest in ambulatory surgery emphasizes the importance of a smooth postoperative recovery with a minimized risk of unscheduled hospital admission. Therefore, we developed the concept of the "antiemetic portfolio" as an easily applicable antiemetic algorithm for clinical decision-making.

Materials and Methods: Equally effective prophylactic antiemetic interventions (RRR = relative risk reduction: 30%) with different sites of action and comparable side-effect profile were systematically searched in large randomized controlled trials and systematic reviews. The resulting portfolio was cross-checked with an international consensus statement on PONV (1). Available antiemetic drugs in the hospital with suggested effective doses were then tabulated and efficacy calculations (EER = experimental event rate as the incidence with various numbers of interventions, NNT = number needed to treat for each additional antiemetic intervention) were performed for various combinations depending on the baseline risk (2).

Results and Discussions: The antiemetic portfolio in our hospital finally comprised 5 interventions: TIVA (Propofol, no N_2O), Dimenhydrinate 62 mg, Haloperidol 1 mg, Granisetron 1.5 mg, Dexamethasone 4 mg. The table shows the efficacy of combinations (1 to 4 interventions) so that at least one option remains for rescue treatment.

Risk factors (2)	0	1	2	3	4
Baseline risk [%]	10	21	39	61	79
EER 1 [%]	7.0	14.7	27.3	42.7	55.3
NNT 1st option	33	16	9	5	4
EER 2 [%]	4.9	10.3	19.1	29.0	38.7
NNT 2nd option	48	23	12	7	6
EER 3 [%]	3.4	7.2	13.4	20.9	27.1
NNT 3rd option	67	32	18	12	9
EER 4 [%]	2.4	5.0	9.3	14.6	19.0
NNT 4th option	100	45	24	16	12

Conclusions: The antiemetic portfolio allows to calculate clinically relevant efficacy measures and the overall resulting effect of an antiemetic algorithm.

References:

1 Gan TJ et al. Anesth Analg 2003;97:62–71.
2 Apfel CC et al. Anesthesiology 1999;91:693–700.

A-37

What can be expected from antiemetic pathways based on single versus multimodal and general versus adapted algorithms?

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Background and Goal of Study: Expectations with respect to the efficacy of antiemetics are extremely high. A recent publication of The Royal College of Anaesthetists on acute pain services (http://www.rcoa.ac.uk/docs/section11.pdf) suggests that an overall incidence of PONV in the range of 25% with an appropriate change in practice should fall to less than 10%. In a simulation model we calculated whether these goals are reasonable and achievable.

Materials and Methods: Using the risk distribution of relevant factors for PONV (1) in our institutions we determined the overall risk reduction of various antiemetic algorithms. We assigned a relative risk reduction of 30% to each of the applied antiemetics out of an "antiemetic portfolio" consisting of Dexamethasone, Haloperidol, Dimenhydrinate, TIVA (propofol, no N_2O), Serotonin Antagonist. Assumptions were based on findings of valid meta-analyses (2) and the recently published IMPACT study (3). Eight algorithms were investigated depending on the action if none, one, two, three or four risk factors are present (number in parenthesis are the number of antiemetic options applied in the risk groups 1–5). Approach A: (1/1/1/1/1), B: (2/2/2/2/2), C: (3/3/3/3/3), D: (0/0/0/1/1), E: (0/0/1/1/1), F: (0/0/1/2/2), G: (0/0/1/2/3), H: (0/1/2/3/4). Endpoints were the incidences of PONV, the number of doses needed (D) and the number of patients that needs to be treated (P).

Results and Discussions: Incidence can be reduced from 26.2% to 18.3% (P: 100, D: 100), 12.8% (P: 100, D: 200) and 9.0% (P: 100, D: 300) using a single, double or triple general prophylaxis (A, B, C). With a single risk-adapted approach (D, E) incidences were 23.2% (P: 15, D: 15) and 21.4% (P: 30, D: 30). The incidences with a multimodal risk-adapted approach (F, G, H) are 19.3% (P: 30, D: 45), 18.7% (P: 30, D: 50) and 14.3% (P: 60, D: 110).

Conclusion(s): Using realistic assumptions on antiemetic potency only a general triple antiemetic algorithm fullfilled the criteria of efficacy (<10% PONV). However, with this approach in 83% of patients antiemetics were administered ineffectively and therefore goals of audits should be reflected. A shift of emphasis towards early treatment may prove more efficient.

References:

1 Anesthesiology 1999;91:693–700.
2 AINS 2005;40:549–54.
3 NEJM 2004;350:2441–51.

A-38

Anesthetic implications and prevalence of cholecystectomy performed by laparoscopy vs. open technique in Catalonia during 2003

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Background and Goal of Study: We studied the different anesthetic implications of cholecystectomy (CH) surgery. Data were obtained from ANESCAT (a general survey of anesthetic activity performed in Catalonia during 2003).

Materials and Methods: The survey was carried out in all (131) public and private hospitals in Catalonia (6,704,146 inhabitants). A questionnaire was filled out for every anesthetic procedure performed on 14 randomised days. Variables: open vs. laparoscopic technique, public vs. private hospital cases, time of day, and urgent vs. elective; ASA, age, gender and recovery needs of patients. Values expressed in median and percentile 10–90.

Results and Discussions: CH made up 12.7% of digestive surgery, which extrapolates to 11,393 CH for the whole year. Age: 62 years (37–79), 59.9% were women. 84.3% of CH were elective.

Laparoscopy was performed in 75% of all CH (63% women, 37% men). Public hospitals performed 71.6% of all CH, 79.6% of them were done by laparoscopy; in private hospitals the proportion of laparoscopy CH was 63.7% ($p = 0.01$).

Laparoscopy was performed in 79.6% of elective CH, and 49.2% of urgent ($p < 0.00001$). The incidence of laparoscopic CH in ASA I–II patients was 79.8%, ASA III 68.9% and 41.2% in ASA ⩾ IV. The proportion of ASA ⩾ III patients was higher in public than in private hospitals (35.1% vs. 25%). Anesthesia time in laparoscopic CH: 95 min (60–150) vs. 110 min (65–159) in open technique ($p = 0.006$), with similar recovery times.

92.2% of CH patients received postop care in PACU, and 7.8% in ICU (15.6% undergoing open technique vs. 5.2% laparoscopy).

Time: 76.1% of CH were started between 8 AM–4 PM, 22.2% between 4 PM-midnight and 1.7% between midnight-8 AM. Private hospitals performed 40.5% of CH in the evening shift vs. 14.7% of public hospitals.

Conclusions: Most CH were elective, performed laparoscopically and carried out in public hospitals. The use of open technique increases with ASA status and emergency, requiring more postop care. Public hospitals performed more CH in more critical patients. Workload of private hospitals was higher during the evening shift.

References:

1 Clergue F. Anesthesiology 1999;91:509–20.
2 Peduto VA. Minerva Anestesiol 2004;70:473–91.

A-39

Two decades experience in a single Swiss liver transplantation center: evolution of anesthesia techniques

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Background: Over the past two decades, liver transplant (LT) surgery has gained popularity worldwide leading to organ shortage and longer waiting

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time. Performance of a transplant centre is directly related to surgical procedure volume and transplantation team skills.
Goals: To analyse anesthesiologic and perioperative procedures from all transplantations performed since eighteen years in a single centre.
Material and Methods: Retrospective analysis of LT anesthesiologic and surgical records since the introduction of the LT program in Geneva.
Results: 368 LT (36% female, mean age 41 [0–72], 19.8% infants) were performed between 1987 and 2004 (median LT/year: 19.5 [33-3], 33 in 2004), 17 were re-LT. Median survival at 5 years was 81.6% and increased significantly the last ten years (87%). Perioperative mortality (at 6-months) was 8.4% in the last five years. Blood products and vasopressors requirements significantly decreased over years, as well as surgical and anhepatic phase duration. Anesthesiologic protocols included establishment of specific protocols for blood sparing techniques, for fluid volume infusion, for management of portopulmonary hypertension, hepatorenal syndrome or hepatopulmonary syndrome. Long-lasting neuromuscular blocking agents were progressively substituted by agents with extrahepatic clearance. Use of clonidine and beta-blockers was progressively introduced.
Conclusions: Performance of liver transplantation team is related to many factors including learning curve of all medical speciality involved and establishment of management protocols. Anaesthesia for LT needs blood product sparing techniques, use of drugs with extrahepatic clearance and establishment of specific management protocols.

A-40

Staff use of gloves as a prophylactic measure during daily activities in the anesthesiology department of our hospital

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Background and Goal of Study: The guidelines of the American Society of Anaesthesiology regarding occupational safety stress the use of gloves during induction of anesthesia, insertion of intravenous cannulae, laryngeal mask airways and tracheal tubes as well as during their removal. This study was designed to evaluate the adherence to these measures of the staff in our department.
Materials and Methods: We studied the medical (16) and nursing (10) staff of the Anesthesiology Department in 20 different occasions during daily activities such as insertion of intravenous cannulae, insertion and removal of tracheal tubes and laryngeal masks.
Results and Discussions: The heads of the department do not at any occasion use gloves during the iv accessing and take this measure in 5%, 5%,7.7%, 2.5% of cases during intubation, LMA insertion and their removal respectively. Our consultants and registrars adhere in 30.2%, 46%, 61.6%, 44.3%, 52.2% of cases in the studied procedures and in the order mentioned. The SHOs obey in 70.5%, 89%, 90.5%, 85%, 88% of cases accordingly. Lastly, our nurses, behave securely in 37%, 50%, 47.5%, 49.5% and 56.5% of instances
Conclusion(s): In spite of the well awareness of the potential hazards of disease transmission, a significant part o our staff seems to negligibly omit to use gloves during daily activities.
References:
1 Mikatti N. *Anaesthesia* 1999; 54: 13–18.
2 Michael S. *Anesthesiology* 1990; 73: 619–624.

A-41

The risk of PONV in patients undergoing laparoscopic cholecystectomy

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Background and Goal of Study: Postoperative nausea and vomiting (PONV) is one of the most frequent complications after surgery. The incidence is 20–30% in patients undergoing balanced anesthesia. Several clinical studies had been carried out to determine the risk factors of PONV. After certain surgical interventions, like laparoscopic cholecystectomy – after which the incidence of nausea and vomiting is 25–75% according to the literature – special factors could contribute to the onset of PONV. In our study we attempted to clarify the role of several components which are related to laparoscopic cholecystectomy.
Materials and Methods: In the present study 100 patients (27 male, 73 female; average age: 49.95 ± 12.4 years) undergoing elective laparoscopic cholecystectomy were investigated. Every patient with nausea or vomiting within the postoperative 24 hours deemed to have PONV. At the preoperative assessment we recorded age, gender, BMI and the Apfel score. We also recorded the intra- and postoperative medication, the duration of surgery and anesthesia, and LC related factors, like the amount of consumed CO_2, the maximal intraabdominal pressure during pneumoperitoneum, and the occurrence of bile leakage. The evaluation of PONV was done by verbal analog scale (0–10).
Results and Discussions: We detected postoperative nausea and vomiting in 33 cases. The mean of the Apfel score value was 2.31 in all patients and 2.58 in patients who had PONV. In the cases of PONV the mean duration of surgery and the mean duration of anesthesia proved to be longer (56.5 vs. 49 min. and 72 vs. 65 min.). Regarding the consumed carbon dioxide, the intraabdominal pressure and bile leakage, there were no substantive differences between the two cohorts.
Conclusion(s): In our study we did not find any factor related to laparascopic choloecystectomy which could elevate the risk of postoperative nausea and vomiting. The incidence of PONV in the high risk cohort was lower than the anticipated occurrence determined by the Apfel score.

A-42

Poor guideline adherence in prescribing PONV prophylaxis disclosed by anaesthesia information system

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Background and Goal of Study: Recently, guidelines for the prevention of postoperative nausea and vomiting (PONV) have been developed. (1) Since suboptimal guideline adherence may affect the effectiveness of these guidelines, we studied the degree of guideline adherence in prescribing PONV prophylaxis at the time of the preoperative visit in a large community based teaching hospital from September 2005 until December 2005.
Materials and Methods: Medical information of all patients scheduled for elective surgery is routinely entered in the Anaesthesia Information System (Metavision, *i*MD*soft*, Tel Aviv, Israel). According to our PONV prevention guideline, patients were considered at high risk (⩾61%) for PONV and thus entitled to PONV prophylaxis based on the presence of at least three of the following risk factors: female gender, previous history of PONV or motion sickness, non-smoker status, and anticipated use of postoperative opioids. (2) At the preoperative screening clinic, these high-risk patients were identified and the anaesthesiologist was to prescribe PONV prophylaxis on the preoperative fact sheet. To quantify guideline adherence, we queried all patients that were entitled to PONV prophylaxis. We then queried to see if PONV prophylaxis was prescribed for these patients at the preoperative screening visit.
Results and Discussions: In this period 2766 patients were scheduled for surgery. According to our PONV prevention guideline, we identified 472 patients with at least three risk factors for PONV, eligible for PONV prophylaxis. Only 167/472 (35%) of these high risk PONV patients were ordered to receive prophylaxis for PONV at the time of their preoperative screening clinic visit.
Conclusion(s): PONV prevention guideline adherence can greatly be improved, since only a small proportion of patients at high risk for PONV are prescribed PONV prophylaxis. Since Anaesthesia Information Systems allow for identification of patients that would benefit from a specific therapy, added functionality to these systems (e.g. decision support) may theoretically improve guideline adherence significantly.
References:
1 Gan TJ, Meyer T, Apfel CC et al. *Anesth. Analg.* 2003;97:62–71.
2 Apfel CC, Kranke P, Eberhart et al. *Br J Anaesth.* 2002;88:234–40.

A-43

Cost-effectiveness of prophylactic antiemetic therapy by laparoscopic surgery

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Background and Goals: Postoperative nausea and vomiting (PONV) are the most common complication in patients undergoing laparoscopic surgery and a cause of significant increasing of costs. We compared the cost-effectiveness

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of four prophylactic regimens for PONV: 8 mg ondansetron, 5 mg tropisetron, 8 mg dexametason and combination of 5HT3-serotonin antagonists (8 mg ondansetron or 5 mg tropisetron plus 8 mg dexametason).
Materials and Methods: Adult gynecological inpatients were studied. All the groups received general anesthesia with fentanyl, propofol in combination with 65% nitrous oxide. Study drugs were administered intravenously by induction of anesthesia. Effectiveness of antiemetic prophylactic was evaluated by patients with visual analog scale (VAS). Cost-effectiveness analysis was performed for all groups. A decision-tree analysis was used to group patients based on treatment and outcome. We calculated the total cost, including costs of anesthesia, PACU.
Results: 120 patients were enrolled. Both groups were well matched in terms of weight, sex and ASA class. The effectiveness of antiemetic prophylactic was significantly higher in ondansetron and tropisetron group compared with dexametason group and in combination prophylactic group compared with the others. Combination of 5HT3-serotonin antagonists with dexametason significantly increased patient satisfaction registered by VAS ($P < 0.05$). The total costs among the groups did not differ significantly, although the cost of anesthesia was significant less in dexametason group ($P < 0.05$).
Conclusion: Combination of 5HT3-serotonin antagonists with dexametason is more cost effective than 8 mg of ondansetron, 5 mg tropisetron and 8 mg dexametason for preventing PONV after laparoscopic surgery. The use of combination prophylactic antiemetic therapy in high-risk surgical inpatients was more effective in preventing PONV and achieved greater patient satisfaction at a similar cost compared with ondansetron, tropisetron or dexametason prophylactic alone.

A-44

The comparison of the antiemetic effects of ondansetron and dexamathasone on middle ear surgery

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Background and Goals: Postoperative nausea and vomiting (PONV) is a frequently occurring complication after anaesthesia. When antiemetic treatment is not administered, the rate of PONV is around 25–30% in general surgery population and between 62–80% after middle ear surgery. The aim of this study was to compare the antiemetic efficacy of ondansetron and dexamethasone in adults undergoing middle ear surgery.
Materials and Methods: In the present study, 60 case at ASA group II and that underwent middle ear surgery were included. Anaesthesia induction was carried out with 5 $mg.kg^{-1}$ sodium thiopental and muscle relaxation was performed with 0.5 $mg.kg^{-1}$ atracurium to be followed by orotracheal intubation. Anaesthesia was maintained at 5 $L.min^{-1}$ gas flows with 2–3% sevoflurane inhalation in 70/30% O_2/N_2O. Cases were randomised into two groups and first group (Group O) was administered 4 mg ondansetron at the stage of surgical skin closure and second group (Group D) 5 mg dexamethasone immediately after anaesthesia induction. In the first 24 hours postoperatively, Nausea Vomiting Score (NVS) and nausea, vomiting frequency, metamizole and NSAID use, the need for additional antiemetics in the 0–4, 4–12 and 12–24 hours, the number of cases with nausea, vomiting and the need of extra antiemetics were recorded and their distribution to groups was evaluated.
Results: In the comparison of two groups, NVS was 0(0-0) in Group O while it was 1(0–3) in Group D ($p = 0.003$). The use of additional antiemetics was found to be significantly lower in Group O than Group D (respectively 1.00 ± 0.6, 3.70 ± 1.02) ($p = 0.028$).
Discussion: It was concluded that ondansetron had more significant effect on nausea and vomiting in the early period but no difference remained after 4 hours.
Reference:
1 Habib AS. Evidence-based management of postoperative nausea and vomiting: a review. Can J Anaesth. 2004;51(4):326–41.

A-45

A survey of factors affecting the purchasing decisions of breathing system filters

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Background and Goal of Study: Breathing system filters (BSFs) are recommended for use during anaesthesia in adults (1). A recent study determined the filtration performance of 104 different BSFs on the UK market, with pleated BSFs generally having superior filtration performance than electrostatic BSFs (2). Purchasers therefore have a wide range of devices from which to choose a BSF appropriate for use in their hospital. It is not known what criteria are used to select an appropriate BSF.
Materials and Methods: A postal survey was sent to the Clinical Directors (CDs) in all 306 anaesthetic departments in the UK. Each CD was asked: who chose the BSF(s) used in their hospital; the factors influencing their choice (on a rating scale of 1 (not important) to 5 (very important)); and the importance of the BSF as an infective control measure on the same rating scale.
Results and Discussion: 139 CDs replied (a response rate of 45%). Anaesthetists were involved in the choice of BSF in 111 departments (80%). 114/137 (83%) rated the importance of BSFs as an infection control measure as either 4 or 5. Median rating scores for the factors influencing choice are underlined.

Factor influencing choice (in order of importance)	Rating (number) 1	2	3	4	5
Infection control properties	2	1	8	41	82
Cost	2	5	27	45	56
Humidifying properties	6	7	23	55	43
Resistance to gas flow	2	12	35	60	28
Published evidence	7	14	33	50	31
Deadspace	6	19	50	43	18
National/regional contract	21	35	47	20	13
Pleated *v* electrostatic	24	25	51	26	8
Manufacturer	51	33	37	10	6

Conclusion(s): The generally superior performance of pleated BSFs (2) did not have a major influence on purchasing decisions, despite infection control properties being the most important factor influencing choice.
References:
1 Association of Anaesthetists of Great Britain and Ireland (AAGBI). *Infection Control in Anaesthesia.* London: AAGBI, 2002.
2 Medicines and Healthcare products Regulatory Agency (MHRA). *Breathing system filters.* Evaluation 04005. London: MHRA, 2004.

Ambulatory Anaesthesia

A-46

Gabapentin reduces cardiovascular responses to laryngoscopy and tracheal intubation

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Aim: Gabapentin, a structural analog of γ-aminobutyric acid, is used as an anticonvulsant drug. Studies have shown synergism between gabapentin and morphine for analgesic effects in animals and in humans. Preoperative oral gabapentin decreased pain scores in early postoperative period and postoperative opioid consumption in surgery patients. We compared the effects of gabapentin on arterial pressure and heart rate at induction of anaesthesia and tracheal intubation in a randomized double-blind study.
Material: Ninethy normotensive patients (ASA physical status I) undergoing elective surgery were divided into three groups of 30 patients each. Control group patients received oral placebo (Group I), patients received 400 mg of gabapentin (Group II), and patients received 800 mg of gabapentin (Group III) 1 h prior to surgery in the operating theatre. After induction of anaesthesia, heart rate, mean arterial pressure were recorded as baseline, which is the mean of three resting measurements in the operating room before any instrumentation, 1, 3, 5, 10, and 15 min after the intubation.

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Results: Patients receiving the placebo and 400 mg gabapentin showed a significant increase in MAP and HR associated with tracheal intubation according to baseline levels and group III. There were significant decrease in heart rate and arteriel pressure in group III after intubation 1, 3, 5, and 10 min ($p < 0.001$, $p < 0.001$, $p < 0.05$, $p < 0.05$ respectively) according to group I and II.
Conclusion: As a result, given 1 h before operation gabapentin 800 mg blunted the arteriel pressure and heart rate increase in first 10 min due to endotracheal entubation. Oral administration of gabapentin 800 mg before induction of anesthesia is a simple and practical method for attenuating pressor response to laryngoscopy and tracheal intubation after standard elective induction.

A-47

Systematic review of low dose spinal anaesthesia for ambulatory surgery

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Background and Goal of Study: To determine the optimum low dose regime of spinal anaesthesia, which has both a high efficacy and also an acceptable recovery profile for ambulatory surgery. In addition, we explored the effect injectate characteristics and adjuncts have on spinal efficacy and recovery.
Materials and Methods: The search terms ambulatory surgery and spinal anaesthesia or similar terms were used to find relevant randomized controlled trials using the Medline, Embase and Cochrane databases. Criteria were then used to limit and evaluate the collected trials.
Results and Discussions: Of the 290 articles found in the search, 28 met the inclusion criteria. The lowest effective doses of spinal local anaesthetics, for knee arthroscopy surgery, were: lidocaine 50 mg, mepivacaine 45 mg, ropivacaine 15 mg and bupivacaine 4 mg. Reasonable discharge times were achieved using bupivacaine in doses $\leqslant$7.5 mg and lidocaine $\leqslant$50 mg. Hyperbaric solutions appeared to have faster onset and offset times. The concentration of the local anesthetic did not appear to be important in the few studies looking at this factor. Low doses of spinal anesthetics were enhanced by the addition of the adjuncts fentanyl or epinephrine. Pruritis was the most common side-effect following the use of spinal opiates but often did not require treatment.
Conclusion: The vast majority of trials demonstrate that low dose spinal anaesthetics have a high efficacy for ambulatory surgery. The type of surgery and the duration of surgery are very important factors influencing the efficacy of spinal anesthesia.

A-48

Sevoflurane consumption during routine day case anaesthesia: addition of nitrous oxide to fresh gas flow permits higher flows at no extra cost

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Background and Goal of Study: Routines for day surgery must consider not only patient comfort and safety, but even costs and shortened turn around times. High gas flows for inhalation anaesthesia allow easier titration of anaesthetic depth but result in higher primary anaesthetic gas consumption and consequently higher costs. This study sought to determine if the addition of nitrous oxide would allow higher fresh gas flows but without increasing sevoflurane consumption/costs during general anaesthesia for day surgery.
Materials and Methods: Routine day surgical patients ($N = 27$; ASA 1–2) received our department's standardised general anaesthesia. Fresh-gas was randomised to one of three alternatives: A. Oxygen in air 1 + 2 L/min; B. Oxygen in N_2O 1 + 2 L/min; C. Oxygen in air 0.3 + 0.7 L/min. Anaesthesia was induced with 0.1 mg fentanyl and propofol titrated to allow insertion of a laryngeal mask airway. Sevoflurane was added and titrated according to clinical needs based on heart rate, blood pressure and the Cerebral State Index™ (target value 40–60). All patients breathed spontaneously and ventilation was assisted only when necessary. At the end of the procedure all anaesthetic gases were turned off and the fresh gas was increased to 6 L/min oxygen. The vaporiser was weighed on a precise scale before and after each procedure.
Results and Discussions: Anaesthesia and surgery were uneventful in all cases and no complications were noticed during or after surgery. CSI™ was similar for all three groups. Sevoflurane consumption differed significantly between the different fresh gas flows studied. During high flow oxygen in air, sevoflurane consumption was more than twice ($p < 0.01$) that for oxygen in nitrous oxide (0.45, 0.2, 0.18 ml/min for groups A, B, and C). Sevoflurane consumption for the group (C) with 1 L/min fresh gas flow was similar to the high flow oxygen and nitrous oxide combination. As fresh gas costs are negligible compared to sevoflurane, the addition of N_2O allows the convenience of higher gas flows but at no additional cost.
Conclusion(s): The use of nitrous oxide as a part of the fresh-gas flow allows use of a higher fresh-gas flow with more easily titrated depth of anaesthesia while maintaining the same sevoflurane consumption as a low-flow oxygen in air.

A-49

A comparison of unilateral spinal anesthesia with hyperbaric bupivacaine and general anesthesia with sevoflurane for inguinal hernia repair

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Background and Goal of Study: A unilateral spinal anesthesia (USA) with small doses of hyperbaric long-acting local anesthetic is widely used for inguinal hernia repair, providing a fast onset, effective sensory blockade and earlier home discharge (1). This study was conducted in the aim to assess whether USA with small doses of hyperbaric bupivacaine provides earlier home discharge with fewer side effects compared with sevoflurane general anesthesia (GA).
Materials and Methods: We have investigated 60 ASA I or II patients undergoing inguinal hernia repair who were randomly allocated to receive either USA ($n = 30$) or GA ($n = 30$). The patients in USA group received 8 mg of hyperbaric bupivacaine with the low flow steady injection at the lumbar 2/3 interspace, and maintained in a lateral decubitus position, the operative side dependent, for 10 min. In GA group, anesthesia was maintained with sevoflurane (1%–2%) titrated to keep BIS index values between 50 and 60. Criteria for home discharge were stable vital signs, ability to tolerate liquids by mouth, to walk and void spontaneously, with no nausea or pain. The postoperative side effects concerning: pain, need for opioids and incidence of nausea and vomiting were also evaluated.
Results and Discussions: No difference was seen in the early home discharge possibilities between the groups. Criteria for home discharge were full field after 307 $\pm$ 67 min in USA group and 297 $\pm$ 83 min in GA group ($p = 0.33$). The incidence of postoperative nausea and vomiting was significantly lower in USA group compared with GA group ($p = 0.021$). In the GA group, the patients had significantly higher pain scores and needed more postoperative opioids compared with USA group ($p < 0.001$).
Conclusion: We conclude that USA with small doses of hyperbaric bupivacaine provides equal early home discharge possibilities with less frequent side effects compared with GA with sevoflurane in patients undergoing inguinal hernia repair.
Reference:
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A-50

Volatile induction maintenance anaesthesia (VIMA) with sevoflurane for urological endoscopic procedures in the elderly

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Background and Goal of Study: The following study examines the safety and efficacy of the use of sevoflurane as a monoanaesthetic in elderly patients undergoing endoscopic urological procedures, such as Transurethral Resection of Bladder Tumours (TURBT).
Patients and Methods: After approval of the local ethics committee, two groups of patients were included in this prospective randomised study. The Sevoflurane Group (S) of 46 patients mean aged of 69 $\pm$ 3.8 (ASA III) and the Propofol–Sevoflurane group (PS) of 42 patients mean aged 72 $\pm$ 4.6 (ASA III). In the S group vital capacity anaesthesia was induced using 8%

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sevoflurane in a N_2O/O_2 (2:1) mixture at 6 L/min, whereas in the PS group, anasthesia was induced with 2.5 mg/kg propofol and 7 μg/kg alfentanil. Following successful LMA insertion, anaesthesia was maintained with 1.5–2% sevoflurane in a N_2O/O_2 (2:1) mixture. Boluses were given for light anaesthesia in the S group with 8% sevoflurane at 6 L/min and in PS group with 0.5 mg/kg propofol. Heart rate (HR), mean arterial pressure (MAP), LMA insertion time, number of additional bolus doses and side effects were recorded throught the induction (I) and the maintance (M) of anaesthesia. Statistics were analysed with the Chi-Squared test and Student's t test.

Results:

	S group (n = 46)		PS group (n = 42)		
	I	M	I	M	p value
HR (bpm)	92 ± 12*	86 ± 12	62 ± 11*	78 ± 12	p < 0.05*
MAP (mmHg)	98 ± 11	84 ± 12	67 ± 9	74 ± 10	p < 0.05*
LMA insert. time (s)		164 ± 12		78 ± 9	p < 0.01
Add. bolus doses (n)		12		16	NS
Apnoea (n)	9*	2	38*	3	p < 0.01*
Movements (n)	8	1	2	1	NS
Coughing (n)	15*	2	4*	0	

*p < 0.05

Conclusions: Cardiovascular stability is the main advantage of VIMA with sevoflurane in the elderly. The induction of the anaesthesia is slower and the appearance of apnea is significantly lower in the S group. The appearance of side-effects, such as movements and coughing is higher in the S group.

Reference:

1 Meaundre E et al. Sufentanil supplementation of sevoflurane during induction of anaesthesia: a randomised study. EJA 2005; 21: 793–796.

A-51

The use of N-Methyl-D-Aspartate (NMDA) antagonist under monitorized anaesthesia care in extracorporeal shock wave lithotripsy (ESWL)

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Background and Goal of Study: It has been suggested that magnesium sulfate ($MgSO_4$) prevent pain by acting on central sensitization caused by peripheral nociceptive stimulation as an antagonist of NMDA receptors (1). The aim of the study is to assess intravenous $MgSO_4$ infusion affects analgesic requirements under MAC during ESWL.

Material and Methods: 40 ASA I–II patients undergoing ESWL under MAC were randomly divided into two groups. Induction of sedation was produced by bolus dose of 0.03 mg kg^{-1} midazolam and 0.5 μg kg^{-1} fentanyl followed by midazolam infusion of 0.015–0.06 mg kg^{-1} hr^{-1} in group I and group II. In addition, group I received, 30 mg kg^{-1} intravenous $MgSO_4$ as a bolus dose followed by a continuous infusion of 10 mg kg^{-1} hr^{-1}. $MgSO_4$ bolus and infusion was initiated 15 min. before the sedation induction. Midazolam infusion rate and additional fentanyl dose requirements were adjusted to obtain Ramsey Sedation Score (RSS) >2, Visuel Analog Skala (VAS) >2, Observer Assessment Sedation Score (OAS) <4 and to achieve a target Bispectral Index (BIS) in range of 70–90. Hemodynamic monitorization, BIS, RSS, OASS and VAS scores were recorded for 5 min intervals. At the end of ESWL the total midazolam and total fentanyl consumptions were recorded and serum Mg concentration was measured. Student-t test was used to statistical analysis. A p value <0.05 was accepted statistical significant.

Results: The total consumption of midazolam (TCM) and fentanyl (TCF) in group I were significantly lower than group II. The RSS and OASS is shown as mean ± SD in the table. The VAS scores at 15th and 25th min. in group I were significantly lower than in group II. The BIS levels of 5th and 10th min. were significantly lower in group I. The SpO_2 was significantly higher in group I. Plasma magnesium concentrations were greater but within normal limits compared to control.

	TCM	TCF	RSS 5	RSS 25	OASS
I	2.7 ± 0.6	52.8 ± 19.6	2.3 ± 0.4	2.5 ± 0.5	4.1 ± 0.4
II	3.1 ± 0.7	75.3 ± 34	1.9 ± 0.2	2 ± 0.2	4.7 ± 0.5
p	0.044*	0.015*	0.002*	0.001*	0.002*

Conclusion: This study showed that magnesium sulphate infusion was associated with a reduction of total midazolam and fentanyl consumptions. In group I oxygenisation paramaters were better than in group II. Magnesium sulphate bolus and infusion can be an alternative to reduce analgesic requirements under MAC.

Reference:

1 Pain 1993;53:287–93.

A-52

Intrathecal local anesthetics minimun doses for ambulatory hysteroscopy surgery

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Background: Lidocane and levobupivacaine are local anesthetics (LA) usually used for intrathecal injection. The aim of our study was to compare the intra and postoperative clinical properties between hyperbaric levobupivacane 0.5% and hyperbaric lidocane 2% in intrathecal injection for outpatient hysteroscopy surgery.

Material and Methods: 38 ASA I–II patients for elective hysteroscopy surgery. We did usual monitoring and premedication with midazolam 1–2 mg. All the patients underwent an intrathecal injection in L3–L4 with a 25 G Pajunk needle, in sitting position and medial approach. Immediately after the LA injection the patients were placed in lithotomy position. The patients were randomized to receive either a lidocane 30 mg intrathecal dose (group 1) either a levobupivacane 0.5% 6 mg (group 2), in an hyperbaric 2.4 ml total injection volume.

It was considered that a T10 sensitive level was sufficient for hysteroscopy surgery. Bilateral sensitive level was assessed every 2 minutes (whith de pinprick test) until 10, then every 5 minutes until 30 minutes and finally every 10 minutes until the sensitive blockade reversion (bilateral L2 level). The bilateral motor level was also checked (modified Bromage scale) at 5 minutes and then every 10 minutes until motor blockade reverssion (Bromage 0).

Discussion: No statistically significant differences concerning to age, stature, weight or type of surgery were found between both groups.

	Lidocaine 2% (n = 18)	Levobupivacaine 0.5% (n = 20)	P value
Sensitive time onset (min)	4.22 ± 2.05	5.00 ± 1.52	NS
Maximum sensitive level	T7 ± 1.76	T8 ± 1.33	NS
Time to L2 regression (min)	90.56 ± 15.85	99.50 ± 13.56	NS
Bromage ⩽ 1 at the end of the surgery (%)	44%	100%	P < 0.05

Values are expressed in average + standard desviation or in patient number and percentage.

Conclusions: Both minimum LA doses in intrathecal injection were effective for the hysteroscopy surgery but levobupivacane 0.5% provided a lower motor blockade at the end of the surgery and less side effects; both were similar in effectiveness for this short duration type of surgery.

References:

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2 Urmey WF. Spinal anaesthesia for outpatient surgery. Best Pract Res Clin Anaesthesiol. 2003 Sep;17(3):335–46.
3 Urbanek B et al. Levobupivacaine for regional anesthesia. A systematic review. Anaesthesist. 2005 Dec.

A-53

Does ondansetron prevents PONV in gynecologic surgery under local anesthesia with remifentanil sedation?

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Background and Goal of Study: The incidence of post-operative nausea and vomiting (PONV) is increased by 30% when remifentanil is used alone for sedation[1]. We assessed the use of ondansetron in a high risk population[2] to prevent PONV for surgery under remifentanil sedation.

Materials and Methods: After informed consent, 79 consecutive female patients (without previous history of PONV), scheduled for ambulatory gynecologic surgery under local anesthesia with continuous infusion of

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remifentanil, were included. The remifentanil infusion was titrated to obtain a Ramsay score of 2–3. Patients were randomized to receive either no PONV prevention (C), ondansetron 4 mg IV before the remifentanil infusion (OB), or ondansetron 4 mg IV at the end of surgery, i.e. when remifentanil was stopped (OE). Patients and nursing staff in the post-anesthesia care unit were blinded to the intervention. Paracetamol and ketoprofen were used for post-operative pain control as required. Recorded parameters were: age, remifentanil regimen, peri-operative pain (visual analog scale: VAS) and presence of PONV. A Chi square test was used with a $p < 0.05$ considered significant. Results are mean ± SD.

Results and Discussion: The study groups were 45 ± 14 years old. The remifentanil dose was 0.18 ± 0.08 $\mu g.kg^{-1}.min^{-1}$ and the median [range] peri-operative pain score was 0 [0–10] (VAS). There was no statistically significant difference between the intervention groups. Results concerning PONV prevention are shown in the table.

Groups	C (n = 29)	OB (n = 29)	OE (n = 21)
PONV n (%)	13 (44.8)	6 (20.7)	1 (4.7)
Statistical analysis between groups	OB *vs* C: p = 0.09 OE *vs* C: p = 0.003 OB *vs* OE: p = 0.21		

Conclusion: We conclude that ondansetron prevents PONV in a high risk day case population under local anesthesia and remifentanil infusion. It should be used at the end of the surgical procedure.

References:

1 Hwan et al., Anesth Analg 2001;93:1227–32.
2 Apfel et al., Anesthesiology 1999;91:693–700.

A-54

P6 acupressure can relieve nausea and vomiting after ambulatory dilation and curettage

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Background and Goal: Postoperative nausea and vomiting (PONV) are still common side effects of general anaesthesia after outpatient surgery. Recently it has been shown that P6 acupressure can decrease the incidence of PONV after laparoscopic surgery and Cesarean section (1, 2). The purpose of this study was to examine the effectiveness of P6 acupressure in preventing PONV in patients undergoing ambulatory dilation and curettage (D&C) and to compare the effects with those of intravenous metoclopramide.

Materials and Methods: With IRB approval and informed consent, women undergoing D&C were randomly divided into three groups to receive acupressure at bilateral P6 points (Neiguan) (Group A), an intravenous metoclopramide 10 mg before surgery (Group B), or nothing as an antiemetic treatment (Group C). Acupressure was applied on both wrists using Seaband before the induction of anaesthesia and placed until 2 hr after surgery. General anaesthesia was induced and maintained with thiamyral and O_2/N_2O, respectively. The incidence of PONV was evaluated for 2 hr after surgery.

Results and Discussion: Although the number of patients who developed PONV did not differ among groups, the use of acupressure reduced the incidence of vomiting from 27% to 0%.

	Group 1 (n = 14)	Group 2 (n = 16)	Group 3 (n = 15)
Age (yr)	32 (9)	28 (7)	30 (7)
Op time (min)	11 (5)	11 (5)	8 (3)
Thiamyral (mg)	290 (63)	308 (65)	278 (33)
Incidence of PONV	7%	25%	33%
Incidence of vomiting	0%*	19%	27%

Values are mean (SD). *P < 0.05 *vs* Group 3.

Conclusion: P6 acupressure may have a place as prophylactic antiemetic therapy during D&C. However, further studies are needed to determine whether P6 acupressure is more effective than metoclopramide in preventing PONV.

References:

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A-55

Dexamethasone – a good choice for PONV prevention in ENT surgery

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Background and Goal of Study: ENT surgery is associated with a high incidence of 24 hours PONV that affects the length of hospitalization. The aim of this study was to investigate the efficacy of PONV profilaxis with 8 mg Dexamethasone or 4 mg Ondansetron and the best treatment of PONV.

Materials and Methods: after Hospital Ethics Committee approval 180 adult patients undergoing ENT surgery were randomized in 3 groups each of 60 patients. In the first group (P) we administrated placebo (saline), in the second (D) 8 mg Dexamethasone and in the third (O) 4 mg Ondansetron, all given 15 minutes preoperatively. When PONV appeared (42 patients) we randomly administrated 4 mg Dexamethasone to 21 patients and 4 mg Ondansetron to 21 patients. We evaluated the incidence of PONV in these 3 different groups, the response to treatment at patients in whom PONV occurs and the necessity to postpone discharge for PONV. Statistics used: Student's test, Fisher's exact test ($p < 0.05$).

Results and Discussions: No significant difference was found between O and D group (PONV incidence 15% in group D vs. 16.7% in group O) ($p \approx 1$); but for patients who underwent septoplasty and rhinoplasty intervention (28 from group D and 26 from group O) Dexamethasone was superior than Ondansetron in preventing PONV (PONV incidence 14.7% vs. 23%) even not statistically significant ($p = 0.49$). The incidence of PONV in P group 38.33% was significantly higher than in the other 2 groups ($p = 0.0067$, $p = 0.01$). For treatment of PONV 4 mg Ondansetron was better (71.5% responded to treatment and could be discharged) than 4 mg Dexamethasone (9.5% responders to treatment) ($p = 0.0058$). From those patients in whom PONV occurred, those treated with Ondansetron spent less time in hospital: 14.57 ± 6.3 h compared with those treated with Dexamethasone 21.33 ± 5.97 h.

Conclusion(s): Profilaxis of PONV with 8 mg Dexamethasone is efficient and nonexpensive, so we strongly recommend it in ENT surgery and especially in septo- and rhinoplasty. When PONV occurs Dexamethasone is not recommended for treatment.

A-56

Postoperative analgesia in ambulatory patients undergoing inguinal hernia repair under balanced sevoflurane-remifentanil anaesthesia

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Background and Aims: The aim of the study was to assess if the administration of IV dexamethasone or ketamine, alone and combined, would improve postoperative analgesia in patients undergoing ambulatory inguinal hernia repair under sevoflurane plus remifentanil anaesthesia.

Methods: After approval by the Ethical Committee of the Institution, forty three male patients were randomly assigned to receive in a double blind manner, one of the following: Group D intravenous (iv) dexamethasone 8 mg, 1 h before surgery. Group K, a bolus of racemic ketamine 0.5 $mg.kg^{-1}$ after endotracheal intubation, or Group DK the combination of both. Surgical anaesthesia was achieved with 1% sevoflurane and a remifentanil infusion adjusted to maintain MAP within 20% of pre-op values and a BIS ⩽60. During mesh placement, all patients received 50 mg IV dexketoprofen plus 1 g IV paracetamol. In PACU, boluses of 50 mg IV tramadol were administered every 15 minutes until VAS <3. Patients were discharged with 600 mg p.o. ibuprofen q 8 h and paracetamol 500 mg p.o. as analgesic rescue. The study variables were: remifentanil and tramadol requirements, VAS on admission and discharge from PACU, time in PACU, and side effects. VAS and paracetamol consumption were also registered 24 h post-op by telephone interview.

Results: Remifentanil requirements were similar in all groups (range 0.28 ± 0.09 to 0.35 ± 0.10 $\mu g.kg^{-1}.min^{-1}$). All patients in-group K required ⩽50 mg tramadol in the PACU, while 35.7% (D) and 40% (DK) required >50 mg (χ^2 test, $p = 0.027$). No differences between groups were observed in any of the other variables, and none of the patients had nausea and vomiting.

Conclusion: The administration of ketamine alone (but no dexamethasone), decreased the requirements of tramadol in the PACU. Adding dexamethasone to ketamine did not improve the effects of ketamine alone, suggesting antagonism between these drugs.

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A-57

Homepump technique – preserved motion without pain after hand surgery

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Background and Goal of Study: Patient-Controlled Regional Analgesia (PCRA) techniques using perineural and incisional catheters have been described for pain management after a variety of ambulatory surgical procedures. In hand surgery the negative effects of a proximal nerve block is loss of motor function. The aim of this study was to develop a new application of the homepump technique to achieve postoperative analgesia with preserved mobility of arm and hand. In this study carpal tunnel release situates a model by a distal blocking of the median nerve.
Materials and Methods: This randomized double-blinded study involved 88 patients, 61 female, 27 male, age 30 to 61 years, all scheduled for ambulatory carpal tunnel release. Patients were randomized into four groups (A to D), 22 in each group. Patients in A to C received a small epidural catheter, placed adjacent to the median nerve, proximal to incision. Additionally, all patients received subcutaneous wound infiltration with ropivacaine. Group A was given 0.2% ropivacaine, B 0.75% ropivacaine, and C 0.9% NaCl (placebo). Group D constituted a control group and was given a nerve block and wound infiltration using 0.20% ropivacaine. Patients in groups A to C were given an elastometric, disposable "homepump". Postoperatively the patients had the ability to self-administer maximum 10 doses of study drug, A and C 10 ml, B 3 ml per dose. On day 3 the catheter was removed. Oral rescue analgesics were prescribed in all cases. Pain assessment was made by VAS at regular times, additional analgesics and adverse effects were registered. Analgesia when using the pump, over all pain reduction and satisfaction were recorded.
Results and Discussions: We found a significant difference in pain reduction between active groups and placebo ($p = 0.001$), the over all pain reduction ($p = 0.02$), satisfaction ($p = 0.03$), and additive analgesics ($p = 0.001$). Both concentrations of ropivacaine were effective, however there was less numbness in patients receiving 0.2% ropivacaine.
Conclusion: Our results show that in patients undergoing hand surgery PCRA with "Home-pump" provides effective pain relief without adverse effects and a preserved range of motion.

A-58

Does preoperative hypnosis improve early rehabilitation after dental surgery

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Background and Goal of Study: Several studies have reported that hypnosis might provide physiological, psychological and economical benefits for patients (1,2). This prospective randomised double blind study was designed to assess the possible benefits of a hypnosis session performed just before induction of a general anaesthesia with naso-tracheal intubation.
Materials and Methods: After approval of the Hospital Ethics Committee and written informed consent, 40 healthy women undergoing dental surgery were randomly assigned to have either a ten min hypnosis session or a simple conversation just before a standardized general total intravenous anaesthesia. Postoperative analgesia was also standardized. Patients were evaluated postoperatively by blinded observers for pain (visual analog scale: VAS), major analgesic requirements, anxiety (VAS), PONV, in-hospital length of stay, postoperative fatigue, and return to professional activities. Statistical analysis included unpaired Student t-test and Chi-square test, as appropriate. A $p < 0.05$ was considered significant (*).
Results and Discussions: No differences were observed in clinical and demographic variables between both groups.

	Control (N = 20)	Hypnosis (N = 20)
Postop pain	48 ± 21	38 ± 17
Piritramide consumption (mg)	3.1 ± 0.8	2.7 ± 0.6*
Postop anxiety	1.6 ± 2.3	0.9 ± 1.3
Hospital stay (hours)	6.3 ± 4.3	5.9 ± 4.5
Return to work (days)	5.6 ± 1.9	4.6 ± 2.1

Conclusion: No significant differences were observed between groups except for a lower postoperative major analgesic need in the hypnosis group. The results of the present pilot study suggest that a sufficiently powered trial will be necessary to assess potential benefits of hypnosis on postoperative recovery and rehabilitation.
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A-59

Dexamethasone enhances antiemetic efficacy of dolasetron and haloperidol for treatment of established PONV

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Background and Goal of Study: When given prophylactically, dexamethasone increases the effectiveness of other antiemetics to prevent postoperative nausea and vomiting PONV (1,2). It is not known whether dexamethasone also increases the effectiveness of antiemetics when given as a PONV treatment. Antiemetics were shown to have similar antiemetic potency when given as a prophylaxis of PONV suggesting that they are equipotent in the treatment of PONV (3). We therefore compared the efficacy of dolasetron or haloperidol given alone to the efficacy of both drugs when given in combination with dexamethasone in patients with PONV.
Materials and Methods: After IRB approval and written informed consent, 1800 patients aged 18–75 yrs and scheduled for an elective procedure under general anaesthesia were prospectively enrolled into this double blinded study. There were no constraints regarding the drugs used for premedication and general anaesthesia. Using a factorial design, the patients participating in the study were randomised to one of the following treatment groups upon the occurrence of PONV: dolasetron 12.5 mg and placebo (DP), haloperidol 0.75 mg and placebo (HP), dolasetron 12.5 mg and dexamethasone 8 mg (DD), haloperidol 0.75 mg and dexamethasone 8 mg (HD). Study subjects were monitored for further occurrence of any PONV for 24 hrs postoperatively. Primary endpoint was the incidence of PONV following antiemetic treatment. Incidences were compared using Fisher's exact test with $P = 0.05$.
Results and Discussions: Of the 1800 patients enrolled into the study, 228 were analysed for efficacy. Patients' characteristics, risk factors for PONV, and anaesthetic and surgical characteristics of patients in groups DP ($n = 58$) and HP ($n = 56$) did not differ from those in groups DD ($n = 55$) and HD ($n = 59$). PONV occurred more frequently in patients of groups DP and HP (59 out of 114) than in groups DD and HD (38 out of 114), $P = 0.0072$.
Conclusion(s): Results of this study show that the combination of dexamethasone with dolasetron or dexamethasone with haloperidol is superior to dolasetron or haloperidol alone for the treatment of PONV.
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A-60

Clinical indicators for day surgery: influence of anaesthetic technique

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Background and Goal of Study: Pain and other postoperative adverse phenomena influenced outcome in ambulatory surgery. The aim of our study was to compare anaesthetic technique measuring clinical indicators for day procedures and evaluating a 24 h-questionnary.
Material and Methods: After excluding ocular and skin procedures, we have followed 1604 major ambulatory surgery patients in a six-month period. 56.8% received general anaesthesia (GA), 5.6% central neural blockade (CNB), 2.7% troncular blockade (TB) and 34.9% sedation/local anaesthesia/monitored care (MC). There were no unplanned return to the OR; 181 patient (10%) were overnight admitted. Phone call questionnaire related to adverse phenomena and satisfaction were made 24 h after the procedure.
Results and Discussion: 1523 patient went home, of them 4% called for medical problems, 6.5%, returned to the hospital and 0.9 were readmitted. When comparing type of anaesthesia, pain at home was significantly more

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present in patients who received regional anaesthesia (CNB and TB); vomiting was present in GA and MC; time from procedure and discharge was significantly higher those patients who received general anaesthesia and central neural blockade. There were no differences in future choices for ambulatory surgery and for anaesthetic technique. More than 95% of patient expressed satisfaction about the procedure and anaesthesia.
Conclusions: Pain is the most important adverse phenomena in ambulatory surgery. However, pain at home depends on adequate protocol of pain management and not on anaesthetic technique.

A-61

Haloperidol plus dexamethasone versus dexamethasone alone to prevent postoperative nausea and vomiting in patients undergoing ambulatory surgery: a randomised, controlled and double-blind study

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Background and Goal of Study: Haloperidol is an effective antiemetic drug. We sought to determine whether haloperidol with dexamethasone-based prophylaxis scheme decrease the incidence of postoperative nausea and vomiting (PONV) in patients undergoing ambulatory surgery.
Materials and Methods: We enrolled 160 non-smokers females that received a standardized anaesthesia technique including 8 mg of dexamethasone at the beginning of surgery, then they were randomised to receive 1.5 mg of Haloperidol (DH group) 30 minutes before the end of surgery or Placebo (DP group). The incidence of PONV was assessed by a blinded investigator at 30 min, 2, 6 and 24 h in the postoperative period; analgesic requirements, ocular opening time and sedation were quantified. The quantitative variables of normal distribution were evaluated with the t-student test and the ones with abnormal distribution with the U–Mann Whitney test. Qualitative variables were evaluated with the Fisher test.
Results and Discussion: Both groups were homogeneous in demographic characteristics (30.1 vs 29.5 years, 55.9 vs 56 kg and history of PONV in 21.5% vs 21.2% in DH group vs DP group respectively). At 6 hours postoperatively we found no difference in the incidence of nausea (22.5% vs 27.5%; RR: 0.81, CI 95% 0.56–1.25), but there was a lower incidence of vomiting (15% vs 26.2%; RR: 0.57, CI 95% 0.39–1.05) in DH vs DP group. At 24 hours pop we found no difference in the incidence of nausea (41.25% in DH vs 52.5% in DP group; RR: 0.80, CI 95% 0.57–1.1) but again a protective effect of vomiting (22.5% in DH vs 41.25% in DP group; RR: 0.62 CI 95% 0.40–0.90). We found a non-significant decrease of postoperative morphine requirements in DH group (3.2 mg vs 4 mg), no difference in ocular opening time (8.3 min (DH) vs 8 min (DP)) and Ramsay score > 2 at 30 min. were equal in both groups (18.75% (DH) vs 17.5% (DP)).
Conclusion: Adding 1.5 mg of Haloperidol to a standard dexamethasone prophylactic scheme for PONV is a very effective strategy to control early and late vomiting but a non conclusive strategy for decreasing the incidence of nausea being a safe and cost-effective strategy in ambulatory surgical patients.

A-62

Preoperative evaluation clinic analysis: a comparison of the organizational structure in two university hospitals

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Background and Goal of Study: Previous research shows that an anesthesia preoperative evaluation clinic (APEC) enhances hospital cost-efficiency. However, at present, the differences in organization of the various APECs have not been analyzed. In this study, we analyzed the logistic processes and costs of the APEC in two academic centers in the Netherlands (LUMC and AMC).
Materials and Methods: The study included 880 patients, who visited either academic center. The organizational structure of the two centers is essentially different. At the LUMC, electrocardiography and laboratory tests are performed at the APEC. Other tests require an appointment elsewhere in the hospital. In the AMC, no additional tests are performed at the APEC. The efficiency of the APEC was evaluated by means of the patient flow time, comprising the total procedure time and the total waiting time, and the staffing costs.
Results and Discussions: Total patient flow time was significantly shorter in the LUMC; 49 min [33–69 min] versus 65 min [41–92 min] ($p < 0.001$). The main cause of this difference was the increase in patient flow time when additional tests are performed. The median patient flow time with additional tests was 63 min [48–83 min] in the LUMC compared to 126 min [92–149 min] in the AMC. The median time to complete the additional tests was 41 min [29–72 min] in the AMC versus 6 min [4–8 min] in the LUMC ($P < 0.001$). More patients undergo additional testing in the LUMC (46% versus 25%). However, the tests that are not performed at the APEC in the LUMC are requested less often compared to the AMC, where all tests are done elsewhere in the hospital ($P < 0.02$). Annual APEC staffing costs are higher in the AMC as compared to the LUMC (€309,901 versus €283,240). However, staffing costs per patient are lower (€30 versus €40).
Conclusion(s): This study shows that the choice of organizational structure of an APEC has major impact on patient flow time, staffing costs and, possibly, the number of preoperative tests performed. Evaluating an APEC by means of the waiting time and procedure time provides insight into the impediment of the organization.

A-63

Alternative medicine use in ambulatory surgical patients

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Background and Goals: Use of alternative medicines is common in the general population. Potential adverse effects of such products taken perioperatively have been identified (1). We investigated patterns of alternative medicine use in our hospital's ambulatory surgical population.
Materials and Methods: A paper questionnaire was distributed to ambulatory surgical patients over the age of 16 during a 3 week period in July 2005. Use of alternative medicines in the preceding 2 weeks and 6 months was surveyed. Alternative medicine use by different subsets of patients was analysed using the chi^2 test.
Results: Response rate was 96% (300/312 questionnaires returned). Overall 32.3% of patients had taken at least one alternative medicine in the preceding 6 months with female patients more likely to have done so than males (71/168 [42.3%] vs. 26/132 [19.7%], $p < 0.001$). 18% of patients reported using alternative medicines in the preceding 2 weeks. In our sample alternative medicine use was not statistically related to age ($p = 0.131$) or ethnicity ($p = 0.157$). The most commonly used alternative medicines were: Evening Primrose Oil (17% of total), Echinacea (16.5%), Garlic (14%), Ginseng (9.5%), Aloe Vera (9%) and Arnica (8.5%).
Discussion: In contrast to a previous UK study (2) the rate of alternative medicine use in our study population was comparable to that reported in US studies. Although the pharmacokinetics of most alternative medicines are poorly defined, the fact that a large proportion of users continue taking their alternative medicines in the two weeks before surgery makes it likely that significant levels of active ingredients may persist in the perioperative period. The alternative medicines which were most commonly used by our study population were different to those found to be popular in previous studies, including a study performed three years ago in a hospital only 70 km from ours.
Conclusions: The preoperative assessment should include enquiry about alternative medicine use. It would be prudent for anaesthetists to familiarise themselves with those alternative medicines popular amongst their local population.
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A-64

A comparative study on the safety and effectiveness of remifentanil and small-dose ketamine during minor surgical procedures under local anaesthesia

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Background and Goal of Study: This prospective, randomized, double-blind, controlled study was designed to compare the safety and effectiveness of

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remifentanil with ketamine during minor surgical procedures under local anaesthesia.

Materials and Methods: Ninety adult healthy patients scheduled for minor surgical procedures under local anaesthesia randomly assigned to one of three treatment groups. Each patient received 0.1 mg kg^{-1} midazolam intravenously 30 min before the study medication. Four minutes before surgery, group S (n = 30) received a saline infusion, group R (n = 30) received a continuous infusion of remifentanil at 0.075 $\mu g\,kg^{-1}\,min^{-1}$ and group K (n = 30) received a continuous infusion of ketamine at 9 $\mu g\,kg^{-1}\,min^{-1}$. Discomfort, sedation, pain scores, number of patients requiring supplementary analgesic and side effects were recorded at 5, 15 and 30 minutes after the start of surgery.

Results and Discussions: Pain and discomfort scores were significantly lower in remifentanil group than in ketamine and saline groups, whereas sedation scores were significantly higher during each study period ($P < 0.017$). Pain scores were significantly lower in ketamine group than in saline group ($P < 0.017$), while sedation scores were similar. Discomfort scores were greater in saline group only at 15 and 30 minutes ($P < 0.017$). Thirty-nine patients (43%) complained of discomfort despite the study medication: 27 in saline group (90%), 11 in ketamine group (37%) and 1 in remifentanil group (3%).

Conclusion(s): Small-dose remifentanil (0.075 $\mu g\,kg^{-1}\,min^{-1}$) and ketamine (9 $\mu g\ kg^{-1}\,min^{-1}$) infusions as supplements to local anaesthesia provided satisfactory intra-operative analgesia, sedation and patient comfort without causing any haemodynamic or respiratory problems. Remifentanil gave better intraoperative pain relief and patient comfort than ketamine.

A-65

Is general anaesthesia for day surgery safe in the elderly?

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Background and Goal of Study: Very few studies have specifically investigated outcomes of the elderly after day surgery. Those that do, included large numbers of procedures carried out under local anaesthesia. Increasing numbers of elderly patients undergo complex procedures under general anaesthesia (GA). This study investigated the incidence of complications in these elderly day surgery patients.

Materials and Methods: With institutional ethics approval, the computerized medical records of all patients ⩾65 years of age, who underwent day surgery at our hospital from 2002 to 2004, were analysed. Primary outcomes were the rates of the following procedure-related adverse events: unanticipated admission, readmission, and Emergency Room (ER) visit within 30 days.

Results and Discussions: 1005 elderly patients (mean age 72.1, range 65–93) underwent surgery under GA during the 3-year period. In total, 88 patients (8.8%) experienced an adverse event, most commonly from surgical causes (59%). The overall incidence of unanticipated admission was 3.6%. The readmission rate was 0.9%, while 4.4% visited the ER within 30 days. Two (0.2%) patients requiring readmission died from complications of their initial surgical procedure.

Patients with ASA class III had a significantly higher risk of adverse events compared to those with ASA class I or II ($p \leqslant 0.01$ and $p \leqslant 0.025$, respectively). The incidence of adverse events for general surgery (14.9%) and urology (13.6%) was significantly higher than for orthopaedic surgery (5.4%, $p \leqslant 0.01$). We identified no major anaesthetic or medical morbidity after discharge.

Conclusion(s): Day surgery in the elderly can be carried out safely under GA, but the overall incidence of complications was not inconsiderable. Most complications were surgical in nature. General surgery and urology were associated with the highest risk. ASA class III was also associated with an increased risk of complications.

A-66

Endocrine response to cataract surgery under total intravenous anaesthesia, local anaesthesia under sedation or local anaesthesia alone

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Background and Goal of Study: The aim of the study is to investigate the effect of three different anaesthetic modes on hormonal response (prolactin, cortisol and thyroid-stimulating hormone) following cataract surgery (1, 2, 3).

Materials and Methods: Sixty postmenopausal women, ASA I–II, aged 50–60 years scheduled for cataract surgery as day-case patient were divided into three groups. In sequential order, groups A, B and C underwent local anaesthesia under sedation with propofol (n = 20), general anaesthesia as total intravenous anaesthesia with propofol (n = 20), and local anaesthesia alone (n = 20), respectively. Blood samples were taken prior to anaesthesia and at regular intervals for up to 2 hours, while prolactin, cortisol and thyroid-stimulating hormone levels were determined, respectively. Statistical analyses were done using the multivariate analysis of variance for repeated measures (SPSS, MANOVA).

Results and Discussions: A slight hyperprolactinemic response was found in group B ($p < 0.001$), while the cortisol and the thyroid-stimulating hormone profiles showed statistically significant changes ($p < 0.001$) but within the normal range. No statistically significant hormonal changes were observed in groups A and C, at any time interval.

Conclusion(s): Stress response to cataract surgery under local anaesthesia with or without sedation is minimal, if any. On the other hand, total intravenous anaesthesia with propofol did not completely suppress the stress response associated to cataract surgery and increased cortisol, prolactin and thyroid-stimulating hormone levels were observed. Besides, cortisol and thyroid-stimulating hormone increases were within the normal values.

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A-67

The effects of pre-anesthetic single dose dexmedetomidine on hemodynamic and recovery parameters

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Background and Goals: Dexmedetomidine is a selective α_2 adrenoreseptor agonist with centrally mediated sympatholytic sedative and analgesic effects (1). The aim of the study was to invastigate the hemodynamic, anaesthetic and recovery effects of dexmedetomidine used as single preanaesthetic dose.

Material and Methods: ASA I–II patients, aged 20–60 years, scheduled for elective abdominal surgery. Patients were randomly divided into two groups to receive 0.5 $\mu g\,kg^{-1}$ dexmedetomidine as a bolus dose in group D (n = 20) or saline solution as a bolus dose in group C (n = 20) within 60 second. Ten minutes after dexmedetomidine administration anaesthesia was induced with sodium thiopental until loss of eyelash reflexes. Vecuronium 0.1 mg/kg was used. The scores of tracheal intubations and thiopental doses were noted. Anesthesia was maintained with 4–6% desflurane (4 L min^{-1} 50% $N_2O + O_2$) according to bispectral index monitor (BIS) range of 40–60. Mean arterial pressures (MAP), heart rates (HR), oxygen saturations (SpO_2) were monitorized. Ejection fractions (EF), end-diastolic indexes (EDI), cardiac indexes (CI), stroke indexes (SI) were monitorized and recorded with noninvasive thoracic electrical bioimpedance for 10 min. intervals. Postoperative Aldrete Recovery Score (ARS) was recorded. Analysis of varience (ANOVA) were used to evaluate the groups. A p value <0.05 was accepted statistically significant.

Results: The EDI's, CI's, SVI's and EF's were similar in group I and II. The HR at 10th min ($p = 0.024$) and MAP at 30th min ($p = 0.026$) were significantly different. Intubation scores, thiopental doses and BIS are shown as mean ± SD in the table.

	Group C	Group D	p value
BIS after *dex*	95.5 ± 9.7	86.8 ± 1.09	0.001
Thiopental doses	518 ± 62.3	354.1 ± 72.3	0.002
Entubation score	Excellent 45%	Excellent 75%	0.001
ARS 10th min	8.76	8.65	0.132

Conclusions: In conclusion, a single dose dexmedetomidine given before induction of anaesthesia decreased thiopental requirements without serious hemodynamic adverse effects and provided better intubation condition. In addition there is no effect on recovery times compared with saline.

Reference:

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Monitoring: Equipment and Computers

A-68

Estimation of safety-levels for pulse oximetry in patients with black, purple, and blue nail polish applied

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Background and Goal of Study: Nail polish of dark colors has repeatedly been reported to interfere with pulse oximetry [1, 2]. Readings may be falsely high compared to the gold-standard CO-oximetry, leading to a risk for unnoticed hypoxia. The aim of this trial was to estimate three different pulse oximetry safety levels for critically ill patients with black, purple, or blue nail polish applied.
Materials and Methods: The three different nail polishes (black, purple, and blue) were applied on finger nails in 50 critically ill and mechanically ventilated patients of an ICU after approval of the local ethics committee and guardian approval. Functional oxygen saturation was measured by pulse oximetry (SpO_2) and CO-oximetry (SaO_2) simultaneously. The safety levels for each color were determined by graphical analysis of the correlation between SaO_2 (x-axis) and SpO_2 (y-axis) as previously suggested by Seguin et al. [3]. The safety-level (e.g. which SpO_2 is needed) to guarantee a SaO_2 of 96% was determined on the basis of a 5% error ($\alpha = 5\%$).
Results and Discussion: 50 patients (19 female, 31 male) with an age of 59 ± 14 years were included. Mean SaO_2 ($97.8 \pm 1.3\%$) correlated well with mean SpO_2 ($97.5 \pm 2.2\%$, n.s. for natural nail as control). Bias was calculated as $B = +1.6 \pm 3.0\%$ (black), $B = +1.2 \pm 2.6\%$ (purple), and $B = +1.1 \pm 3.5\%$ (blue). To guarantee a SaO_2 of 96% with an accepted error of $\alpha = 5\%$, the following SpO_2 values were graphically determined to be necessary: $SpO_2 = 99\%$ if black nail polish was present, $SpO_2 = 98\%$ for purple, and $SpO_2 = 100\%$ for blue nail polish.
Conclusion: Compliance of these safety levels (SpO_2: black 99%, purple 98%, and blue 100%) during intensive care routine treatment may help to reduce the incidence of unrecognized hypoxic episodes (e.g. $SaO_2 < 96\%$).
References:
1 Cote CJ et al. Anesth Analg 1988;67:683–686.
2 Hinkelbein J et al. J Emerg Med 2004;26:377.
3 Seguin P et al. Crit Care Med 2000;28:703–706.

A-69

Acetazolamide compromizes the measurement of $p_{et}CO_2$ but not $p_{tc}CO_2$

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Background and Goal of Study: The carbonic anhydrase blocker acetazolamide is used to decrease carbonic anhydrase activity (e.g. in eye surgery). Measurement of carbon dioxide determined with end-tidal techniques ($p_{et}CO_2$) may be affected due to an interference with a decreased transport capacity for CO_2 in the blood. The aim of this trial was to evaluate precision of end-tidal and transcutaneous CO_2-measurement after administration of carboanhydrase compared to the gold-standard CO-oximetry.
Materials and Methods: After approval of the local ethics committee for animal research, $p_{et}CO_2$ (Datex Ohmeda, Helsinki/Finland), p_aCO_2 (CO-oximetry, ABL500, Radiometer/Denmark), and transcutaneous CO_2 partial pressure $p_{tc}CO_2$ (TCM4, Radiometer/Denmark) were determined simultaneously in six intubated and ventilated house pigs after administration of $20\,mg\,kg^{-1}$ acetazolamide. Bias for the measurement was calculated as $B_{et} = p_aCO_2 - p_{et}CO_2$ (end-tidal bias) and $B_{tc} = p_aCO_2 - p_{tc}CO_2$ (transcutaneous bias). Student's t-test was used to prove significance, $p < 0.05$ was considered significant.
Results and Discussion: Average weight of the six female house pigs was 29 ± 3 [27.5 to 40.0] kg. 61 data pairs were recorded prior to and 14 data pairs after administration of acetazolamide. Prior to administration, mean p_aCO_2 was 41.8 ± 12.5 [21 to 93] mmHg. End-tidal Bias (B_{et}) changed from $+1.8 \pm 4.6$ [−13 to 16] mmHg before to $+28.7 \pm 20.9$ [7 to 67] mmHg after administration of acetazolamide ($p < 0.01$). Bias for the transcutaneous measurement (B_{tc}) remained stable: -4.6 ± 6.4 [−33 to 3] mmHg vs. -0.1 ± 4.0 [−9 to 4] mmHg (n.s.).
Conclusion: Accuracy of end-tidal carbon dioxide measurement is severely compromised (falsely low) after administration of acetazolamide, whereas accuracy of transcutaneous measurement ($p_{tc}CO_2$) remains unaffected. In monitoring CO_2 after the administration of acetazolamide, $p_{tc}CO_2$ is superior to $p_{et}CO_2$.

A-70

Forehead SpO_2 monitoring compared to finger SpO_2 monitoring in flight rescue emergency medicine

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Background and Goal of Study: Continuous monitoring of the peripheral hemoglobin saturation (SpO_2) has become standard in emergency medicine recent years. This monitoring requires adequate plethysmographic pulsations. Under certain circumstances, e.g. cold ambient temperature, that are often to be found in air based emergency medicine, monitoring does not work adequate, maybe due to the patients' vasoconstriction (1). So we compared monitoring quality of finger attached pulse oximeter to forehead attached pulse oximeter.
Materials and Methods: We enrolled 78 patients with neurological symptoms due to cerebral apoplexy, that were transported by helicopter to the hospital. All patients had a Glasgow Coma Scale of 13, and were to be classified as ASA 2 or 3. None had to be intubated. We attached finger and forehead pulse oximeters on the patient. During transport (average 27.9 ± 3.4 min) a notebook computer counted number and duration of alerts due to technical artifacts (poor signal detection) of the two pulse oximeters seperately. Only alarming of at least 10 seconds was taken into account.
Results and Discussions: The results show a significant difference in number of alerts (finger pulse oximeter 5.8 ± 3.1 alerts, forehead sensor 2.1 ± 1.2 alerts per patient) and in duration of alarming (343.1 ± 120.5 sec finger oximeter to 86.5 ± 54.0 sec forehead sensor).
Conclusion(s): Especially in a patient population, where the surveillance of respiration and oxygenation is of crucial importance, we can recommend the use of a forehead pulse oxymetry sensor as a tool to diminish monitoring failure.
Reference:
1 Kober A, Scheck T, Lieba F et al. The influence of active warming on signal quality of pulse oximetry in prehospital trauma care. Anesth Analg 2002;95:961–6.

A-71

End-tidal gas monitoring: a clinical study showing that a new main-stream device is equivalent to the conventional side-stream technique

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Background and Goal of Study: End-tidal gas concentration monitoring has become standard practice in general anaesthesia with most monitors using the side-stream, active sampling technique. In the present study a new main-stream device was compared to a conventional side-stream monitor during routine day surgery anaesthesia. As this mainstream technique is less complex to use and potentially less expensive than the side-stream technique, we sought to determine if the new monitor was equivalent to the standard.
Materials and Methods: End-tidal gas concentrations of nitrous oxide and sevoflurane were measured from the larynx mask airway the during washout phase in 15 ASA I–II day surgical patients. A VEO™ multigas monitor with Irma™ detector head (Phasein AB, Stockholm, Sweden) and a conventional side-stream gas monitor (Cardiocap/5; Datex/GE, Helsinki, Finland) were used simultaneously. Simultaneous pair wise readings were recorded every 60 seconds after cessation of anaesthetic gases until patients were awake and the laryngeal mask airway was removed.
Results and Discussions: The main-stream monitor was a fraction of the size of the side-stream device and very easy to use. The correlation between main and side-stream measurements of nitrous oxide and sevoflurane during washout via the larynx mask airway was found to be high, R^2 for nitrous oxide and sevoflurane were 0.944 and 0.967. Figure shows end-tidal concentrations from mainstream (y-axis) and side stream (x-axis).

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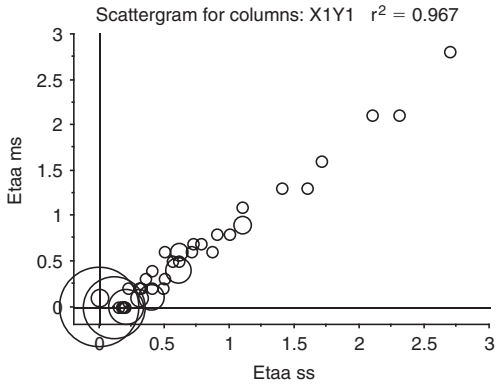

Conclusion(s): The novel main-stream gas monitor was found to be an interesting and fully comparable alternative to side-stream gas monitor during routine clinical anaesthesia.

A-72

Patent blue violet in diluted blood interfers with co-oximeter readings

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Background and Goal of Study: Patent blue violet (PBV) is useful to mark neoplasia. It sometimes leads to irregular readings of co- (1,2) as well as pulse-oximeter devices. Recently, in pediatric anesthesia, we managed an anemic patient and irregular readings occurred after PBV. Therefore we investigated whether PBV distorted oximeter readings were modified by anemia.
Materials and Methods: Hemoglobin solution of 10 g/dl and 5 g/dl were prepared by diluting venous blood form healthy volunteers (n = 6). Each sample was mixed with 0.5 and 1.0 mg PBV, respectively and measured with two co-oximeters (OSM3 and ABL725; Radiometer Medical A/S, Denmark). The data are presented with mean ± SD.
Results and Discussions:

Carboxyhemoglobin

	Hb	Control	0.5 mg-PBV	1 mg-PBV
ABL	10	0.8 (0.4)	−0.1 (0.5)#	−1.1 (0.7)#
ABL	5	0.9 (0.4)	−1.1 (0.6)#	−3.6 (1.3)#
OSM	10	1.2 (0.3)	−13.6 (6.5)#*	−25.9 (10.2)#*
OSM	5	1.1 (0.2)	−25.8 (10.3)#*	−40.0 (17.1)#*

Methemoglobin

	Hb	Control	0.5 mg-PBV	1 mg-PBV
ABL	10	0.3 (0.2)	−2.1 (0.6)#	−4.9 (0.9)#
ABL	5	0.2 (0.3)	−4.1 (0.7)#	−8.7 (0.5)#
OSM	10	0.7 (0.1)*	17.3 (9.3)#*	30.3.(11.8)#*
OSM	5	0.9 (0.2)*	30.7(13.3)#*	45.5(21.2)#*

#: $p < 0.05$ vs. Control, *: $p < 0.05$ vs. ABL

The addition of PBV resulted in a dose dependant, highly reproducible, significant deviation of the carboxy- and methemoglobin readings. Decreasing HB concentrations correlated with more marked deviations. The deviation was most severe in the OSM3 device.
Conclusion(s): PBV and anemia have additive distorting effects on oxymetry readings. The OSM3 as a 2 wave length device is much more susceptible to readout deviation than the 5 wave length device ABL725.
References:

1 Saito S et al. Acta Anaesthesiol Scand 1995;39:268.
2 Larsen VH. Acta Anaesthesiol Scand 1995;39:53–55.

A-73

Transcutaneous monitoring of carbon dioxide partial pressure

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Background and Goal of Study: Patients undergoing sedation during spontaneous breathing usually receive drugs with a potential for respiratory depression. Oxygen saturation is only a late marker of inadequate minute ventilation, whereas noninvasive measures of expired CO_2 may be unreliable. Transcutaneous capnometry might represent a useful monitoring device for spontaneously breathing patients at risk for respiratory depression. We evaluated the accuracy and mean bias of a transcutaneous capnometer in estimating arterial carbon dioxide partial pressure ($PaCO_2$) in awake, spontaneously breathing patients.
Materials and Methods: After proper calibration, a $TcCO_2$ monitor system (Santec stand-alone monitoring system, Santec, Switzerland) was applied to an ear lobe of spontaneously breathing, hemodynamically stable post-surgical patients. Estimated $PaCO_2$ values ($TcCO_2$) at 0, 30, 60, 90 and 120 minutes were recorded. At the same times, arterial blood samples were taken from an indwelling catheter for ABGs. Arterial blood pressure and heart rate were also recorded. After checking for normality of the distributions, linear regression with a Pearson's coefficient was performed, as well as a Bland-Altman analysis. SPSS for Windows 13.0 was used for all tests except the Bland-Altman analysis for which MedCalc 8.0 was used. Data are presented as value (95% confidence intervals).
Results and Discussions: Thirteen patients were enrolled in this phase, for a total of 56 measurements. Linear regression showed a significant correlation with a coefficient of 0.61 (0.41–0.81) and an intercept of 11.4 (3.5–19.3) mmHg ($R^2 = 0.41$; $p < 0.001$). The $TcCO_2$-$PaCO_2$ mean gradient was −3.8 (−5.6–13.3).
Conclusion(s): We conclude that $TcCO_2$ using the present device is only moderately accurate in estimating $PaCO_2$ and its variations in spontaneously breathing patients. Changes in $TcCO_2$ can only partially be explained by changes in $PaCO_2$ Further research may improve our understanding of $TcCO_2$ and its relation to $PaCO_2$ and other hemodynamic variables.

A-74

Efficiency measurement of the waste anesthetic gas treating system

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Background and Goal of Study: Waste anesthetic gases scavenged from operating rooms are usually discharged into the atmosphere without being processed. This is not a negligible state of affair in view of environmental pollution. We have developed a unique system for treating waste anesthetic gases and reported the practical use of it for the first time in the world (1). Here we report the efficiency of the system in actual clinical use, based on the continuous measurement for a month.
Materials and Methods: In the system, waste anesthetic gases are first introduced into an adsorbent cylinder, where volatile anesthetics are adsorbed and removed. The remaining gas is passed into a catalytic reactor, where the nitrous oxide is decomposed into nitrogen and oxygen. The adsorbed volatile anesthetics are desorbed and collected as a liquid through the manipulation of temperature and pressure, then the adsorbent cylinder is recycled. Two adsorbent cylinders are switched periodically for adsorption and desorption. Thus, the system can process continuously. The concentrations of N_2O and volatile anesthetics at inlet of the system were measured at three minutes-interval using Fourier transform infrared spectrophotometer. The concentration of N_2O at outlet of the catalytic reactor was measured continuously using infrared spectrophotometer. An approximate re-collection rate of volatile anesthetics was calculated from actually re-collected liquid amount and the sum of usage amounts on anesthesia records.
Results and Discussions: Decomposition rates of N_2O calculated from inlet and outlet concentrations were 99.0∼99.9%. The time-weighted average concentration of N_2O at outlet was 32 ppm. The re-collection rate of volatile anesthetics was 80%. These values are sufficient for practical use, though there is room for improvement in the re-collection rate. A leakage of the vapor from the collecting tank is supposed to be one of the factors. We plan to minimize it and improve the efficiency.
Conclusion: The continuous concentration measurement of inlet and outlet gases revealed that our waste anesthetic gas treating system has a practical efficiency.
Reference:

1 T. Kai: ASA abstract. Anesthesiology 96: A574, 2002.

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A-78

The effects of rocuronium and ketamine on bispectral index, A-Line auditory evoked potentials index and spectral entropy

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Background and Goal of Study: We studied the effect of ketamine and rocuronium on the following depth of anaesthesia measures: bispectral index (BIS), the A-Line auditory evoked potentials index version 1.6 (AAI1.6), the response entropy (RE) and the state entropy (SE).
Materials and Methods: After ethics' committee approval, 41 patients were allocated to four groups. Baseline measurements were performed after implementing a calculated steady state anaesthesia with propofol and remifentanil. The KET group received a bolus of ketamine (0.4 mg/kg) followed by a 1 mg/kg/h continuous infusion. The ROC group received rocuronium (0.9 mg/kg). The ROC+KET group received both. No additional drugs were given in the CONTROL group. All data was stored during a 15 minstudy period after baseline, using RUGLOOP[#].
Results and Discussions: BIS showed a non significant rising trend in KET. Mean BIS values decreased in the ROC group. In ROC+KET, this decreasing effect of rocuronium was countered. For AAI1.6, a lower mean value compared to baseline was seen during several minutes in ROC and ROC+KET. For RE and SE, ketamine evoked a significant increase in KET and ROC+KET. Mean RE, but not SE, was decreased in ROC. As the basic locomotor rhytmicity is N-Methyl D-Aspartaat dependent, the distortion evoked by ketamine on neurophysiological monitoring might be caused by a change in electromyography. However, we found that this distortion is independent from the presence of rocuronium for BIS, RE and SE. BIS seems less sensitive for the effects of ketamine with a balanced anaesthesia compared to a propofol anaesthesia.
Conclusion(s): Rocuronium decreases BIS, AAI1.6 and RE, but not SE. Ketamine counters this decreasing effect for BIS, and RE but not for AAI1.6.

[#] RUGLOOP, written by T. De Smet and M. Struys. More information at http://www.anesthesia-uzgent.be, URL-posting date: 01/11/2005.

A-80

Monitoring of the anesthetic depth during VATS with auditory evoked potentials (AEP) – does it change propofol requirement and recovery course

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Background and Goal of Study: Total intravenous anesthesia is strongly recommended in thoracic surgery due to its minimal influence on V/Q mismatch during one lung ventilation. The inadequate dosage of propofol may cause prolonged recovery or awareness during procedure. Monitoring of the depth of anesthesia can be helpful to achieve the optimal propofol plasma concentration during target controlled infusion (TCI). The aim of our prospective, randomized study was to compare the anesthetic requirement, recovery course and depth of anesthesia of patients undergoing AEP-guided anesthesia to patients managed conventionally by anesthesiologist blinded to AEP.
Materials and Methods: 40 patients undergoing video-assisted thoracic surgery (VATS) were randomized to group A (AEP-guided, AEP Monitor 2, Danmeter) or group B (AEP-blinded), 20 patients each. In both groups anesthesia with fentanyl, propofol (TCI 4 mcg $\cdot$ ml^{-1}, 2.0 version) and rocuronium was implemented. In the group A propofol infusion was adjusted in increments of 0.5 mcg $\cdot$ ml^{-1} every 5 min as necessary to maintain AAI between 15–25. In the group B initial propofol TCI of 4 mcg $\cdot$ ml^{-1} was adjusted to the patient's current hemodynamic and clinical status. Comparisons were made using t-test.
Results and Discussions: The demographic data, anesthesia and procedure duration were comparable in both groups. The average propofol dose (mg $\cdot$ kg^{-1} hr^{-1}) and propofol plasma concentration (mcg $\cdot$ ml^{-1}) were higher in group B vs A (12.9 $\pm$ 1.3 vs 8.9 $\pm$ 1.8 and 4 $\pm$ 0.1 vs 3.1 $\pm$ 0.5, $p < 0.0001$). Time to awakening, extubation and recovery room stay were also longer in group B vs A (17.5 $\pm$ 6 vs 8.6 $\pm$ 3.4 min, 20.7 $\pm$ 5.7 vs 10.3 $\pm$ 3.6 min, $p < 0.0001$ and 75 $\pm$ 17 vs 49.7 $\pm$ 18 min, $p = 0.0005$). AAI values below 15 were found in 43.4% of the records during propofol infusion in group A and 58.6% in group B ($p < 0.05$). In the group A mean plasma concentration of propofol calculated by the TCI device was 3.1 $\pm$ 0.5 mcg $\cdot$ ml^{-1} and showed negative correlation with the age ($r = -0.59$, $p < 0.05$). In both groups no incidents of intraoperative awareness were observed and patients satisfaction was comparable.
Conclusion: Monitoring of the anesthetic depth with AEP decreases propofol dosage and improves the recovery.
Reference:
1 Weber F. Acta Anaesthesiol Scand 2005;49:277–83.

A-81

Comparison of the Index of Consciousness (IoC) and the Auditory Evoked Potentials Index (AAI) during sevoflurane induction of general anaesthesia

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Introduction: The purpose of this study was to compare a new Index of Consciousness (IoC) with the Middle Latency Auditory Evoked Potentials (AAI) and the Observers Assessment of Alertness and Sedation Scale (OAAS) (1) during the induction of anaesthesia. The IoC is based on a chaos mathematical analysis, termed Symbolic Dynamics, of the frontal EEG. The symbol sequences were estimated according to the algorithm proposed by Mrowka et al. (2).
Materials and Methods: After Ethical Committee approval, data was collected from 12 patients scheduled for cardiac surgery. All patients were induced with 8% sevoflurane applying one of the standard departmental procedures. Five minutes after the patient had reached OAAS 1, atracurium 0.6 mg.kg^{-1} and remifentanil 1 μg.kg^{-1} were administered, the trachea was intubated and the study was finished. The IoC was recorded using a prototype of the IoC-view monitor and the AEP was recorded using the AEP-monitor/2 (Danmeter A/S, Odense, Denmark). The IoC and the AAI were registered while awake (OAAS 5) and at loss of consciousness (OAAS 1), defined as loss of response to mild shaking and prodding. A null-hypothesis was used to test (*t-test*) whether there was significant difference between the index values at OAAS 5 and OAAS 1. The prediction probability (Pk) was assessed as well.
Results: The Pk for Ioc and AAI was 0.99 and 0.98, respectively. The Table shows the mean (SD) for IoC and AAI at OAAS 5 and OAAS 1. Both IoC and AAI were significantly different at OAAS 5 and OAAS 1.

	IoC	AAI
OAAS 5	95.1(3.8)	57.7(16.1)
OAAS 1	47.3(3.7)	21.33(6.11)
p-value	<0.01	<0.01

Conclusion: The IoC and the AAI correlated well to awake and asleep, identified as OAAS 5 and OAAS 1. It is concluded that the IoC is a promising new method for assessing the level of consciousness during induction of anaesthesia with sevoflurane.
References:
1 Chernik et al. J Clin Psychopharmacol 1990;10:244–51.
2 Mrowka et al. Computers in Cardiology 1997;24:37–40.

A-82

Comparison between bispectral index and patient state index as measures of the electroencephalographic effects of propofol

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Background and Goal of Study: Patient state index (PSI) and bispectral index (BIS) are designed to measure depth of anaesthesia and are based on a multiparametric analysis of the electroencephalogram. We investigated the dose response relationship of PSI and BIS during propofol anaesthesia.
Materials and Methods: Seventeen patients were studied without surgical stimulus. Propofol was infused via a large forearm vein at a constant rate of 2000 mg/h until substantial burst suppression (BS) occurred (>60% BS ratio). Hereafter, propofol infusion was stopped until BIS recovered to values above 60. Subsequently, the propofol infusion was restarted at the same rate of 2000 mg/h until more than 60% BS ratio were achieved. Propofol plasma concentrations were calculated using the propofol data set provided by Schnider [1]. BIS (Aspect A-2000 XP, Newton, MA, USA) and PSI

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(Physiometrix PSA 4000, North Billerica, MA, USA) were simultaneously recorded and compared with the estimated effect site propofol concentration, which was calculated using a population based pharmacodynamic model (NONMEM V, GloboMax, USA).

Results and Discussions: The constant k_{e0}, which determines the efflux from the effect site, was estimated as $0.10\,min^{-1}$ for both BIS and PSI. Comparing PSI with BIS, the sigmoid dose response relationship was steeper ($\lambda = 2.00$ versus 1.05; λ describes the slope of the concentration-response relation) and shifted to a lower concentration ($C_{50} = 0.77$ versus $1.45\,\mu g/ml$; C_{50} is the concentration that causes 50% of the maximum effect) with similar intraindividual variability ($\sigma = 11.8$ versus 9.4). In terms of prediction probability (P_k) the performance of PSI ($P_k = 0.87 \pm 0.05$) to predict propofol effect side concentration did not differ ($p = 0.85$) from that of BIS ($P_k = 0.86 \pm 0.04$).

Conclusion(s): Despite major differences in their algorithm and minor differences in their dose response relationship, both BIS and PSI perform equally well in assessing depth of propofol anaesthesia.

Reference:

1 Anesthesiology 1998; 88: 1170–82.

A-83

The assessment of effect of neuromuscular blocking agent on depth of anesthesia using the BIS and AEPindex

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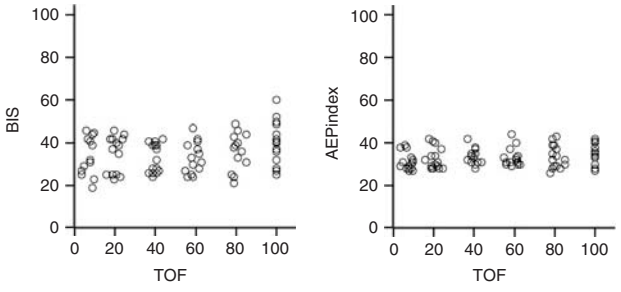
Background and Goal: Neuromuscular blocking agents have appeared to affect the depth of anesthesia, however, some reports have shown different findings. The capability of Bispectral index (BIS) and Auditory Evoked Potential index (AEP index) indicating the depth of anesthesia when paralyzed has not been confirmed. This study was performed to determine the effects of the intensity of neuromuscular block on the depth of anesthesia.

Materials and Methods: This study was performed in 15 patients undergoing surgery for varicose vein. Mivacurium was provided with propofol TCI (4–5 μg/Ml) and fentanyl (100–150 μg) and a laryngeal mask airway was inserted. Mivacurium was adjusted to obtain the desired level of neuromuscular block, and each level of neuromuscular block was maintained constant for a few minutes. BIS and AEP index were recorded at the predetermined range of neuromuscular block.

Results: There was no significant difference in mean BIS and AEPindex values at different degrees of neuromuscular block during unconscious state.



Conclusions: There was no correlation between the level of neuromuscular block and the depth of anesthesia as measured by BIS and AEPindex.

References:

1 Richmond CE, Matson A, Thornton C, et al. Br J Anaesth 1996; 76: 446–8.
2 Schwartz AE, Navedo AT, Berman MF. Anesthesiology 1992; 77: 686–90.

A-84

Impact of neuromonitoring on anesthetic drug consumption and quality of depth of anesthesia in cardiac surgery patients

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Background and Goal of Study: Development of computing technology led to the appearance of new depth of anesthesia neuromonitors. In our prospective study we aimed to show whether neuromonitoring has a significant impact on conduction of anesthesia in terms of anesthetic drug consumption and quality of depth of anesthesia.

Materials and Methods: In the study we enrolled 30 patients who were to undergo cardiac operation performed with cardiopulmonary bypass (CPB) in mild hypothermia. Depth of anesthesia was assessed with a neuromonitor based on auditory evoked potential analysis (AEP Monitor/2). Patients were divided in two groups: monitorized group: included 15 consecutive patients. Anesthesia was conducted based on the information provided by the neuromonitor as well. Control group: 15 consecutive patients were added. The anesthetist was blinded to the monitor, registered data were evaluated later.

We analyzed the variation of propofol dosage during hypothermia and rewarming. We evaluated the incidence of the AAI indices which indicate depth of anesthesia, in different zones (recommended, above recommended and below recommended) in different phases of the operation: whole time of anesthesia, hypothermia and rewarming.

Results and Discussions: In the monitorized group patients received significantly less propofol in hypothermia than in the control group ($p < 0.001$), and than during rewarming ($p < 0.001$). In the monitorized group in the whole time of anesthesia occurred more AAI indices in the recommended zone with borderline significance ($p = 0.05$). In the control group significantly more indices occured under the recommended zone in this period ($p = 0.01$). During rewarming we noticed significantly more indices in the zone above recommended in the monitorized group ($p = 0.04$).

Conclusion(s): Variation in the need for anesthetic drug on CPB can not be evaluated in the absence of neuromonitoring. Quality of depth of anesthesia was better with neuromonitoring. Without monitoring anesthesia was too deep. With neuromonitoring anesthesia can easily become superficial-experience and care are inevitable.

A-85

A new spectral index for assessing depth of anesthesia based on the cumulative power spectrum of the EEG

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Background and Goal of Study: Spectral parameters like spectral edge frequency (SEF) have been considered to reflect the decrease of the EEG frequency content when the depth of anesthesia increases[1]. Instead of considering solely the global frequency shift, we propose in this work a new spectral parameter that studies the EEG power distribution across its whole frequency range to assess the level of consciousness during general anesthesia.

Materials and Methods: After ethical committee approval and informed consent, the EEG signal of 20 female ASA I patients aged 18–60 years (Ghent University Hospital, Belgium) were analyzed. Propofol was administered by target effect-site concentration of propofol (CePROP) (RUGLOOP®). The A-line monitor (Danmeter A/S, Denmark) furnished the raw EEG and the AAI values. The BIS values were calculated by the BIS monitor (Aspect Medical Systems Inc., MA). The EEG data were from a database, the original results have previously been published[2]. In order to compute the novel spectral index, the power spectrum of the EEG segment is calculated, divided by an average power spectrum to emphasize intrinsic information and then integrated. The result is the cumulative power spectrum (CPS) curve, a monotonous increasing function across the frequency range. The CPS index is obtained comparing the CPS curve of this new segment with a set of reference segments whose level of anaesthesia is approximated by the AAI value. The adequacy of the CPS index and SEF95 with the level of anaesthesia is compared through the correlation with AAI, BIS and CePROP (Pearson's coefficient), and through prediction probability (Pk) analysis considering 3 levels defined by the AAI value.

Results and Discussions: The following Table presents the Pearson's correlation coefficients and the Pk values for both CPS index and SEF95.

	r AAI	r BIS	r CePROP	Pk
CPS index	0.787	0.703	0.625	0.863
SEF95	0.739	0.691	0.570	0.823

Conclusion(s): In terms of correlation and prediction probability, CPS index performs better than SEF95 and is thus a promising spectral method to measure the depth of anaesthesia.

References:

1 British Journal of Anaesthesia 1996; 77:179–84.
2 Anesthesiology 2002; 96:803–16.

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A-87

High levels of surgical stress index before movements of anesthetized patients

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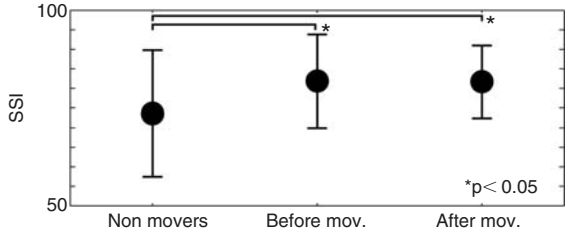
Background and Goal of Study: Surgical stress Index (SSI) is a novel method for measuring the hemodynamic changes related to the surgical stress response (1). Sudden noxious stimulation may cause movements whose exact time cannot be predicted. However, we hypothesized that during the surgery, changes in the balance between the level of analgesia and the average level of noxious stimulation might increase both stress level and probability of movements.
Materials and Methods: Physiological parameters were measured from 55 female patients anesthetized with propofol and remifentanil, and paralyzed with rocuronium. Remifentanil effect-site concentration was changed between 1, 3, and 5 ng/ml. SSI was calculated off-line. We compared the maximum SSI level of the periods 5 min before patient movements noticed by a research nurse with the maximum SSI levels of random 5 min periods of the surgery of patients with no noticed movements.
Results and Discussions: Of the 55 patients, 13 had annotated movements during the surgery, and 20 had no annotated movements at all. Average rocuronium dosages were similar (32 and 33 mg/h, respectively). As the SSI levels of the two groups were overlapping, the SSI information alone could not infallibly predict whether an individual patient will move or not within the next 5 minutes. However, there were significantly ($p < 0.05$; Mann-Whitney) more high SSI values with the patients that did move.



Conclusions: High levels of SSI seem to be related with an increased risk of patient movements and SSI may thus help choosing adequate level of antinociceptive medication.
Reference:
1 Huiku MT, Kymäläinen MK, Uutela KH, et al. Anesthesiology 2005; 103: A67.

A-88

Changes of a Surgical Stress Index in response to standardized pain stimuli during propofol–remifentanil infusion

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Background and Goal of Study: The Surgical Stress Index (SSI), normalised from the heart rate and the plethysmographic pulse wave amplitude, measures autonomic changes in response to surgical stress (1). This study aimed at observing the changes of SSI in response to standardized tetanic pain stimuli (100 Hz, 60 mA, 30 s) during propofol–remifentanil infusion.
Materials and Methods: After IRB approval, 40 ASA I patients were randomly allocated to 1 of 4 groups that received a remifentanil step-up/-down effect-compartment target controlled infusion (Ce_{remi}) of 0, 2, 6, 2, 0 or 6, 2, 0, 2, 6 ng/ml and an effect-compartment TCI propofol infusion (Ce_{prop}) to keep the state entropy between 30–50 or 15–30, respectively. At every Ce_{remi}, after an equilibration of 4 min, max. change in SSI after a painful stimulus (SSI_{max}) compared to baseline (SSI_{BL}) were correlated with Ce_{prop} and Ce_{remi}. RMANOVA with post-hoc, Pearson's correlation and prediction probability (P_K) analysis were done.
Results and Discussions: At similar time course of Ce_{remi}, both SSI_{BL} and SSI_{max} were independent from Ce_{prop} used in this study (mean concentrations between 3.4–6.9 μg/ml). Poor correlations for SSI_{BL} and SSI_{max} vs. Ce_{prop} were found ($r = 0.08$ and 0.07). Correlation between Ce_{remi} and SSI_{BL} and SSI_{max} were –0.34 and −0.55. SSI_{BL} and SSI_{max} were significantly higher within a Ce_{remi} range between 0 and 2 ng/ml than at higher Ce_{remi}. This might reveal leveling of surgical stress values at below Ce_{remi} 6 ng/ml. An increase in SSI compared to SSI_{BL} of more than 7.5 was a good predictor for Ce_{remi} ($P_K = 0.89$).
Conclusion(s): SSI was independent from Ce_{prop} as titrated in this study. SSI_{BL} was poorly correlated with Ce_{remi}, SSI_{max} was better correlated and clearly higher at very low Ce_{remi}. At Ce_{remi} concentrations higher than 2 ng/ml in combination with steady-state Ce_{prop}, SSI response was small, indicating a blockade of most of the noxious stimulation.
Reference:
1 Huiku M et al. Anesthesiology 2005; 103: A67.

A-90

Surgical stress index and entropy provide complementary information of analgesia and hypnosis

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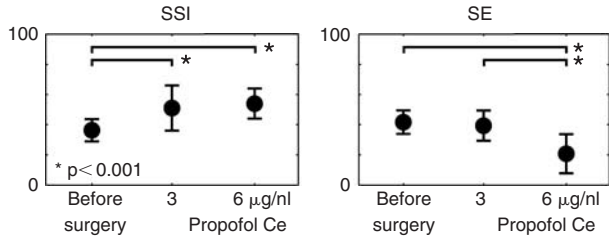
Background and Goal of Study: Surgical stress index (SSI) is a novel method for measuring the hemodynamic changes related to the surgical stress response (1). We studied how changes in SSI and state entropy (SE) relate to changes in hypnotic drug effect-site concentration (Ce) and level of noxious stimulation.
Materials and Methods: SSI and SE (2) were measured from 33 patients anaesthetized with propofol and remifentanil, and paralyzed with cisatracurium. To address the effect of hypnotic drug, propofol Ce was varied between 3 and 6 μg/ml with 15 min intervals during the laparotomic surgery. SSI and SE were computed from values between induction and the start of surgery and during surgery at propofol levels 3 and 6 μg/ml. The remifentanil effect-site concentration was before surgery 1–5 ng/ml (mean 2.9 ng/ml) and during surgery 3 ng/ml.
Results and Discussion: The propofol Ce before surgery was 4.5 ± 0.6 μg/ml. SSI during surgery was significantly higher than before surgery, while propofol level did not significantly affect SSI. SE levels before surgery and at low propofol level during surgery were similar but SE was significantly lower with high propofol.



Conclusions: The fluctuating propofol Ce during surgery did not significantly affect SSI. SSI and entropy provide complementary information on the level of stress and hypnosis of the subject, and may thus help balancing the hypnotic and antinociceptive medication.
References:
1 Huiku MT, Kymäläinen MK, Uutela KH, et al. Anesthesiology 2005; 103: A67.
2 Viertiö-Oja H, Maja V, Särkelä M, et al. Acta Anaesthesiol Scand 2004; 48: 154–161.

A-91

Surgical Stress Index as a measure of analgesia during general anaesthesia

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Background and Goal of Study: Analgesia is an essential part of balanced anaesthesia. So far there has not been any direct monitoring method for analgesia during general anaesthesia. The goal of this study was to assess the performance of a new Surgical Stress Index (SSI) (GE Healthcare, Helsinki, Finland).
Materials and Methods: A prospective, randomised, single-blinded study was conducted. Patients scheduled to elective shoulder surgery were included after IRB approval. After premedication, patients were randomly allocated into two groups: interscalenic plexus block was applied either pre- or postoperatively. Anaesthesia was induced with propofol, alfentanil, and rocuronium and maintained with desflurane in oxygen in air. Alfentanil boluses were given according to the study protocol in response to increased

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blood pressure and/or heart rate, patient movement or coughing. In both groups, the target level of State Entropy was 50 (1). Electrocardiography, pletysmography, and EEG waveforms were collected, and SSI values were calculated off-line (2). Mann-Whitney-test was used for statistical evaluation.

Results and Discussions: 30 ASA 1–3 patients, aged 25–67 years were studied. Patients with preoperative plexus block needed significantly less alfentanil than patients with postoperative plexus ($p < 0.0005$). SSI values were significantly higher in postoperative plexus group during skin incision than in preoperative plexus group ($p < 0.005$).

Conclusion(s): In this study, SSI values were significantly lower in the group in which nociceptive signals were blocked with interscalenic plexus block. SSI seems to be a promising way to monitor nociception-antinociception balance during general anaesthesia.

References:

1 Vakkuri A, Yli-Hankala A, Talja P, et al. Acta Anesthesiol Scand 2004; 48: 145–53.
2 Huiku MT, Kymalainen MK, Uutela KH, et al. Anesthesiology 2005; 103: A67.

A-92

Surgical Stress Index and epidural analgesia

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Background and Goal of Study: Surgical Stress Index (SSI), utilizing heart rate and finger photoplethysmography, is a recently introduced method for measuring haemodynamic reactions to surgical stress in general anaesthesia in a scale of 0 to 100, high values indicating inadequate anti-nociceptive state (1). We hypothesized that epidural ropivacaine given before surgery might decrease intraoperative SSI values during sevoflurane-sufentanil-nitrous oxide (N_2O) anaesthesia.

Materials and Methods: In an IRB approved open, controlled trial, 30 patients scheduled for open abdominal surgery (29–66 yr, 23 females) were randomized to receive ropivacaine (37.5 mg, 10 ml) or saline (10 ml) epidurally before anaesthesia. The appearance of epidural analgesia was verified with loss of cold sensitivity before anaesthetic induction. Anaesthesia was induced with propofol (2–3 mg kg^{-1}), fentanyl (1 mcg kg^{-1}), and cis-atracurium, and maintained with sevoflurane, sufentanil target controlled infusion (0.25 ng ml^{-1}) and N_2O (67%). Sevoflurane was given to maintain stable haemodynamics and to keep Entropy™ at 50. SSI was calculated off-line.

Results: SSI data (mean ± SD) are shown in Table. End-tidal sevoflurane concentrations (mean ± SD) for ropivacaine and saline groups, respectively, were 0.67 ± 0.34 and 1.00 ± 0.33% ($P = 0.565$).

Table. SSI before and after skin incision (Inc.) and 20 min after incision (Surgery).

	Before Inc.	After Inc.	Surgery
Ropivacaine	22 ± 11.9	29 ± 14.4	47.5 ± 15.0
Saline	20 ± 15.9	47 ± 14.1	50 ± 14.8
P	0.890	0.023	0.345

Conclusion: SSI is sensitive to ropivacaine mediated epidural antinociception after skin incision, but this sensitivity disappears within 20 min. Further studies are required to elucidate whether this is due to the rather strong adaptivity of the preliminary SSI algorithm version used, or merely an indication of adequate analgesia by sevoflurane, sufentanil, and N_2O.

Reference:

1 Huiku M, Kymäläinen M, Uutela K et al. Anesthesiology 2005; 103: A67.

A-93

Effects of spinal anesthesia on heart rate variability and baroreflex sensitivity using a new analytical method

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Background and Goal of Study: We studied heart rate variability (HRV) and baroreflex sensitivity (BRS) using a new monitoring system in order to elucidate how spinal anesthesia affect heart rate (HR), mean blood pressure (MBP) and stroke index (SI) through the autonomic nervous system (ANS).

Materials and Methods: We studied 15 patients before and 5, 15, 30 min after spinal anesthesia (0.5% bupivacaine). The Task Force Monitor (CNS systems, Graz, Austria) provides non-invasive beat-to-beat blood pressure, stroke volume by the Impedance Cardiography (ICG), numbers for low frequency (LF) and high frequency (HF) by the maximum entropy method, and slope mean (BRS slope).

Results and Discussions: Data (Mean ± SD) are shown in the Table:

	Before	5 min	15 min	30 min
HR	76.3 ± 12.1	80.4 ± 9.1	78.6 ± 12.4	74.5 ± 10.3
MBP	103.8 ± 13.9	87.1 ± 16.0	86.4 ± 18.6*	83.0 ± 18.2*
SI	42.1 ± 7.2	43.0 ± 8.8	40.8 ± 9.3	37.9 ± 9.0
HF	106.7 ± 97.9	115.0 ± 116.3	117.3 ± 128.7	142.0 ± 131.0
LF/HF	2.1 ± 1.3	2.0 ± 1.7	1.5 ± 0.8	1.3 ± 1.1
Slope mean	9.5 ± 3.3	10.4 ± 5.3	11.6 ± 5.8	12.1 ± 5.6

*$p < 0.05$ vs. before.

Although sympathetic blocking of the lower body decreased MBP, slope mean indicated by BRS did not change. Spinal anesthesia was shown to tend to suppress sympathetic activity and increase parasympathetic activity. Therefore, this may suggest that spinal anesthesia blocks the cardiac branch of sympathetic nerve.

Conclusion(s): Spinal anesthesia maintained baroreflex mechanism, but may block the cardiac branch of sympathetic nerve.

Reference:

1 Fortin J. Compt Biol Med 2005; 27: in print.

A-94

Measurement of vegetative stress by continuous wavelet transformation of the heart rate in patients undergoing major abdominal surgery with and without thoracic epidural anaesthesia

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Background and Goal of Study: Standard monitoring parameters reflect haemodynamic and peripheral perfusion but not real-time activity of the autonomic nervous system (ANS). Patients with concomitant cardiac disease are in particular endangered by vegetative stress [1]. We describe a novel method for on-line assessment of ANS function and early detection of vegetative stress [2].

Materials and Methods: After ethic board review and written informed consent we studied 12 patients (7 male, 5 female), aged 55.3 ± 10.4 years (mean ± SD) (weight 71.8 ± 16.0 kg, height 174.0 ± 8.1 cm) undergoing major abdominal surgery. In all subjects a thoracic epidural catheter (Th 5–7) was inserted and general anaesthesia was maintained with nitrous oxide and up to 1 MAC desflurane, supplemented with remifentanil if needed to adapt depth of anaesthesia to a Narcotrend stage Kugler D1–D2. Subjects were randomly allocated to receive epidural ropivacaine 0.5% + 1 μg/ml sufentanil or saline prior to incision and repeatedly every 60 min. Complex continuous wavelet transformation was performed to calculate power spectral density in three frequency bands (high freq. (HF): 0.14...0.4 Hz; low freq. (LF): 0.07...0.14 Hz; very low freq. (VLF): 0.05...0.07 Hz). Median VLF, LF and HF spectral power was fitted in a linear model with epidural ropivacaine concentration and mean remifentanil dosage as independent variables.

Results and Discussions: Patient characteristics did not differ between the groups. Heart rate variability in all frequency bands was less in the ropivacaine group as compared to the placebo group (VLF 0.12 vs. 0.21; LF: 0.27 vs. 0.48; HF 1.6 vs. 3.4 s^{-2} Hz). After adjustment for mean remifentanil dosage both epidural ropivacaine ($p < 0.01$) and intravenous remifentanil ($p < 0.05$) had a significant effect on LF spectral energy.

Conclusion(s): Complex continuous wavelet transformation of the heart rate reflects ANS activity as well as cardiac sympathectomy by neuraxial blockade. Therefore, significant vegetative stress may be detected early, thus, permitting in-time interventions to prevent cardiac incidents.

References:

1 La Rovere MT et al. *Lancet* 1998.
2 Heller, Burghardt *patent pending* DE102005007963.6.

A-95

Tetanic stimulus of the ulnar nerve as a predictor of heart rate response to skin incision in propofol–remifentanil anaesthesia

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Background and Goal of Study: For research of intraoperative nociception related phenomena, a minimally invasive, repeatable test that simulates surgical stimuli is needed. In this purpose, finger photoplethysmography has

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been evaluated (1). We hypothesized that 30 sec lasting tetanic stimulus of ulnar nerve might elicit heart rate changes comparable to skin incision in anaesthetized patients.

Materials and Methods: In an IRB approved open, controlled trial, 33 patients scheduled for open abdominal surgery (18–64 yr, 11 males) were randomized to receive remifentanil at three target controlled infusion levels: 1, 3 or 5 ng/ml during tracheal intubation, tetanic test and skin incision. Anaesthesia was adjusted with propofol to maintain Spectral Entropy™ level between 35 and 60, targeted at 50 (propofol effect-site concentration (Ce) 4.33 ± 0.64 mcg/ml). Each patient received three stimuli: a short (5 sec) and a long lasting (30 sec) tetanic stimulus (50 mA, 50 Hz) and skin incision. The order of the tetanic stimuli was randomized. Remifentanil Ce was kept constant throughout the testing period. RR-intervals of electrocardiogram before the tetanic stimuli and the skin incision were compared to those after the stimuli.

Results: Length of tetanic stimulus had a significant impact on the RRI response at remifentanil level of 1 ng/ml. Post/pre RRI ratios were 0.88 ± 0.08 (mean ± SD), 0.83 ± 0.09, and 0.82 ± 0.11 for 5 and 30 sec tetanic stimuli, and skin incision, respectively ($P < 0.01$ between 5 sec and others; $P = 0.469$ between 30 sec and skin incision). Strong correlation was seen between RRI response to 30 sec tetanic stimulus and skin incision ($r = 0.950$, $P < 0.001$). At 3 and 5 ng/ml remifentanil levels all stimuli types were associated with similar, very small RRI responses.

Conclusions: A 30 sec tetanic stimulus elicited similar RRI changes as skin incision at remifentanil Ce of 1 ng/ml, while 5 sec stimulus did not. RRI response to 30 sec tetanic stimulus predicted the RRI response recorded after skin incision. However, with higher remifentanil concentrations RRI remained unresponsive to short or long tetanic stimuli, as well as to skin incision.

Reference:

1 Luginbühl M et al. BJA 2002; 89: 389–397.

A-96

The relationship of INVOS cerebral oximeter (rSO_2) and postoperative cognition function of patients under isoflurane or sevoflurane combined intravenous anesthesia

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Background and Goal of Study: To discuss the relationship of perioperative INVOS cerebral oximeter (rSO_2) and postoperative cognition function alteration of patients under Isoflurane or sevoflurane combined intravenous anesthesia.

Materials and Methods: Sixty ASA I~II patients, aged >60 yrs were enrolled in the study. Anesthesia was induced with intravenous propofol, fentanyl and muscle relaxant vecuronium, maintained with inhalational anesthesia cerebral oximeter (rSO_2) of introperation was recorded at average expired end-tidal concentrations: 1.0 MAC. The Mini-Mental State Examination (MMSE) was used to access cognitive function before and after surgery.

Results and Discussions: The critical values of rSO_2 at which patients' cognitive function was shortly impaired in Isoflurane groups: Illiterate: 45, Grade school: 47, Middle school or over: 49, patients in Sevoflurane groups: Illiterate: 47, Grade school: 48 Middle school or over: 50.

Conclusion(s): The perioperative cerebral oximeter values of patients should be controlled over 50 to reduce the possibilities of patients'cognitive function impairment in postoperative periods.

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A-97

Cerebral oximetry changes during shunting in carotid endarterectomy

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Goal of Study: To assess the cerebral oximetry changes during carotid endarterectomy where a shunt was used.

Materials and Methods: After board approval and informed consent 30 patients, ASA 2–3, aged 63–82 yr, scheduled to undergo elective carotid endarterectomy were included in our study. Anaesthesia was induced with propofol, fentanyl and cisatrcurium and was maintained with sevoflurane, remifentanil infusion and cisatracurium infusion. Monitoring included invasive arterial pressure, NIBP, ECG, pulse oximertry, capnography, and cerebral oximetry (INVOS 4100, Somanetics USA). Vital signs and cerebral oximetry values for the ipsilateral (IpsiL) and contralateral (ContL) hemispheres to the endarterectomy were recorded every 10 sec. We noted the regional oximetry values (rSO_2) of the ipsilateral and the contralateral hemispheres before induction (T_0) after the carotid cross clamping (CCC) (T_1) and after the shunt placement (T_2). Statistical analysis included one-way ANOVA by using Levene statistic as homogeneity of variance and Scheffe correction.

Results: They are shown in the Table. Values of regional cerebral oximetry (rSO_2) are expressed as mean (SE).

	T_0	T_1	T_2	p
IpsiL	62 (1.6)	50 (1.6)	57.3(1.7)	<0.01
ContL	62 (1.4)	58 (1.2)	59 (1.3)	NSS

NSS: non statistical significance.

Conclusion: The use of cerebral oximetry revealed that there was a significant decline of the ipsilateral rSO_2 values during the CCC and then a significant rise after the shunt placement.

A-98

Effect of carbon dioxide pneumoperitoneum on regional cerebral oxygen saturation during laparoscopic surgery in Trendelemburg position

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Background and Goals: We evaluated the effects of carbon dioxide (CO_2) pneumoperitoneum on regional cerebral oxygen saturation (rSO_2) during laparoscopic surgery with the patient in Trendelemburg position.

Material and Methods: We studied 10 patients (aged 55–74) scheduled for laparoscopic surgery for nephrectomy or sigmoidectomy in the head-down position (30°) and ventilated to a baseline end-tidal CO_2 (P_{ETCO_2}) between 25–33 mmHg. rSO_2 was measured by near-infrared spectroscopy with the cerebral oximeter INVOS 4100. rSO_2, central venous pressure (CVP), peak pressure in airway (PP), and P_{ETCO_2} were recorded at 5 time points: before Trendelemburg (B), during Trendelemburg (T), pneumoperitoneum (P), surgery (S), and after desufflation of CO_2 (D).

Results: Mean (SD) are shown in the Table.

	B	T	P	S	D
rSO_2	63 ± 4	59 ± 3*	58 ± 3*	60 ± 6	64 ± 7
CVP	10 ± 3	17 ± 2*	20 ± 3*	17 ± 2*	13 ± 2
PP	21 ± 2	24 ± 2	29 ± 3	27 ± 3	22 ± 1
P_{ETCO_2}	26 ± 3	26 ± 2	31 ± 3*	32 ± 3*	30 ± 2*

* = $P < 0.05$ *vs* baseline value.

Conclusion: We have demonstrated that insufflation of CO_2 in patient with head-down position for laparoscopic surgery causes significant decreases in rSO_2, but without clinical relevance. Also, significant increases in P_{ETCO_2}, central venous pressure, and peak pressure in airway were observed.

A-99

Entropy and analgesic requirement during thyroid surgery

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Background: Calculation of spectral entropy is derived from electroencephalogram analysis. It is characterized by: 1) state entropy (SE) in which the frequency analysis is similar to bispectral index (BIS) and 2) response entropy (RE) with higher frequency analysis including muscular activity. RE and the difference between RE and SE (RE-SE) are therefore supposed to estimate analgesic compound of anaesthesia. This randomized double blinded controlled study was conducted to evaluate RE and RE-SE during nociceptive stimulation in patients having thyroid surgery under general anaesthesia with or without bilateral superficial cervical plexus block (BSCPB).

Materials and Methods: After ethical committee approval, 57 patients undergoing thyroidectomy were included. BSCPB was performed just after anaesthesia induction. Patients were randomized to receive on both sides 10 ml of saline solution (S) or ropivacaine 0.487% plus clonidine 50 microg (R). Intraoperative administration of sufentanil was done for a 20% increase in mean arterial pressure and/or heart rate while BIS value was maintained between 40 and 60 with sevoflurane (sevo). SE and RE were measured by M-entropy module. Sufentanil consumption, parameters were assessed

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every 5 minutes and during nociceptive stimulation at induction, incision, surgical traction, thyroid removal and extubation.
Results and Discussions: Although end-tidal sevo concentration was similar in both groups, intraoperative sufentanil consumption was significantly lower in R (29.6 ± 12.3 [mean ± SD] microg) than in S (43.1 ± 18.3 microg, p = 0.002, Mann Whitney test). BIS, RE and SE had a strict similar parallel evolution during surgery. No difference was observed between the two groups for RE (figure) and RE-SE during nociceptive stimulation.

RE value	Group S	Group R
Induction	95.0 ± 10.7	95.2 ± 4.0
Incision	46.7 ± 16.1	46.4 ± 12.8
Surgical traction	41.6 ± 15.7	41.6 ± 9.8
Thyroid removal	39.6 ± 10.4	40.9 ± 11.2
Extubation	90.0 ± 11.5	87.1 ± 16.6

Conclusion: In patient operated for thyroidectomy with or without efficient BSCBP, RE and RE-SE did not predict analgesic requirement. Entropy does not seem to help for the monitoring of intraoperative analgesia.

A-100

Individual titration of effect site remifentanil concentration for skin incision using pupil reflex dilation

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Background and Goal of Study: Pupil reflex dilation in response to noxious stimulation (PRD) is in relationship to brain evoked potentials and pain reported in awake patient (1). It is a more sensitive measure of noxious stimulation than BP and HR during general anaesthesia (2) and is a better measurement of the progressive increase of remifentanil (remi) effect site concentration (Ce) up to 5 ng/ml than haemodynamic (HD) or BIS measurements (3). Could abolition of PRD be used during TCI anesthesia for individual titration of remi requirement for skin incision?
Materials and Methods: PRD after two 10 seconds tetanic electrical stimuli (Tet) (80 mA, 100 Hz) were measured with an infrared video camera connected to a personal computer (Videoalgésigraphe, Synapsys, France). After approval by our institution Ethics Committee, twelve patients were anaesthetized with propofol and remi using a Ce TCI system (itb95). After laryngeal mask insertion, Ce of propofol was adjusted to maintain Bispectral index (BIS) at 50 ± 10. Remifentanil was increased by steps of 1 ng/ml every 5 mn, until obtaining abolition of PRD (dilatation less than 30%) and then maintained at this Ce (named Ca) for skin incision. BIS, heart rate (HR), systolic arterial blood pressure (SAP, mmHg) and PRD (mm^2) were recorded at each step before and after tet (BefTet, AftTet), before and after incision (BefInc, AftInc).
Results and Discussions: Each Bef vs Aft statist. nonSign.

Time	CaBefTet	CaAftTet	CaBefInc	CaAftInc
BIS	42 ± 7	48 ± 11	45 ± 7	49 ± 7
PRD*	+16% ± 7		+11% ± 10	
Ce prop	2.1 ± 0.6 (ug/ml)		1.82 ± 0.3 (ug/ml)	
HR mn^{-1}	57.8 ± 5.7	58.3 ± 6	54 ± 8	55 ± 6
SAP	99.1 ± 16	100 ± 15.5	98 ± 15	101 ± 15

*% change in surface after Tet and skin incision.

With constant BIS, Ca range was between 3 and 8 ng/ml. Under propofol anesthesia, when abolition of PRD to tetanic stimuli was obtained, nor BIS, nor haemodynamic parameters (HD) changed with skin incision.
Conclusion: Pupil reflex dilation in response to tetanic stimuli (80 mA) allows individual titration of Ce remi requirements for BIS and HD stability after skin incision.
References:
1 Chapman C et al, Psychophysiology, 1999, 36: 44–52.
2 Larson M et al, Anesth Analg, 1993, 76: 1072–8.
3 Barvais L et al, BJA, 2003, 91(3): 347–52.

A-103

Brain function monitoring during off pump cardiac surgery: the effect of cardiac output on cerebral perfusion in a patient with severe extracranial vascular disease

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Background and Goal of Study: Somatosensory evoked potential (sep) monitoring has been shown to be sensitive for detecting cerebral ischemia and represent an alternative to near infrared spectroscopy, transcranial doppler and to eeg for intraoperative brain monitoring. This report focuses on cerebral neurophysiologic modifications related to a reduced cardiac index and how to manage cerebral ischemia.
Materials and Methods: A patient with occluded internal right carotid and left vertebral artery and a 50% stenosis of left internal carotid artery, poor controlled hypertension, diabete mellitus, instable angina, underwent to a continuous intraoperatively monitoring with bilateral sep from median nerve stimulation.
Results and Discussions: The cardiac index noticeably decrease during the anastomosis on the obtuse marginal and circonflex coronary arteries because the heart was displaced; the right sep suddenly disappeared and the patient became anisocoric, right > left. The right sep reappeared after 10 minutes because the blood pressure was increased with norepinephrine injection; during this time the volemia was also increase with packed red cells and the brain metabolism was reduced doubling the minimum alveolar concentration of isoflurane.

	Post anaesthesia induction		Heart enucleation		"Anaestesiologist reaction"		End surgery	
	Right	Left	Right	Left	Right	Left	Right	Left
N_2O/P25 latency (msec)	22.67	23.83	–	25.54 ± 0.08	23.86 ± 0.13	25.52 ± 0.08	25.15	23.35
N_2O/P25 amplitude (uV)	1.922 ± 0.09	2.51 ± 0.13	0.02	1.83 ± 0.007	1.03 ± 0.3	2 ± 0.04	1.67 ± 0.03	1.68 ± 0.01
CF (pulse/min)	80		60		65		65	
SAP (mmHg)	135		130		173		146	
MAP (mmHg)	84		91		114		95	
DAP (mmHg)	58		70		76		67	
CVP (mmHg)	18		24		27		18	
"CPP" (mmHg)	66		67		87		77	
CI (l/min/m^1)	2.9		1.8		1.8		2.6	
SVRI (dyn.sec. m^1/cm^5)	1820		2977		3866		2369	
$PaCO_2$ (mmHg)	38		39		40		40.5	
SaO_2 (mmHg)	100		100		100		100	
Hb (g/dl)	10		10		12		12	
T (°C)	36.2		35		34.8		35	
Norephi (mcg/Kg/h)	–		–		0.08		–	
Volume load					500 ml coll. +2 blood U.			
MAC (Et isoflurane)	0.7		0.7		1.4		1	

The patient didn't develop perioperative neurological complications and was discharged at home after sixth day.
Conclusions: The low cardiac index produced by the heart enucleation predispose patients, at high risk for stroke, to a reduction of the cerebral blood flow and brain ischemia. Intraoperative sep monitoring seems to provide valuable information regarding the functional status of brain early enough to reverse the effects of ischemia and restore normal cerebral function.
Reference:
1 Ueno T. Jpn J Thorac Cardiovasc Surg. 2005 Mar; 53(3):1.

A-104

Monitoring of cerebral perfusion during carotid endarterectomy

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Background and Goal of Study: The goal of the study was to prove intraoperative monitoring of brain blood perfusion by cerebral oximeter during carotid endarterectomy to prevent cerebral ischemia. Cerebral oximeter is a device that uses near-infrared spectroscopy to measure changes in the balance between oxygen supply and demand within a sample of blood in the cerebral cortex (Regional Oxygen Saturation, rSO_2). Normal cerebral rSO_2 values range from 55% to 75% in the majority of the population. Studies have shown that rSO_2 values below 50% for long periods of time and below 40% for short periods of time or changes of more than 20% from baseline, are associated with an increased incidence of neurological complication.
Materials and Methods: For intraoperative cerebral ischemia, hypoperfusion, and cerebral emboli monitoring during carotid endarterectomy was used neurological assessment and cerebral oximeter. The t-test was used for statistical analysis.
Results and Discussions: We examined 50 Czech subjects (Caucasians; 16 women and 34 men). Regional anesthesia was used (superficial and deep cervical plexus block). 25% of patients within a period of carotid clamping fallen unconscious with necessity of shunt insertion. Cerebral rSO_2 values decreased on average of 18% from baseline, and it always preceded neurological complications ($p < 0.001$). 19% of patients during a period of carotid clamping minor neurological complications. Cerebral rSO_2 values decreased on average of 10%, and it always preceded neurological complications ($p < 0.001$).

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Conclusion(s): Cerebral perfusion monitoring during carotid surgery is necessary for prevention of neurological complications. Our results show that cerebral oximeter is more sensitive than conventional neurological assessment. This method is also more comfortable for patients because it makes possible to use analgosedation in anxious patients during regional anesthesia and is very reliable for cerebral perfusion monitoring during general anesthesia too.

A-105

Cerebral oxymetry monitoring after carotid endarterectomy or stenting

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Background and Goal of Study: Hyperperfusion syndrome (HP) is a rare but potentially grave complication after carotid endarterectomy (CEA) or stenting (CS) (1). Intraoperative regional cerebral oxygen saturation (rSO_2) monitoring can identify patients at risk for HP after CEA (2). The goal of this study was to determine whether intra or postoperative changes in rSO_2 could help to identify patients at risk for HP after CEA or CS.
Methods: 42 patients scheduled for elective severe carotid stenosis repair were studied; 24 underwent CEA and 18 CS. Bilateral rSO_2, mean arterial blood pressure (MAP) and periferal oxygen saturation (SpO_2) were continuously monitored intraoperatively, at arrival to postanesthesia care unit (PACU) and 12 hours postoperatively. All patients underwent strict control of postoperative blood pressure. Changes in rSO_2 (ΔrSO_2) were calculated between T1 (basal awake), T2 (after declamping), T3 (PACU arrival), 1, 6 and 12 hours postoperatively (T4−T6) and PACU discharge (T7). Changes in MAP and SpO_2 were also recorded, as well as the postoperative incidence of cephalea, seizures or neurological events. Repeated measures ANOVA with post-hoc test and Pearson's correlation coefficient were used for statistical analysis.
Results: One patient had to be excluded because of intraoperative angina. From the remaining 41 patients (30 M, 11 W, mean age 73 $\pm$ 10 years, 55–92), 11 (27%) had contralateral severe ICA stenosis. None of the patients had adverse neurological outcome. No significant changes in ΔrSO_2 were observed; however, patients with severe contralateral stenosis showed significant changes in ΔrSO_2 between T2–T3, T2–T4 and T2-T5. A positive correlation betweeen rSO_2 and MAP for ipsilateral ICA ($r_2 = 0.244$, $p < 0.001$) was found.
Conclusions: This study did not show significant changes in rSO_2 immediately after repairing the carotid circulation or in the immediate postoperative period relative to preoperative values. Nevertheless none of the patients had symptoms of HP to be identified by cerebral oxymetry.
References:

1 van Mook, Rennenberg RJ, Schuring GW. Lancet Neurol. 2005; 4:877–88.
2 Ogasawara K et al. Neurosurgery. 2003; 53:309–315.

A-106

Comparison of CSM and BIS monitoring during EUS of upper gastrointestinal tract

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Background and Goal of Study: The aim of this study was to compare the performance of CSM and BIS during induction of and emergence from propofol-induced anaesthesia in patients undergoing upper gastrointestinal tract Endoscopic Ultrasonography (EUS).
Materials and Methods: 52 patients, ASA physical status $\leqslant 3$, scheduled for upper gastrointestinal tract EUS were investigated. Anesthesia was performed using a target-controlled infusion for administering propofol. Initially, a target plasma concentration of 4 mcg/ml was chosen; after introducing the ultra sound probe the target was modified by the anesthesiologist if the sedation was not considered adequate. BIS and CSM index values were automatically recorded at intervals of 5 s during the procedure. The time of start of TCI, loss of verbal contact, loss of eyelash reflex, introduction of the ultrasound probe, stop of TCI, spontaneous opening of eyes and regain of verbal contact were recorded, together with the calculated plasma and effect site propofol concentrations. In order to detect a significant difference between the distribution values of these two indicators of anaesthesia depth we calculated a sample size of 49 patients.
Results and Discussions: Good correlation between BIS and CSM was found by linear regression analysis. Performance prediction was assessed using the Pk value at each clinical marker. We found prediction probability during induction of hypnosis to be better for BIS than for CSM for both loss of consciousness and loss of eyelash reflex. Both methods had a similar performance in predicting the events which marked emergence from anaesthesia. Pk for eyes opening was 0.93 for CSM and 0.94 for BIS, and it reached 0.98 for both techniques in predicting the ability to answer a complex question.
Conclusion(s): BIS monitoring shows a greater prediction probability during induction of hypnosis. CSM and BIS have the same prediction probability during emergence of sedation.

A-107

Time delay of EEG index calculation: analysis of Narcotrend, Bispectral and Cerebral State Index using recorded EEG signals

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Background and Goal of Study: Monitoring of anesthetic depth with EEG derived parameters may detect awareness and thereby help to decrease the incidence of awareness. All currently available indices need some time to react to a change in the state of consciousness. The exact amount of time is unknown. In a previous study using artificial EEG signals (1), we found considerable latencies for the Bispectral Index (BIS), the Cerebral State Index (CSI) and the Narcotrend Index (NCT). The aim of this study was to evaluate our experimental results with recorded EEG signals.
Materials and Methods: From a patient database, recorded EEG signals were identified which generated constant BIS, CSI and Narcotrend Index values, indicating "awake", "general anesthesia" and "deep anesthesia" (total suppression of cortical activity). After a switch from one simulated state of consciousness to another, the time necessary for all indices to adjust the displayed index was recorded.
Results and Discussions: The results were comparable to the ones obtained using artificial EEG signals. The indices showed latencies between 25 and 180 sec. before the new state was indicated. Again, latencies for display of new index values were different between ascending and descending values.

Change in Input Signal		Time to new index (s)		
From	To	BIS	NCT	CSI
Deep anes	General anes	60	60	50
General anes	Awake	20	145	34
Awake	General anes	70	25	26
General anes	Deep anes	60	75	50
Deep anes	Awake	65	180	48
Awake	Deep anes	70	60	46

Conclusions: Our results indicate a limitation for the use of the tested monitors in prevention of recall of intra-operative events and for pharmacodynamic studies.
Reference:

1 Pilge et al. Anesthesiology, in press.

A-108

Depth of anaesthesia and the seizure time after electroconvulsive therapy

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Background and Goal of Study: Electroconvulsive therapy (ECT) is a possible treatment of endogenous depression. The success correlated with the duration of seizure activity. This study was designed to investigate the influence of depth of anaesthesia on seizure duration.
Methods: With IRB approval and written informed consent, 5 adult patients scheduled to undergo multiple ECT were studied. The patients were randomised to receive a propofol TCI effect compartment concentration (Diprifusor, AstraZeneca, Germany) during ECT of 3.5, 4.0 or 4.5 $\mu g\,ml^{-1}$. The EEG was recorded continuously using an Aspect A-2000 BIS monitor (version XP) and the Narcotrend monitor (version 4.0). Before 1 $mg\,kg^{-1}$ succinylcholine was administered a tourniquet applied to the upper arm was inflated to isolate the circulation to the arm and permit the assessment of motor seizure activity. The electroshock stimulus was delivered unilaterally to the nondominant cerebral hemisphere using an ECT stimulator (Thymatron DGx; Somatics Inc., USA). The electrodes were placed in standard frontotemporal and parietal

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positions and the energy setting ranged between 30% and 100% of 504 mC. The duration of seizure activity were calculated as the time intervals from the ECT stimulus until cessation of tonic-clonic motor activity in the isolated arm (motor seizure time; MST) and until the EEG activity was suppressed (EEG seizure time; EST). Data are mean ± SD.

Results: A total of 30 ECT procedures (10 at each propofol effect site concentration) were investigated. The patients received between 4 and 8 ECT procedures. Mean durations of both motor (18.5 ± 9.3 s) and EEG (29.9 ± 14.3 s) seizure activity were not correlated with the randomized 3 propofol effect site concentrations or with immediate pre-ECT BIS or Narcotrend index values.

	MST (sec)	EST (sec)
3.5 μg/ml	19.8 ± 11.1	31.3 ± 13.1
4.0 μg/ml	16.4 ± 7.1	27.7 ± 12.6
4.5 μg/ml	19.3 ± 9.4	30.5 ± 19.0

Conclusion: We found no correlation between depth of anaesthesia and duration of the seizure activity.

A-109

The effects of electromyographic activity on the bispectral index during combined anaesthesia

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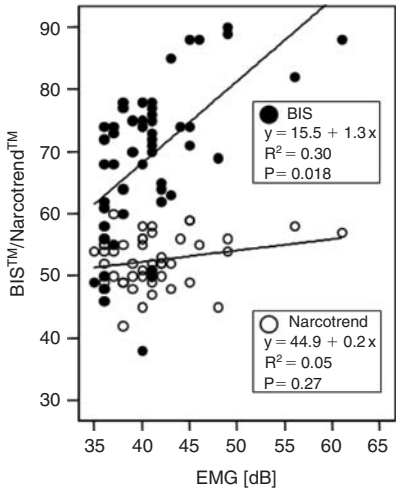
Background and Goal of Study: The bispectral index (BIS) is a monitor system designed for the assessment of anaesthetic depth. However, electromyographic activity may influence the accuracy of the assessed anaesthetic depth. We report six cases in which increases of BIS during anaesthesia did not reflect wakefulness, rather than increased neuromuscular activity.

Materials and Methods: After institutional approval patients participated in a study investigating the effects of thoracic epidural analgesia on the end-tidal desflurane requirement under combined anaesthesia. Anaesthetic depth was assessed by the PRST score, the OAA/S scale, the Narcotrend and the BIS XP.

Results and Discussions: As electromyographic activity incrementally increased in six patients as a sign of recovery from the neuromuscular blockade, the BIS value increased from a range of 40–55 to 70–80, indicating thereby an inadequate anaesthetic depth. The anaesthetic depth recorded by Narcotrend™ and the clinical signs remained unchanged. End-tidal concentration of desflurane was set to an age adapted 1 MAC. Despite that intervention, BIS value remained unchanged and patients received remifentanil intravenously without any effect on the BIS value. None of the patients reported intraoperative awareness or recall after surgery. Although the BIS XP provides an indicator for EMG activity, the new BIS XP platform fails in some occasions to assess accurately the anesthetic depth, above an electromyographic activity of 35 dB.



Conclusion(s): The BIS XP fails in some occasions to assess accurately the anesthetic depth, above an electromyographic activity of 35 dB.

References:

1 Bruhn J. Anesthesiology 2000.
2 Lanier WL, Anesthesiology 1994.

A-110

Does the Cerebral State Index differentiate between consciousness and unconsciousness – a prospective patient study

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Goal of Study: The Cerebral State Index (CSI) indicates the hypnotic component of anaesthesia. Aim of the study was to evaluate the ability of CSI to separate consciousness from unconsciousness in surgical patients with different anaesthetic regimens.

Methods: After approval from the university's ethics committee, 35 patients undergoing elective surgery were enrolled in the prospective clinical study. Patients were assigned to receive anaesthesia according to clinical standard practice: 12 patients received propofol-remifentanil (TIVA), 12 propofol-sulfentanil-sevoflurane (sevoflurane) and 11 propofol-sufentanil-isoflurane (isoflurane). During induction and emergence of anaesthesia, patients were asked every 15 seconds to squeeze the investigator's hand. Tunstall's isolated forearm technique [1] was applied during administration of neuromuscular blocking agents. Consciousness was determined as response to verbal command with either eye opening or hand squeezing. Prediction probability (P_K) [2] was calculated from CSI values 15 seconds before and 30 seconds after loss and return of consciousness.

Results: Prediction probability to separate consciousness from unconsciousness at induction and emergence were calculated for all patients and for the different types of anaesthetics respectively:

	Induction	Emergence	Both
Total	0.81	0.60	0.70
TIVA	0.81	0.68	0.74
Sevoflurane	0.89	0.62	0.72
Isoflurane	0.79	0.53	0.65

Conclusion: The data set represents clinical conditions. The short interval of 15 seconds between asking the patients to squeeze hand allows a close definition of the clinical endpoints. Thus, a P_K of 0.7 indicates a reasonable differentiation between consciousness and unconsciousness. Performance at induction was better than at emergence. Overall results were best in the TIVA group.

References:

1 Tunstall ME, BMJ 1977; 1:1321.
2 Smith WD et al., Anesthesiology 1996; 84:38–51.
3 Zhong T et al., Br J Anaesth 2005; 95(6):798–802.

A-111

Narcotrend monitoring prevents fluid overload during colonic surgery under combined anaesthesia

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Background and Goal of Study: Perioperative fluid overload is associated with increased postoperative morbidity (1). During anaesthesia hypotension may occur and is often treated by increasing i.v. volume supply. However, hypotension may be related to an inadequate anaesthetic depth as assessed by clinical signs such as the PRST score. We therefore evaluated the fluid requirement during colonic surgery to a standardized depth of anaesthesia by means of Narcotrend monitoring.

Materials and Methods: After institutional approval, 40 patients scheduled for colonic surgery under combined anaesthesia, randomly received either desflurane or sevoflurane in nitrous oxide for maintenance of general anesthesia. Intraoperative analgesia was provided by epidural ropivacaine 0.3% and 10 μg sufentanil. At 1 MAC for both volatile anaesthetics, the fluid infusion rate was adjusted in order to maintain mean arterial pressure (MAP) and heart rate (HR) ± 20% of baseline values. Central venous pressure was maintained between 5–10 mmHg. The end-tidal concentration of the volatile anaesthetics was then reduced to reach a Narcotrend stadium D1 (50–55) and fluid infusion was re-adjusted in order to maintain MAP, HR, and CVP within the above mentioned target values.

Results and Discussions: During the 1 MAC period an infusion rate of 9.7 ± 1.4 ml/kg/h of lactated Ringers' solution was necessary to maintain haemodynamics, while at Narcotrend stage D1 the infusion rate could be reduced to 5.9 ± 1.4 ml/kg/h ($p < 0.001$). The individual adjustment of the anaesthetic depth leads to a reduction in intraoperative fluid requirement, thereby minimizing the risk of intraoperative fluid overload and providing stable haemodynamics.

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Conclusion(s): In patients undergoing colonic surgery under combined anaesthesia, adjustment of anaesthetic depth by means of Narcotrend monitoring allows a reduction in the amount of intraoperative fluid supply.

Reference:

1 Brandstrup et al. Ann Surg 2003.

A-112

Narcotrend (NT) monitoring depth of anesthesia in gynaecologic surgery: a comparison with Bispectral Index (BIS)

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Background and Goal of Study: We assessed the depth of anaesthesia with NT monitoring compared to BIS monitoring.

Materials and Methods: We studied 60 ASA I–II pts undergoing elective gynecologic surgery. Premedication: atropine 0.01 mg/kg, midazolam 0.03 mg/kg i.v. Induction: TIVA with propofol 4 mcg/ml, remifentanil 0.25 mcg/kg/min, cisatracurium 0.2 mg/kg. We registered NT and BIS values (like coupled data) during 8 times (T): T1-pts: awake, T2:induction, T3:laringoscopy, T4:IOT, T5:skin incision, T6:peritoneal incision, T7:stop anesthesia, T8:eyes open.

Results and Discussions:

Table 1. Stat. analysis:

Monitor	Time registr.	Mean(*)	E. Std	−95,00%	+95,00%
BIS	T 1	90.33	0.51	89.29	91.38
	T 2	66.37	0.49	65.35	67.38
	T 3	54.17	1.07	51.97	56.36
	T 4	54.17	1.07	51.97	56.36
	T 5	46.67	0.95	44.73	48.61
	T 6	47.17	0.58	45.98	48.36
	T 7	48.17	0.51	47.13	49.21
	T 8	90.73	0.70	89.30	92.17
NT	T 1	87.27 (B0)	1.07	85.08	89.45
	T 2	50.83 (E1)	2.76	45.18	56.49
	T 3	49.63 (D1)	1.34	46.90	52.37
	T 4	49.27 (D2)	1.61	45.97	52.56
	T 5	50.27 (E1)	1.21	47.79	52.74
	T 6	51.07 (E1)	0.96	49.11	53.02
	T 7	51.00 (D1)	0.64	49.69	52.31
	T 8	88.13 (B0)	0.87	86.35	89.91

(*)M.m.q.

The results (Tab.1) (ANOVA) show that except for 2nd time, BIS score of 60–40 is correlated to NT score of D–E. There's no differences between the 2 monitoring systems during the different stages of anesthesia ($F = 1.417$; $p = 0.2438$).

Conclusion(s): BIS values between 60 and 40 are correlated with NT Index values between "D" and "E" indicating either adequate anaesthesia, without awareness.

Reference:

1 Kreuer S et al. *The Narcotrend, a new EEG monitor designed to measure the depth of anesthesia.* Anaesthesist 2001;50.

A-113

Monitoring depth of anesthesia with Bispectral Index (BIS) and Narcotrend (NT) during caesarean section

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Background and Goal of Study: Evaluating the risk of awareness and the influences on Apgar Index (A.I.), monitoring the depth of anesthesia with Bispectral Index (BIS) and Narcotrend (NT) related to the applied anesthesiologic protocol.

Materials and Methods: 40 pts primiparae, 33 ± 3 ys, A.S.A I–II, have been enrolled. Anesthesiologic protocol: induction with TPS, paralysis with cisatracurium, OTI, normocapnic ventilation in O_2/N_2 at 50% + sevoflurane 3% up to an End-tidal of 1.4 ± 0.1%, obtained in about 2 min. The monitoring was carried out as a rule. The anesthesia level has been evaluated with NT and BIS, by outlining and comparing data at induction, at I, III and then every 3 minutes until foetal extraction. The A.I. was registered at 1 and 5 min.

Results and Discussions: All the pts at induction reached with NT index between D and E corresponding to BIS values between 35 and 40, at 1 min between C and D and 40 ±10, from 3 to the extraction between C and D and 45 ± 10. The A.I. at 1 min was in media 8 ± 1, at 59 ± 1.

Conclusion(s): The anesthesiologic protocol we used revealed neither incidence of awareness not influences on foetal outcome. Furthermore we can consider reliable the monitoring with NT.

Reference:

1 Yeo et al. *BIS in assessment of adequacy of general anesthesia for lower segment caesarean section.* Anesthesia and Intensive Care, 2002 Feb,30(1):36–40.

A-114

Does pEEG monitoring predict implicit recall?

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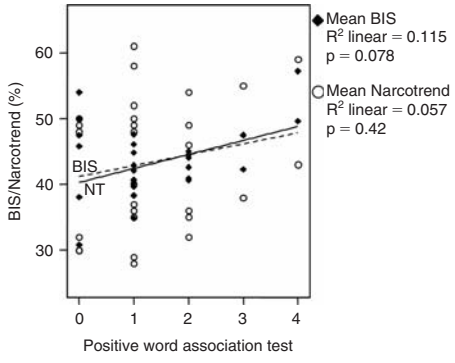
Background and Goal of Study: The BIS and Narcotrend are two evaluated monitor systems for assessment of anaesthetic depth. The present study was designed in order to evaluate the ability of these monitor systems to detect intraoperative explicit and implicit recall during major abdominal surgery under combination of thoracic epidural analgesia (TEA) and general anaesthesia (GA).

Materials and Methods: After institutional approval and written informed consent, 60 patients (ASA II–III), undergoing major abdominal surgery in combined anaesthesia, were randomly assigned to 3 groups receiving 10 ml ropivacaine 0.5% and 5 μg sufentanil, 10 ml ropivacaine 0.2% and 5 μg sufentanil and placebo 10 ml NaCl 0.9% (groups 1–3 respectively) every 60 minutes for intraoperative analgesia. Anaesthetic depth was assessed by the Narcotrend and BIS monitor systems as well as by the clinical signs measured by the PRST-score and the OAA/S-scale. After induction of GA and at a stable anaesthetic depth, patients received 20 different word associations via headphones, e.g. yellow-banana and a short story in order to detect intraoperative explicit and implicit recall. Patients were interviewed directly after surgery.

Results and Discussions: None of the patients reported explicit recall. Regarding implicit recall, positive word association test occurred at BIS and Narcotrend stages which are considered to indicate sufficient anaesthetic depth. Narcotrend values poorly correlated with the association test, whereas the BIS values showed a trend to a correlation.



Conclusion: BIS and Narcotrend monitors correlated only poorly with implicit recall after anaesthesia. However, the BIS had a better correlation but closely failed to reach significance in our trial. Therefore further investigations in a larger trial are necessary.

A-116

Comparison of a target controlled infusion system and manual infusion of propofol in routine anesthesia care

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Background and Goal of Study: Although target controlled infusion (TCI)-systems are already widely used to obtain constant plasma levels of intravenous anesthetics, there have been only a few studies comparing the efficacy of TCI in routine practice with conventional manually controlled infusion (MCI). We hypothesized that a TCI system would particularly help anesthesiologists at the beginning of their training to control depth of anesthesia and shorten recovery times due to reduced concentration variability[1].

Materials and Methods: After ethics committee approval and informed consent, 100 ASA I–III patients were randomized to either the TCI (Fresenius Base Primea, Schnider model) or MCI groups. Six anesthesiologists with less than 2 years of experience performed TCI or MCI with propofol and remifentanil. They were asked to assess depth of anesthesia subjectively at regular intervals, blinded to concomitant BIS recordings. Propofol concentrations were recalculated in the MCI group from the dosing history using STANPUMP software. Results are given as means ± SD.

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Results and Discussions: The propofol concentration in both groups was similar during surgery (3.2 ± 0.6 mg/l in the TCI group and 3.0 ± 0.7 in the MCI group), corresponding to identical (and rather low) mean BIS values of 31 for both groups. However, mean calculated propofol effect compartment concentration at the time of intubation was with 7.4 ± 2.6 mg/l significantly higher in the TCI group than in the MCI group with 6.4 ± 2.7 mg/l, with correspondingly lower BIS values. Correlation of subjective assessment of anesthetic depth with BIS values was not different in both groups, neither were the times of end of propofol infusion until return of consciousness or until extubation.

Conclusion(s): Relatively inexperienced anaesthesiologists achieved a similar time profile of propofol concentrations using a TCI system compared to conventional manually controlled infusion of propofol. Only at the time of intubation they used a higher concentration of propofol during TCI anaesthesia. The TCI system did neither alter control of anesthetic depth nor recovery times.

Reference:

1 Hu C et al. Anesthesiology 2005; 102: 639–45.

A-117

Usage of the BIS in the monitoring of the CNS reaction during neurosurgical procedures

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Background and Goal of Study: In neurosurgical procedures we must prevent haemodynamic reactions. Haemodynamic responses are the most commonly used clinical measures to judge anaesthetic depth and adjust dosage, and it may be influenced by disease, drugs and surgical techniques and interpatient variability [1–3]. This study aimed to investigate the Bispectral Index (BIS) and the effect of haemodynamic reactions during surgical operations for patients with aneurismal subarachnoid haemorrhage (SAH) and brain tumours.

Materials and Methods: The ethical committee of the hospital approved the study. 40 patients, ASA III, ageing 20–82, undergoing elective neurosurgery were randomised into two groups: I group patients with aneurismal subarachnoid haemorrhage (SAH) (n = 20), when aneurysm was preparated and temporary clipping done, II group with brain tumours (n = 20), when dura mater was opened and brain tumour evacuated, II A – with detected seizure activity (n = 10), II B without seizure activity (n = 10). Induction technique was standardised with Midazolam 5 mg, Thiopental 4 mg/kg^{-1}, Fentanyl (F) 3 μg/kg^{-1} and Atracurium 0.6 mg/kg^{-1}. Anaesthesia was maintained with Sevoflurane (Sevo) and mixture 50% O_2 in air. The concentration of Sevo was titrated to maintain BIS among 30–45 during the surgery. Fentanyl and Atracurium were added in requirement perfusion. The mean blood pressure (MAP), ECG, HR, the end tidal Sevo concentration, MAC, capnography, SpO_2 and BIS module has been developed. Cerebral perfusion pressure was maintained above 70–80 mmHg. The data were analysed with unpaired t-test and confidence interval analysis.

Results: In the I group BIS index for 40% of the patients increased from 30–45 to 60 during surgery, but without MAP and HR satisfied changes. In the II A group BIS index increased for 50% of the patients (deeply situated brain tumours) to 60, also without MAP and HR changes and than Sevo and/or F was added. In II B group BIS index was 30–45 or less without satisfied haemodynamic changes and need for hypnotics and analgesics addition.

Conclusion: Assessment of BIS in the neurosurgical procedures is very useful monitoring, because it is an earlier parameter than haemodynamic changes.

References:

1 Taha A.M.R., Hassan M. *QMJ* 2003; 12 (1): 1–4.
2 Schneider G. et al. *JNA* 2002; 14 (1): 7–11.
3 Nunes C. et al. *JNA* 2005; 17 (2): 110–114.

A-118

Relationship between bispectral index and propofol concentrations during target-controlled infusion anesthesia: a comparative study, children versus young adults

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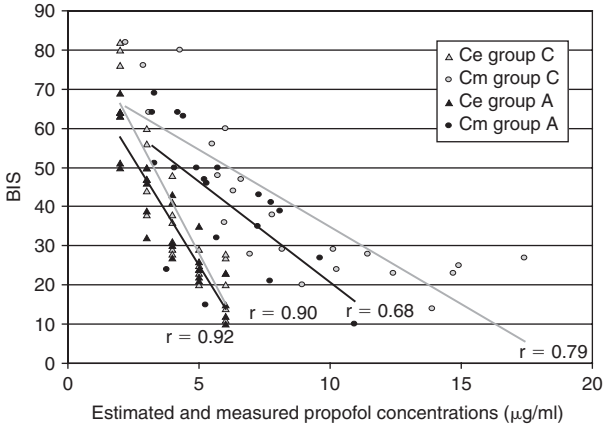
Background: In children, bispectral index (BIS) is poorly investigated under target-controlled infusion (TCI) of propofol (P). The aim of this study was to compare relationship between P concentrations and BIS in children (C) versus young adults (A) anaesthetized with TCI of P.

Materials and Methods: After IRB approval and informed consent, 26 prepubertal children (9 ± 2 yr) (group C) and 26 postpubertal subjects (20 ± 6 yr) (group A), scheduled for middle-ear surgery were included. Propofol was infused with TCI system (Alaris) using Kataria's model in C, and Schnider's model in A. TCI of P was used for standardized induction and maintenance of anaesthesia (40 < BIS < 60). After the end of surgery, 2 steady-state periods of 10 min were obtained in each subject: one corresponding to a BIS of 50, and the second corresponding to a target effect-site concentration (Ce) randomly assigned between 2 and 6 μg/ml. At the end of each period, blood P concentrations (Cm) were measured by HPLC and, Ce and BIS were recorded.

At BIS50, Ce and Cm were compared between C and A (ANOVA for repeated measures). Data at fixed Ce were used to assess relationship between BIS, Ce and Cm of P with linear regression (Staview, Abbacus) ($p < 0.05$).

Results: At BIS 50, Ce and Cm were higher in C than in A: Ce50 = 3 ± 0.7 vs 2.6 ± 0.6 μg/ml ($p < 0.05$); Cm 50 = 6.1 ± 1.8 vs 4.5 ± 0.9 μg/ml ($p < 0.01$). In both groups, BIS was highly correlated with Ce. The correlation of BIS with Cm was also significant but to a lesser degree. (Figure)



Conclusion: In children as in adults, BIS is highly correlated with P data under TCI. Our results suggest that the BIS may be useful in children receiving P anesthesia.

A-119

Preliminary results of data mining in BIS guided propofol–remifentanil TCI anaesthesia

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Background and Goal of Study: TOOLBOX is a software system which allows saving the archives of BIS guided TCI anaesthesia. The purpose of the study was to analyse TOOLBOX record files to compare how the anaesthetists titrate the hypnotic and analgesic components of a total intravenous anaesthesia technique according to the phases and types of surgery.

Materials and Methods: The archive files of 34 patients undergoing thyroid surgery and 29 patients undergoing cardiac surgery with CPB, anaesthetised with a BIS (XP2000, Aspect Medical) guided propofol–remifentanil effect site TCI anaesthesia technique (data recorded every 5 seconds) were imported in a MySQL database and analysed by the R statistical software package.

Results and Discussions:

	Thyroid before surgery	Thyroid surgery	Cardiac before surgery	Cardiac surgery
Mean Ce propofol	2.8 ± 0.9*	2.6 ± 0.5$	1.3 ± 0.6*	1.4 ± 0.4$
Mean Ce remifentail	3.1 ± 1.6	5.8 ± 1.9	2.6 ± 1.4	5.3 ± 1.7
Mean BIS	40.7 ± 15.2*	39.3 ± 8.8$	56.3 ± 14*	45.8 ± 9$
% BIS 40–60	31.6*	38.1$	48.7*	66.6$
% BIS < 40	58.6*	59.2$	10.5*	25.3$
% BIS > 60	9.8*	2.6$	40.8*	8.1$

Ce = effect site concentration; % BIS = percentage of time of BIS values within the range; Statistical difference of mean propofol Ce, mean and range of BIS values between thyroid and cardiac surgery before surgery * and during surgery $.

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Conclusion(s): When using a propofol–remifentanil effect site TCI anaesthesia technique, the analysis of the anaesthetists' behaviour shows that they administer the same remifentanil Ce target concentrations during either thyroid or cardiac surgery but targeted higher propofol Ce and tolerated lower mean BIS values in ASA 1–2 patients undergoing thyroid surgery compared to ASA 3 patients undergoing cardiac surgery.

A-120

k_{e0} values for propofol using different PK/PD data sets

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Background: Two different PK/PD models [1,2] are used for propofol computer target controlled infusion systems. The effect site concentrations are calculated with the k_{e0} value which is the first order rate constant determining the efflux from the effect compartment. We compared k_{e0} values for propofol based on Narcotrend (MonitorTechnik, Germany) or bispectral index (BIS XP, Aspect, USA) during combined epidural/general anaesthesia.
Methods: With IRB approval and written informed consent we investigated 20 patients scheduled for radical prostatectomy. After lumbar epidural catheterisation, patients received remifentanil solely for induction of anaesthesia and 30 mg $kg^{-1}h^{-1}$ propofol using an infusion system (Graseby 3400, Graseby Medical Limited, UK). After loss of consciousness the propofol infusion was reduced to 6 mg $kg^{-1}h^{-1}$, 45 min later propofol was increased to 20 mg $kg^{-1}h^{-1}$ and later decreased to 1 mg $kg^{-1}h^{-1}$. Propofol plasma and effect site concentrations were calculated with the recorded propofol infusion rates using the propofol data by Marsh [1] and Schnider [2]. Narcotrend and BIS index values were determined and their correlation with the respective propofol effect compartment concentration, obtained by simultaneous pharmacokinetic-pharmacodynamic modeling, were compared. We used a variation of the classical fractional E_{max} model with two successive sigmoidal curves. All parameters were calculated as a population fit by NONMEM V in one step by minimizing log likelihood. For testing statistical significance between the NONMEM population fits the likelihood ratio test was used.
Results: Using the respective EEG indices as a measure of drug effect the k_{e0} values were calculated as 0.247 min^{-1} (Marsh) and 0.118 min^{-1} (Schnider) for BIS and 0.284 min^{-1} (Marsh) and 0.124 min^{-1} (Schnider) for Narcotrend. The difference between the log likelihood values of the published k_{e0} values and the calculated values is 51 (Marsh), 592 (Schnider) for the BIS monitor and 26 (Marsh), 549 (Schnider) for the Narcotrend.
Conclusion: The calculated k_{e0} values differ substantially between the two PK/PD data sets and from the published values.
References:
1 Br J Anaesth 1991; 67: 41–8.
2 Anesthesiology 1998; 88: 1170–82.

A-121

Awareness case during surgery and general anesthesia with BIS above 60 for only one minute and never above 71

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Background and Goal of Study: It is accepted that awareness may occur if BIS is above 60. However, the sensitivity of BIS to detect awareness is not known. We report a case of awareness in which BIS was over 60 only briefly.
Case Report: A 40 year-old man with hydrocephalus presented for ventricle-peritoneal shunt placement. His speech and movements were slower than normal, but the GCS was 15 and there were no focal deficits. Anesthesia was with propofol and remifentanil (Remi) by TCI. Rocuronium was given and tracheal intubation and mechanical ventilation were performed. Non-invasive monitoring and BIS were used. Rugloop software was used to drive the TCI infusions and to collect data every 5 s from Datex AS3 and A2000XP (BIS). For incision Remi predicted effect concentration was increased to 3 ng/ml. A rise in HR and BP occurred and Remi was increased again. BIS was noted to rise over 60 briefly at several moments, but it returned to values below 60 without the need of specific action. Following extubation, the patient spontaneously said that he had felt the surgeons operating on the head and abdomen, that there was no pain, but that he could not speak. This report was consistent in several interviews.
Results and Discussions: Data collected during the case were analyzed. The number of 5-second periods in which BIS was above 60 were counted and the maximum BIS in each period was noted. Before incision there were 6 periods of BIS above 60 (only one with BIS above 65), lasting a total of 85 seconds. Following incision there were 3 periods, lasting in total 55 seconds. These periods occurred over 5.3 minutes. Maximum BIS in each was: 70, 63 and 62. Two months following surgery, the patient was interviewed by a neuropsychologist: there was no evidence of post-traumatic stress syndrome.
Conclusion(s): This case shows that awareness may occur even if BIS is between 60 and 70 for a period of less than one minute. There is data suggesting that BIS should be kept between 45 and 60. When trying to keep BIS within these limits, it is likely that BIS may go over 60, even if only briefly. This is compatible with awareness.

A-122

Survey on awareness monitoring during anaesthesia between spanish anaesthesiologists

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[1,2]Department of Anesthesiology, Hospital Clínic i Provincial, Barcelona, Spain; [3]Hospital Santa Creu i Sant Pau, Barcelona; [4]Hospital Marqués de Valdecilla, Santander

Background and Goal of Study: Awareness during anaesthesia is a serious adverse event, which can produce psychological consequences to the patients[1]. Its incidence has been estimated around 0.13% in the general surgical population, although it can be significantly reduced by using proper monitoring[2]. The goal of this study was to assess the relevance of this problem amongst anaesthesiologists in Spain.
Materials and Methods: A survey with 21 questions about routine practice of anaesthesia was designed. All anaesthesiologists attending the 2005 Meeting of the "Sociedad Española de Anestesiología, Reanimación y Terapéutica del Dolor (SEDAR)" were given the questionnaire. The answers to the survey were analysed and the results are presented.
Results and Discussion: 473 anaesthesiologists, representing the 31% of anaesthesiologists registered for the meeting, completed the survey. General anaesthesia was preferred by 51.3%. Drugs for induction and maintenance of anaesthesia were mostly propofol (77% and 21% respectively) or sevoflurane (12.1% and 70.6% respectively) plus opioids (84%) and neuromuscular blocking agents (NMBA) (81%). Awareness was rated as of great concern for the surveyed anaesthesiologists (4.5 $\pm$ 0.8 in a scale from 1 to 5). 221 (46.7%) answered that some of their patients underwent awareness. To prevent awareness in their routine practice 37.1% used a monitor of hypnosis (BIS®: 31.2%; Entropy: 4.4%); 31% monitored the haemodynamic parameters and 24.5% the end-tidal inhalatory anaesthetic. 77% answered that they would always use a depth of hypnosis monitor if they were convinced about its accuracy, 15.4% only in high-risk patients and 3.8% only when using NMBA.
Conclusion: Most of the responders would use a monitor of hypnosis if available. Almost 50% of them stated that some of their patients had experienced awareness (similar results as an Australian survey[3]).
References:
1 Sebel PS et al. Anesth Analg. 2004; 99:833–9.
2 Ekman A et al. Acta Anaesth Scand. 2004; 48:20–26.
3 Myles PS et al. Anaesthesia 2003;58:11–16.

A-123

Prediction of awareness reaction to LMA-Fastrach insertion and intubation with bispectral index

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Background an Goal of Study: This study investigates the potential of bispectral index (BIS) monitoring to predict and indicate awareness reaction to LMA-Fastrach insertion without muscle relaxant and intubation with the muscle relaxation at the BIS values of 40 to 65 (1).
Methods: After obtaining ethics committee approval 51 patients from ASA I–II class who were over 20 years old and to undergo general anesthesia were included to the study. Intramuscular premedication of 0.1 mg.kg^{-1} of midazolam was given 30 minutes before induction. Anesthesia was induced using remifentanil (0.1 mcg.kg^{-1} bolus, followed by 0.1 mcg.kg^{-1} min^{-1}). A propofol bolus was administered and followed by propofol infusion adjusted to maintain a BIS level between 40–65. LMA-Fastrach was inserted at a constant BIS value between 40–65. Patients were tested twice in one-minute intervals for awareness using Tunstall's isolated forearm technique (IFT-1). A tourniquet on the dominant arm was inflated to 250 mmHg. Vecuronium 0.1 mg kg^{-1} was injected into the non-dominant arm to provide neuromuscular blockade and the patients were intubated. After intubation IFT was repeated (IFT-2). Haemodynamic parameters and BIS values had been recorded one-minute intervals for 15 minutes.

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Results: Total of 7 patients showed awareness reaction. Two out of 7 were following LMA-Fastrach insertion, at the BIS levels 49 and 26. Five out of 7 were following intubation, showed an awareness reaction at the recorded BIS levels 52, 37, 56, 52. One patient had recall. The weight and the body mass index (BMI) of the patients in IFT positive group were higher significantly ($p = 0.02$, and $p = 0.015$ respectively). After LMA-Fastrach insertion systolic blood pressures were higher significantly in IFT positive patients. Before intubation systolic blood pressures were higher in IFT positive group than IFT negative group ($p = 0.03$) but similar after intubation.
Conclusion: Awareness reaction to intubation with propofol and remifentanil could not be prevented in all patients premedicated with midazolam at the recommended BIS levels 40–65. BMI over 30 should be considered as a predisposing factor for awareness reaction to this. study. Using muscle relaxant may lead to awareness reaction by decreasing BIS levels.
Reference:
1 Schneider G, Wagner K, Reeker W, Hanel F, Werner C, Kochs E. Journal of neurosurgical anesthesiology 2002; 14: 7–11.

A-124

Is the abdominal pressure-volume relation linear?

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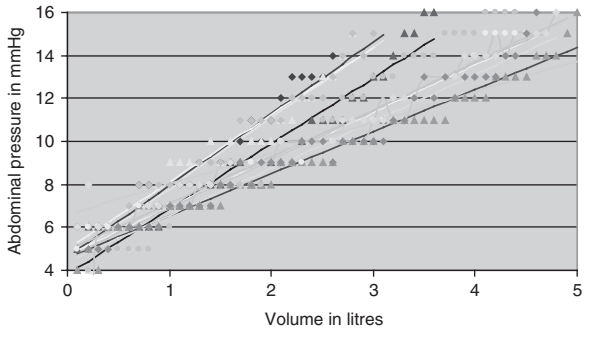
Background and Goal of Study: A pneumoperitoneum with CO_2 allows the measurement of the pressure-volume relation (APVR). Is a linear fit ($y = mx + b$) sufficient as a description?
Materials and Methods: 30 patients, ASA class I or II, between 21 and 75 years old, without any abdominal intervention and scheduled for a laparoscopic surgery were included in this study with approval from the hospital ethical committee.

Anaesthesia was induced with Propofol 200 mg, Sufentanil 20 μg, Nimbex 0.2 mg/kg and Sevoflurane 1.5 Mac in a 50% O_2/N_2O. Patients were asked to empty the bladder before surgery. The stomach was emptied by suction through a gastric tube. All the CO_2 was allowed to escape after insertion of the trocar. An Olympus insufflator UHI-3 was initialised and a stepwise flow of 1 l/min was given. Measurements were taken every 100 ml till the abdominal pressure reached 15 mmHg. APVR data were fit by a linear least-squares regression. An r^2 of 0.95 is assumed to be sufficient.
Results and Discussions: A graph shows the APVR and the fitting of the first 10 patients.



	m	b	r^2
Mean	2.92	5.02	0.95
Stdev	0.88	1.55	0.03

The mean and the standard deviation of the coefficients m, b and r^2 are given in the table. A first order fit is sufficient.
Conclusion: A first degree linear relation fits all APVR data sufficient.

A-125

Is the verres needle an acceptable inflation tool to measure the abdominal pressure-volume relation?

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Background and Goal of Study: It is possible to measure the abdominal pressure-volume relation (APVR) during insufflation through a verres needle. Is a measurement through the verres needle acceptable with an insufflation of 100 ml/min?
Materials and Methods: 10 patients, ASA class I or II, between 21 and 75 years old, without any abdominal intervention and scheduled for a bariatric laparoscopic surgery were included in this study with approval from the hospital ethical committee.

Anaesthesia was induced with Propofol 200 mg, Sufentanil 20 μg, Nimbex 0.2 mg/kg and Sevoflurane 1.5 Mac in a 50% O_2/N_2O. Patients were asked to empty the bladder before surgery. The stomach was emptied by suction through a gastric tube. After insertion of the verres needle a stepwise insufflation at a flow of 1 l/min was given with the Olympus insufflator UHI-3. Measurements were taken every 100 ml till the abdominal pressure reached 15 mmHg. After placement of the trocar the CO_2 was allowed to escape. The insufflator was reinitialised and the measurement repeated.

APVR data were fit by a linear least-squares regression. The coefficients of the fitted linear relations were analyzed by a paired Wilcoxon signed ranks test. Significant difference cannot indicate an abdominal stiffness change in such a short time but a measurement error by resistance.
Results and Discussions:

	m verres	b verres	m trocar	b trocar
Mean	4.263	6.804	3.454	5.510
Stdev	1.772	2.275	1.550	1.417

The paired Wilcoxon test gives a significant difference for the slope m ($p = 0.005$) and the intercept b ($p = 0.022$) between measurements through a verres needle compared with measurements through a trocar. No air remained after the first insufflation as this would shift the APVR in the opposite direction. Slope and intercept are higher with the verres needle indicating a higher resistance during measurement with the verres needle.
Conclusion: The verres needle does not allow abdominal pressure measurements at a flow of 100 ml/min. The measured pressure-volume relation is clearly several mmHg higher compared with the measurement through a trocar.

A-126

Effect of muscle relaxants on the abdominal pressure-volume relation

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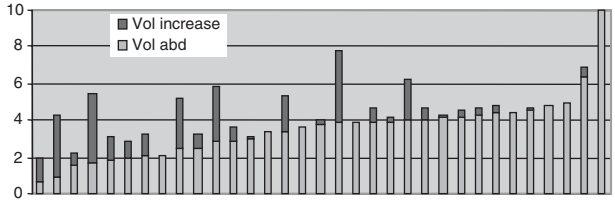
Background and Goal of Study: The aim of the study was to evaluate the effect of muscle relaxants on the abdominal pressure-volume relation.
Methods: 33 patients, ASA class I or II, and scheduled for a bariatric laparoscopic intervention were included in this study with approval from the hospital ethical committee. Age, length, bmi, sex, and gravidity were recorded. Anaesthesia was induced with Propofol 200 mg, Sufentanil 20 μg, Nimbex 0.2 mg/kg and Sevoflurane 1.5 Mac in a 50% O_2/N_2O. Patients were asked to empty the bladder before surgery. The stomach was emptied by suction through a gastric tube. All the CO_2 was allowed to escape after insertion of the trocar. The insufflator Olympus UHI-3 was initialised and during a stepwise insufflation at a flow of 1 l/min the abdominal pressure and volume were measured. 20 mg Cisatracurium was given and after confirming muscle relaxation with a post-tetanic count stimulation, the second insufflation and measurement was done.
Analysis: Pressure-volume data were fit by a linear least-squares regression and used to calculate the abdominal volume at 15 mmHg pressure. A logistic regression analysis was done to find the variables determining the abdominal volume before relaxation. The abdominal volume increase by muscle relaxants was analyzed by a paired t test and by a logistic regression analysis for its variables.
Results and Discussions: Multiparae ($p = 0.027$) have significantly larger abdomens. Abdominal volume increased significantly ($p = 0.000$) 0.95 l with a large stdv of 1.22 l. The increase was significantly more in tall patients ($p = 0.047$) and in patients with a small abdominal volume before insufflation ($p = 0.003$).



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Conclusion: Muscle relaxation during laparoscopy for bariatric surgery helps to increase the abdominal volume and therefore the surgical visibility, certainly in a small abdomen.

A-127

Is it possible to measure the abdominal pressure-volume relation with three points?

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Background and Goal of Study: The abdominal pressure-volume relation (APVR) can be calculated by measuring many pressure-volume points during insufflation. This relation was proven to be linear giving an m and b factor. The APVR might be measured repeatedly during laparoscopy but this takes a lot of work and time. Measuring three points of the relation should be sufficient and fast to find the APVR. Goal of this study was to test this hypothesis.
Materials and Methods: 10 patients, ASA class I or II, between 21 and 75 years old, without any abdominal intervention and scheduled for a laparoscopic surgery were included in this study with approval from the hospital ethical committee.

Anaesthesia was induced with Propofol 200 mg, Sufentanil 20 μg, Nimbex 0.2 mg/kg and Sevoflurane 1.5 Mac in a 50% O_2/N_2O. Patients were asked to empty the bladder before surgery. The stomach was emptied by suction through a gastric tube. All the CO_2 was allowed to escape after insertion of the trocar. The insufflator Olympus UHI-3 was initialised and a stepwise insufflation at a flow of 1 l/min was given. Measurements were taken every 100 ml till the abdominal pressure reached 15 mmHg. All the CO_2 was then allowed to escape. The insufflator was reinitialised and a high flow insufflation till 7, 11 and 15 mmHg was given. At each pressure set the actual pressure and volume was measured when the flow stopped.

The multipoints and the three points measurements were each fitted by a line giving an m, m′ and b, b′. The m's and b's were compared by a paired t-test.
Results and Discussions: No statistical significant difference was found between both groups.
Conclusion(s): The APVR can be measured by three points initial and during the procedure. This allows measurements in all patients and a rapid evaluation during the procedure.

A-128

Abdominal perfusion pressure and intra-abdominal pressure measurements superior to gastric tonometry in prognosing outcome in patients after ruptured abdominal aortic aneurysm repair

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Background and Goal of Study: Overall mortality in patients admitted to ICU after ruptured abdominal aortic aneurysm (RAA) repair persist high and reach around 30–50%. The aim of this prospective observational study was to evaluate predictive value of abdominal perfusion pressure (APP), intra-abdominal pressure (IAP) and gastric tonometry in patients who underwent RAAA repair.
Materials and Methods: We studied 40 consecutive patients of both sexes, mean age 70 ± 10 yrs, presented for RAAA reconstruction. Overall mortality rate was 30% (12 died). IAP, APP (APP = MAP – IAP), splanchnic perfusion parameters (P_gCO_2, $P_{g\text{-}a}CO_2$), hemodynamic (CVP, MAP), and laboratory parameters were analyzed every 6 hours for 72 hours postoperatively, starting from admission to the ICU.
Results and Discussions: Discriminative value and correlations between analised parameters are shown in tables:

	APP	IAP	P_gCO_2	$P_{g\text{-}a}CO_2$
AUROC 95% CI	0.673	0.646	0.578	0.583
	0.610–0.736	0.592–0.700	0.515–0.641	0.523–0.644

	P_gCO_2	$P_{g\text{-}a}CO_2$
IAP	$r = 0.2091$	$r = 0.013$
	$p < 0.0001$	$p < 0.05$
APP	$r = -0.4664$	$r = -0.3498$
	$p < 0.0001$	$p < 0.0001$

Conclusion(s):
(1) Intra-abdominal pressure measurement is a valuable prognostic parameter in patients undergoing urgent abdominal aortic surgery. IAP value of 12 mmHg had the greatest sensitivity and specificity to discriminate survivals and nonsurvivals in the studied group of patients.
(2) Abdominal perfusion pressure was found to be a superior prognostic parameter compared to IAP. The greatest discriminative power was achieved at the APP value of 70 mmHg.
(3) Splanchnic perfusion parameters do not appear to have a reliable prognostic value in patients undergoing ruptured abdominal aortic aneurysm repair. However observed correlations between IAP, APP and splanchnic perfusion parameters warrants further studies.

A-129

Changes of gastric intramucosal pH in patients undergoing laparoscopic and open cholecystectomy under total intravenous anaesthesia

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Background and Goal of Study: Pneumoperitoneum can cause disturbances in splanchnic perfusion. Gastric intramucosal pH (pHi) reflects splanchnic perfusion, while different anaesthetic agents and changes in end-tidal PCO_2 have been shown that would alter pHi (1, 2). The aim of the study is to compare the effects of laparoscopic cholecystectomy and open cholecystectomy on pHi under standardized anesthesia with total intravenous anesthesia (TIVA) and constant end-tidal PCO_2.
Materials and Methods: Twenty one patients subjected to laparoscopic cholecystectomy (group A) and 21 patients subjected to open cholecystectomy (group B) were enrolled in this study. All patients were of ASA I–II, aged 20–60 years and received general anesthesia as TIVA with propofol-remifentanil, while the end-tidal PCO_2 was constant via ventilatory adjustment. pHi was assessed using a tonometric nasogastric catheter. Measurements of pHi were collected at three phases: phase I (after induction of anesthesia before surgical incision), phase II (last stitch) and phase III (15 min after the completion of surgery, patients were full recovered).
Results and Discussions: No statistically significant differences of pHi measurements were observed between 2 groups at phases I and II, using the equal variance Student t-test. In contrast, at phase III a statistically significant difference was revealed between the two groups ($p < 0.001$), due to a decrease of pHi in the laparoscopic group and a tendency of pHi in open cholecystectomy group to return to the baseline values. Besides, pHi decrease in group A was within the normal range.
Conclusion(s): Despite inter-group differences in pHi values early postoperatively, laparoscopic cholecystectomy under TIVA and normocarbia, does not cause significant disturbances in splanchnic perfusion.
References:
1 Yagmurdur H, Cakan T, Bayrak A, et al. *Acta Anaesthesiol Scand.* 2004; 48: 772–777.
2 Thaler W, Frey L, Marzoli GP, et al. *Br J Surg.* 1996; 83: 620–624.

A-130

Two-stage hepatectomy monitored by ICG-densitometry in extended right lobe liver tumors

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Background: Complete resection of hepatic tumors remains the first choice for curative treatment of primary and secondary liver malignancies. The reason for unresectability is that, often, the remnant liver is of insufficient volume to support postoperative liver function. The malfunction is still the principal cause of postoperative death after a major hepatectomy. Various procedures have been developed to induce liver regeneration because liver failure is related to the amount of remaining functional liver volume. The aim of the study was to monitor the liver function and the following regeneration by ICG-densitometry.
Material and Methods: Data were collected during 3 years from 14 patients with primary (n = 3) or secondary (n = 11) liver tumors who underwent ligation of the right portal branch (first stage) before major liver resection. The median age of the patients was 54 years (range 25 to 72 years); 8 men and 6 women. ICG-densitometry was used to measure the hepatic function. In the pre-, and postoperative periods, US and CT-guided volumetry was performed to estimate the liver's regeneration.
Results: Liver resections were performed as a second stage in 8 cases (trisegmentectomy n = 4; right hepatectomy n = 3; non-anatomical resection n = 1). The rest of the patients were unsuitable for liver resection because of postoperative complications. Mortality was nil after the major resections till now. The ICG-densitometry is able to predict the postoperative liver failure

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and show predictable data about the actual liver function. According to this result the optimal time of the surgery is predicable.
Conclusions: These results suggest that two-stage hepatectomy combined with portal ligation can be safely applied to selected patients, who initially are considered as unresectable cases. The postoperative liver failure and malfunction could be predicted by the preoperative ICG-densitometry and the 3D CT-volumetry procedures.

A-131

Changes in mixed venous oxygen saturation after replacing suprahepatic veins clamping during anhepatic phase of orthotopic liver transplant

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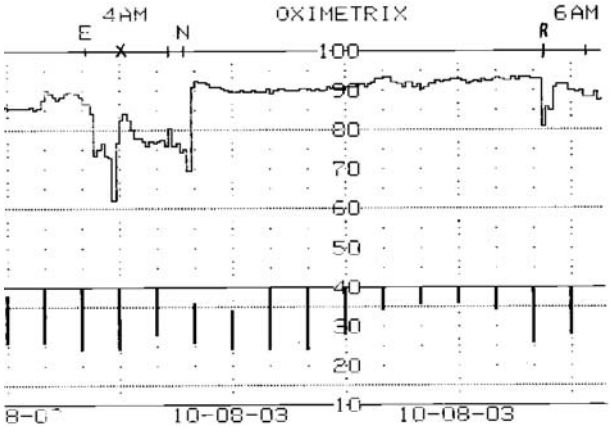
Background and Goals: We studied the decrease of mixed venous saturation and cardiac output and the increase of systemic vascular resistance after not occluded cava vein clamping (piggyback) as well as the recovery of these measurements after replacing this clamping.
Materials and Methods: A 53-year-old patient with hepatitis C (Child Pugh class C) underwent orthotopic liver transplant.

Oxygen arterial saturation, heart rate, blood pressure, mixed venous oxygen saturation, central venous pressure, pulmonary arterial wedge pressure, systemic cardiac output parameters were collected during anhepatic phase of liver transplant which includes the not occluded cava vein clamping (E), the inotropic bolus administration (X), the clamping replacement (N) and the graft reperfusion (R).
Results:



Conclusions: The clamping replacement after suprahepatic veins reconstruction into one single vein is a surgical technique that decreases hemodynamic disturbances in a more effective way than those obtained with inotropic bolus administration.

A-132

EEG Entropy decreases propofol requirement and maintains cardiovascular stability during induction of anesthesia in elderly patients

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Background and Goal of Study: EEG Entropy is a recently introduced monitor to measure the degree of brain hypnosis and anesthesia depth. Metabolism is extensive for intravenous induction agents including propofol. Reduction in hepatic blood flow and liver tissue mass in elderly patients decreases the clearance rates of drugs exhibiting flow-dependent hepatic metabolism. Subjecting elderly patients to unnecessarily large doses of propofol increases the risk of associated cardiovascular adverse effects. The aim of this study is to demonstrate reduced propofol requirement and improved hemodynamic stability during induction of anesthesia in elderly patients guided by EEG Entropy.
Materials and Methods: 72 elderly patients ASA I–II, aged 60–75 years were enrolled in this randomized control trial. Patients randomly allocated into two groups. The control group received the recommended dose of propofol (2 mg/kg) and the entropy group received propofol based on entropy reading where the endpoint was SE 50 and SE-RE difference less than 10. Narcosis was confirmed clinically with loss of response to verbal commands and loss of eyelash reflex. Total propofol dose and hemodynamic changes were recorded.
Results: Data (Mean ± SD) are shown in the table

		Control group	Entropy group
Total dose of propofol		132 ± 29.4	90 ± 42.5*
Mean arterial pressure	Baseline reading	109 ± 13.3	112 ± 13.8
	After induction	77 ± 13.3	85 ± 15.6*
	After intubation	97 ± 19.7	101 ± 21.7

*P value < 0.01.

Conclusion: Use of EEG Entropy during induction of anesthesia in elderly patients reduces propofol requirements and maintains cardiovascular stability.

A-133

Correlation and concordance between BIS and State Entropy during target-controlled infusion of propofol

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Background: Bispectral Index (BIS) and State Entropy (SE) of the EEG are used to quantify the hypnotic component of anaesthesia. We evaluated correlation and concordance between those variables during a target-controlled propofol infusion (PPF TCI).
Methods: With IRB approval, 24 adult consenting patients were enrolled in the study. BIS (BIS XP™) and SE (M-Entropy™) were continuously recorded (Rugloop II®, sampling rate 0.2–1 Hertz). Initial PPF target was set up at 2.5 $\mu g\,ml^{-1}$ and increased by steps of 0.5 until a steady-state (SS) level (BIS between 40 and 50) was achieved. BIS and SE were averaged over 1 min during baseline (Baseline), at loss of eyelash reflex (LER) and at SS. Least square linear regression was performed between BIS and SE. A Bland-Altman[1] analysis evaluated the concordance between BIS and SE during the whole study period, and at Baseline, LER and SS. Data were expressed as mean (SD). Confidence intervals (95% CI) were calculated to assess statistical significance.
Results: At SS, PPF effect-site concentration was 2.6 (0.4) $\mu g\,ml^{-1}$ and BIS value was 43.9 (6.0). A strong linear correlation was found between BIS and SE ($r^2 = 0.87$). Concordance between BIS and SE was poor (95% CI's of the mean difference not containing 0), except at SS. Limits of agreement revealed that a difference in the range of 20 units can often be observed between BIS and SE.
Conclusions: Correlation was excellent between BIS and SE during PPF TCI while good concordance only occurred at SS. This discrepancy is not related to scale differences only, as differences of more than 20 units can be observed. Differences in calculation algorithms and delays, as well as in shapes of the relationship between BIS, SE and the level of hypnosis may be other explanations.

Bland-Altman analysis between BIS and SE during the studied conditions

	Overall	Baseline	LER	Steady-state
Mean difference (SD)	6.0 (8.6)	7.6 (3.8)	8.3 (11.5)	2.1 (7.5)
95% CI of mean diff.	4.0; 8.0	6.0; 9.2	3.5; 13.2	−1.0; 5.3
Mean + 2SD (95% CI)	21.1 (17.6; 24.6)	15.3 (12.5; 18.1)	31.3 (22.9; 9.7)	17.1 (11.6; 22.5)
Mean − 2SD (95% CI)	−11.1 (−14.6; −7.6)	−0.1 (−2.9; 2.7)	−14.7 (−23.1; −6.3)	−12.8 (−18.3; −7.3)

Reference:
1 Bland J.M. and Altman D.G., Lancet, 1986; i: 307–310.

A-134

Effect of an intubation dose of rocuronium on EEG spectral entropy response to laryngoscopy

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Background and Goal of Study: EEG Entropy involves State Entropy (SE) and Response Entropy (RE). RE and RE-SE gradient are thought to be affected

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by nociceptive stimulation. We evaluated the effect of muscle paralysis on the Entropy response to laryngoscopy.

Methods: With IRB approval, 24 adult consenting patients were enrolled in this study. Anaesthesia was induced with propofol (PPF) TCI to achieve a Bispectral Index (BIS XP™) between 40 and 50. Patients randomly received 0.6 mg·kg^{-1} rocuronium (R; n = 13), or the same volume of saline (S; n = 11). Three min after, a 20 sec laryngoscopy was applied by the same anaesthesiologist, blinded to randomisation. BIS, RE and SE (M-Entropy™), mean blood pressure (MBP) and heart rate (HR) were continuously recorded (Rugloop II©, sampling rate 0.2–1 Hertz) and averaged over 1 min. Points of interest were: 2 min after rocuronium or saline (R/S + 2) and 0, 1, 2 and 3 min after laryngoscopy (L0 to L3). Data (mean ± SD) were analysed using t-tests or ANOVA's. $P < 0.05$ was considered significant.

Results: R/S + 2 PPF concentrations were similar in both groups (R and S: 2.7 ± 0.4 and 2.6 ± 0.4 μg ml^{-1}). HR remained significantly higher in R than in S during the whole study. Laryngoscopy provoked a significant increase in MBP, SE and BIS (no difference between groups) and a significantly higher increase in RE and RE-SE gradient in S than in R.

Conclusions: The increase in RE-SE gradient induced by laryngoscopy is affected by rocuronium. Muscle relaxants may be confounding in interpreting entropy values.

		R/S + 2	L0	L1	L2	L3
BIS	R	43 ± 6	**49 ± 8**	45 ± 7	42 ± 7	42 ± 7
	S	42 ± 9	**51 ± 15**	52 ± 15	49 ± 17	44 ± 16
SE	R	43 ± 7	**50 ± 8**	44 ± 8	42 ± 7	44 ± 5
	S	41 ± 10	**55 ± 12**	47 ± 13	43 ± 13	41 ± 13
RE	R	46 ± 8	**54 ± 9**	46 ± 8	45 ± 6	46 ± 6
	S	47 ± 12	**66 ± 15**	54 ± 16	48 ± 16	46 ± 17
RE-SE	R	3 ± 3	**4 ± 2**	2 ± 2	2 ± 2	2 ± 2
	S	5 ± 3	**11 ± 4**	7 ± 5	5 ± 4	5 ± 4
HR (b/min)	R	**79 ± 8**	**84 ± 9**	**83 ± 10**	**85 ± 10**	**83 ± 9**
	S	67 ± 14	67 ± 13	68 ± 17	68 ± 16	67 ± 14
MBP (mmHg)	R	92 ± 21	92 ± 18	**103 ± 21**	**103 ± 20**	**101 ± 21**
	S	84 ± 12	87 ± 9	**90 ± 11**	**91 ± 8**	**89 ± 8**

A-135

Effect of an intubation dose of rocuronium on state and response entropy during target-controlled propofol anaesthesia

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Background: EEG Entropy proposed to monitor depth of anaesthesia include State Entropy (SE) computed from EEG and Response Entropy (RE) computed from EEG and facial muscles activity. We evaluated the effect of rocuronium on RE, SE and RE-SE during propofol TCI.

Methods: After IRB approval, 24 adult consenting patients were enrolled in the study. Anaesthesia was induced using a propofol (PPF) TCI to achieve a Bispectral Index (BIS) value between 40 and 50. Under steady state (SS) conditions, patients randomly received either 0.6 mg·kg^{-1} rocuronium (R, n = 13), or the same volume of saline (S, n = 11). BIS (BIS XP™), RE and SE (M-Entropy™), mean blood pressure (MBP) and heart rate (HR) were continuously recorded (Rugloop II®, sampling rate 0.2–1 Hertz). Each variable was averaged over 1 min at the following time points: before induction (Baseline), at SS before rocuronium or saline, and 2 min after (R/S + 2). Data (means ± SD) were analysed using t-tests and ANOVA's. $P < 0.05$ was considered statistically significant.

Results: PPF effect-site concentrations and BIS at SS were comparable in both groups. MBP, BIS, RE, and SE were significantly lower at SS and R/S + 2 than at Baseline, without difference between groups. At R/S + 2, the RE-SE gradient was significantly lower in R than in S.

Conclusions: Neuromuscular block significantly affects the RE-SE gradient under steady state conditions of propofol anaesthesia. This effect should be considered when using Entropy for monitoring depth of anaesthesia.

	Baseline		SS		R/S + 2	
	Gr R	Gr S	Gr R	Gr S	Gr R	Gr S
$[PPF]_{effect\text{-}site}$	N/A	N/A	2.7 ± 0.4	2.6 ± 0.4	N/A	N/A
HR	73.2 ± 14.0	69.4 ± 16.4	73.4 ± 7.6	65.7 ± 4.5	78.8 ± 8.0	66.5 ± 3.8
MBP	102.0 ± 13.0	101.2 ± 8.4	89.4 ± 16.5*	85.8 ± 7.4*	92.3 ± 0.8*	83.9 ± 1.6*
BIS	95.5 ± 2.8	95.0 ± 5.5	44.6 ± 5.3*	43.1 ± 7.0*	43.1 ± 5.7*	41.6 ± 8.8*
RE	96.7 ± 3.0	96.8 ± 2.4	47.4 ± 8.1*	42.8 ± 9.9*	46.1 ± 7.7*	46.8 ± 11.9*
SE	87.4 ± 3.8	88.0 ± 1.8	44.4 ± 7.3*	38.7 ± 8.2*	43.4 ± 6.5*	41.4 ± 10.4*
RE-SE	9.3 ± 1.2	8.8 ± 1.5	3.0 ± 2.6*	4.1 ± 3.9*	2.7 ± 2.7*+	5.4 ± 3.4*

* = significantly lower than at Baseline, both groups.
\+ = significantly lower in Group R than in Group S.

A-136

Comparative study of the spectral entropy and bispectral index during propofol sedation

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Background and Goals: Recently, approximate entropy has been proposed as a new monitor for measuring depth of anesthesia. The aim of this study was to investigate the dose-response relation of state entropy (SE) and response entropy (RE) during propofol sedation in comparison with the Bispectral Index (BIS).

Material and Methods: Fifteen patients were studied without surgical stimulus. Propofol concentrations were increased, subsequently decreased and newly increased for the patient intubation. SE, RE, BIS, mean arterial blood pressure and heart rate were recorded during stepwise increasing propofol (target-controlled infusion, 0.5 μg/ml), until loss of responsiveness was detected by loss of response to command [observer's assessment of alertness/sedation (OAAS/S) score ⩽2]. Comparison of propofol concentration with SE, RE and BIS was performed with the Spearman correlation coefficient.

Results: SE, RE, BIS values and propofol concentrations are shown in the table 1.

Propofol	SE	RE	BIS
0 μg/ml	89	98	97
1 μg/ml	88	96	96
1.5 μg/ml	87	95	91
2 μg/ml	84	91	83
2.5 μg/ml	81	86	79
3 μg/ml	72	76	71
3.5 μg/ml	52	56	56

Spearman correlation coefficients for propofol concentration are shown in table 2.

	SE	RE	BIS	OAA/S
r	0.737	0.798	0.897	0.878
P-value	0.000	0.000	0.000	0.000

Conclusion: SE, RE, and BIS revealed similar information about the level of sedation and allowed to distinguish between different sedation steps with propofol.

A-137

The effects of acupressure on the bispectral index and entropy parameters in mentally disabled volunteers

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Background and Goal of Study: Preoperative care in mentally disabled persons is an anaesthesiological challenge. Acupressure is described to suppress bispectral index (BIS) in healthy volunteers (1). The purpose of this observational study was to investigate the influence of acupressure on bioelectrical parameters and emotional status in mentally disabled persons.

Materials and Methods: After approval of the local ethics committee twenty one mentally disabled volunteers (Folstein Mini-Mental Exam score <24) were studied. Acupressure was applied by stimulating the Yintang point (midpoint between the two eyebrows) for ten minutes. Endpoints of the study such as BIS, state entropy (SE), response entropy (RE) and heart rate (HR) were measured by Datex S/5 Monitor/M-Entropy® (Datex Ohmeda, Helsinki, Finland) before during and after acupressure. The results of the acupressure intervention were compared by means of the paired t-test.

Results and Discussions: Data (Mean ± SD) before, during and after acupressure are shown in the table:

	Before	During	After	*p*-value
BIS	94.6 ± 5.0	86.7 ± 14.5	95.2 ± 4.6	< 0.001
RE	95.9 ± 3.5	84.2 ± 25.7	96.9 ± 1.7	n.s.
SE	85.8 ± 5.2	74.2 ± 25.5	87.3 ± 1.2	n.s.
HR	90 ± 15	86 ± 13	87 ± 14	n.s.

All volunteers felt emotionally relaxed.

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Conclusion(s): In our study group we found BIS values significantly decreased by acupressure. No significant changes were observed for RE, SE and heart rate. Further randomized studies comparing acupressure and sedation effects will be needed to determine if acupressure might be established as an additive therapeutic option in mentally handicapped patients.

Reference:

1 Litscher G. *EJA* 2004;21:13–19.

A-138

Monitorization of induced neuroaxial blockade sedation

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Background and Goal of Study: The arousal state of the brain is altered during spinal anaesthesia (1). Actually, it is not clear that BIS or others devices could monitor the induced neuroaxial blockade (NB) sedation (2,3). Our objective was to evaluate the BIS and the entropy monitor during spinal anaesthesia.

Materials and Methods: After obtaining Institutional Review Board approval, we developed a prospective study that included 20 patients, ASA I–II, over 60 years old, undergoing spinal anaesthesia, without premedication, for orthopedics procedures. The NB was realized with bupivacaine 0.5% (12 mg). The sensorial blockade achieved was T8 ± 2. Data collected: OAA/S sedation scale every 10 minutes, response (RE) and state entropy (SE) and BIS continuously during 60 minutes, and standard haemodynamics. The correlation between OAA/S and SE, RE and BIS was then investigated with the model independent prediction probability (Pk). Statistical calculations were performed by Wilcoxon test or ANOVA where appropriated.

Results and Discussions: RE and BIS demonstrate a better correlation with the OAA/S scale values (Pk 0.81 and 0.82 respectively) than SE (Pk 0.69). The OAA/S, RE and SE shows a significant differences from basal values after 30 min of NB, the BIS show differences after 40 min (ANOVA $p < 0.05$). There were no differences between BIS and RE values along the study (ANOVA $p > 0.05$). No significant variations were observed in the haemodynamics values.

Conclusion: The NB decreased the cortical activity after 30 min, as measured by OAA/S and depth anaesthetics monitors. OAA/S was a more sensitive value of this induced sedation. BIS and RE also showed a good correlation with OAA/S scale. It's possible that the sedation state is detected before with RE, because is faster than BIS. Although SE has a significant variation from basal values, it does not seem to have a good correlation with the induced sedation state.

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2 Pollock JE, et al. Anesthesiology 2000; 93: 728–34.
3 Kurup V, et al. Can J Anaesth 2004; 51: 562–5.

A-140

Intravenous ketamine induces dose related increases in bispectral index BIS and cerebral entropy during sevoflurane anesthesia

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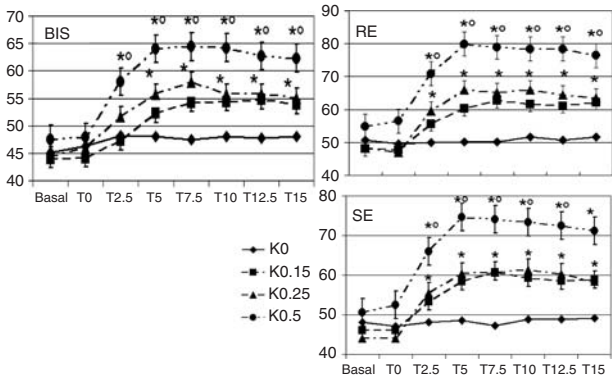
Background and Goal of Study: Increasingly used as a co-analgesic, iv ketamine (K) has been shown to increase BIS and state (SE) and response (RE) entropy E, commonly used to evaluate depth of hypnosis (ref). We wanted to see whether K effect was dose related and could affect anesthesia and recovery.

Materials and Methods: In this randomized placebo controlled double-blind study, after ethics committee approval, 40 consenting women undergoing breast surgery (S) were randomly assigned to 4 K groups: saline (K0), K0.15, K0.25 and K0.5 mg/kg. After iv propofol and remifentanil, under 2% endtidal Sevoflurane (Sev), and BIS and E stabilized below 50 or 60, K was injected as an iv bolus. BIS, SE, RE, cardiovascular and respiratory parameters were recorded before K (basal), at K (T0), then every 2.5 min during 15 min before S. After S, Aldrete, VAS and SVS pain scores were noted. Statistics (ANOVA, t-tests) were done using Statview5© and $P \leqslant 0.05$ was considered significant.

Results and Discussion: There was no between group difference in demographic, operative and anesthesia data. BIS, SE and RE increased with increased K dosage. Recovery was similar in all groups. No untoward effects of K was noted. Awareness during anesthesia was not observed. Figures show BIS, RE and SE with time (mean ± SEM). $P \leqslant 0.05$:* compared to T0; ° between K0.5 and K0.15 & K0.25. NS between K0.15 and K0.25.



Conclusion: Under Sev anesthesia, BIS, SE and RE increases with K are dose related, without affecting level of anesthesia. They do not constitute reliable indices of hypnosis in these conditions.

Reference:

Hans P, et al. Brit J Anest, 2005, 94: 336–40.

A-141

Movement at laryngeal mask airway insertion: comparison of bispectral index, response entropy and state entropy

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Background and Goal of Study: The relationship between pre-stimulus values of EEG variables and stimulus induced movement has been shown to be poor. We compared BIS and entropy during induction with sevoflurane and LMA insertion, to assess which monitor reflects better movement response to LMA insertion.

Materials and Methods: After obtaining approval from Ethics Committee, we enrolled 17 patients ASA I–II undergoing minor elective surgery. General anaesthesia was induced with sevoflurane 8%. Once the eyelash reflex was lost, sevoflurane was set 2.5% end-tidal during 10 minutes. Then, we inserted a LMA Classic™ without muscle relaxants or opioids. Data collected: Movement to LMA insertion and, haemodynamics, BIS, response (RE) and state entropy (SE) at six points (basal, 60 and 30 sec before insertion, maximum values during 40 sec, 40 and 60 sec after insertion). The correlation between movement and SE, RE and BIS was investigated with the model independent prediction probability (Pk). Statistical calculations were performed by student t-test or ANOVA.

Results and Discussions: 47% of the patients moved after the LMA insertion.

	Movement (n = 8)		No Movement (n = 9)	
	Before LMA	After LMA	Before LMA	After LMA
HR	75 ± 17	9 ± 15*	69 ± 13	85 ± 13
BIS	49 ± 22	76 ± 12	35 ± 12	46 ± 15
SE	35 ± 9	60 ± 13	44 ± 21	49 ± 15
RE	37 ± 10	71 ± 15*	48 ± 23	54 ± 17

(m ± sd *$p < 0.05$).

There were no differences between BIS, SE and RE along the study in those patients that moved, or in those patients that did not move. BIS shows a better correlation with movement (Pk 0.76) than RE (Pk 0.54) and SE (Pk 0.54).

Conclusion: BIS, SE and RE show similar values predicting movement during sevoflurane induction and after LMA insertion. None of these monitors correlate movement with the LMA insertion, although BIS shows a better profile. However when patients move after the insertion RE values and HR increase significantly.

References:

1 Br J Anaesth 1999;82:203–7.
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A-142

Modelling the effect of IV drugs on the heart rate: efficiency of a GARCH model

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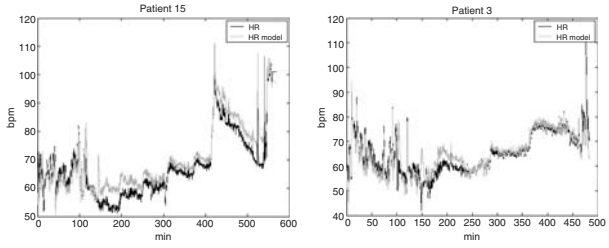
Background and Goal of Study: It would be clinically useful to understand the influence of anaesthetics on the patient heart rate (HR), during general anaesthesia. A model was developed to describe HR using Remifentanil (Remi) and Propofol (Prop).

Materials and Methods: We used data from ASA 1/2 patients, anesthetized with TIVA using effect site TCI Prop (Schnider[1]) and Remi (Minto[2]). Data were collected using RugLoop II® software every 5 s. Induction was performed with Prop at 200 ml/hr until loss of consciousness (LOC). At LOC, Remi started with a plasma target of 2.5 ng/ml. During surgery the Prop and Remi concentrations were manually adjusted. For recovery the Prop target was gradually reduced and Remi adjusted to patient's needs. Data is mean ± sd. A Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model structure was used to model HR.

Results and Discussions: Data from 16 patients, age 46.3 ± 15 years, body mass index 23.6 ± 4, 10 female was used. At baseline mean arterial pressure was 89 ± 3 mmHg, and HR was 66.9 ± 4 bpm. Remi and Prop mean effect concentrations during surgery were 3 ± 1 ng/ml and 2.7 ± 1 μg/ml. Case time was 482 ± 195 min (minimum 245 min and maximum of 972 min). The GARCH model has the same structure for all 16 patients, but trained with individual patient data. The average of modelling errors was 11.2 ± 9.



Conclusion(s): This model describes adequately the patient HR trend during surgery, considering the influence of Prop and Remi in all patients. It can also help the clinician in better controlling a patient HR variability during surgery. The model can in the future be patient adaptive.

References:

1 Anaesthesiology 1998, 88:1170–82.
2 Anaesthesiology 1997, 86:24–33.

A-143

Online outlier detection and removal from ECG heart rate and invasive arterial pressure

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Background and Goal of Study: During surgery different artifacts influence the heart rate (HR) ECG monitoring and the invasive arterial pressure (AP) values (e.g. occlusion). It is important to detect outliers in the data so as not to react to erroneous measurements. We developed an online method to remove outliers from HR, and AP values.

Materials and Methods: We used data from ASA 1/2 patients, anesthetized with TIVA using effect site TCI Prop (Schnider[1]) and Remi (Minto[2]). Data were collected using RugLoop II® software every 5 s. Induction was performed with Prop at 200 ml/hr until loss of consciousness, when Remi started with a plasma target of 2.5 ng/ml. During surgery the Prop and Remi concentrations were manually adjusted. For recovery the Prop target was gradually reduced and Remi adjusted to patient's needs. Data is mean ± sd. A detection algorithm was implemented considering the different artifacts, and a moving average filter was applied to HR and AP data.

Results and Discussions: Data from 16 patients, age 46.3 ± 15 years, body mass index 23.6 ± 4, 10 female was used to test the algorithm. At baseline mean arterial pressures were 89 ± 3 mmHg, and HR was 66.9 ± 4 bpm. Remi and Prop mean effect concentrations during surgery were 3 ± 1 ng/ml and 2.7 ± 1 μg/ml. Case time was 482 ± 195 min (minimum 245 min and maximum of 972 min).

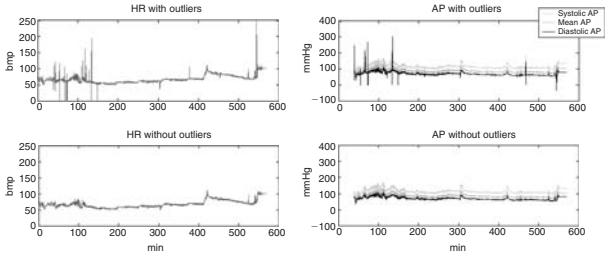

Figure 1. The HR and AP of one patient, with and without outliers.

Conclusion(s): The algorithm was able to detect and adequately replace the existing outliers online, allowing for a better analysis of the data. This technique can also be used as an alarm, indicating abnormal values or tendency of the haemodynamic variables.

References:

1 Anaesthesiology 1998, 88:1170–82.
2 Anaesthesiology 1997, 86:24–33.

A-144

Small stroke volume changes and non-invasive monitoring

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Background and Goal of Study: Portapres with Modelflow® algorithm calculates stroke volume (SV) from non-invasive blood pressure curve (1). This method, after a correction of SV intrinsic overestimation with an independent method, could be proposed also in clinical settings (2). Our aim was to evaluate the sensibility of Portapres versus CO_2 rebreathing (gold standard) to small SV changes.

Materials and Methods: Sixteen healthy women (31.9 ± 6. 5 yrs, 64.8 ± 9 kg, 168.8 ± 3.8 cm) were enrolled. SV was measured by Portapres (Ohmeda 2300, Englewood, CO, USA) and by CO_2 rebreathing in three body positions: orthostatic, at 45° head up tilt, and supine. Data were analysed as follows: a) heart rate and SV changes (paired Student's t-test). b) repeatability of Portapres measurements (3). c) agreement of the two methods (3).

Results and Discussions: a) see table below

Posture		Heart rate ($b \cdot min^{-1}$)	Stroke volume ($ml \cdot min^{-1}$)	
			Model flow	Rebreathing
Orthostatic 90°	Avg	84.7	70.2	55.6
	SD	12.0	16.5	22.5
45°	Avg	76.9	79.9	71.8
	SD	10.1	14.7	25.3
Supine 0°	Avg	74.1	79.4	70.9
	SD	12.0	14.2	27.6

90° vs 45° $p < 0.05$; 90° vs 0° $p < 0.05$; 45° vs 0° ns.

b) More than 95% of the measurements lie between +2 sd and −2 sd (7.16 and −6.0). c) Agreement mean difference is 10.8 ml/min and the limits of agreement (mean difference ± 2DS) are 70.1 and −48.5 ml/min. 95% of the differences lie between these limits. Probably due to the paucity of the data, the changes from 45° to supine are not significant. In this small range of CO changes, Portapres SV showed a good intra subject repeatability, with a good agreement with the gold standard method.

Conclusion(s): In steady state conditions, small changes in SV could be detected by Portapres, providing a first line non-invasive hemodynamic monitoring tool in intermediate critically ill patients.

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1 Wesseling KH, Jansen JRC, Settles JJ, et al J Appl Physiol 1993; 74:2566–73.
2 Tam E, Azabji Kenfach M, Cautero M, et al Clinical Science 2004; 106:371–6.
3 Bland JM, DG Altman Lancet 1986; i:307–31.

A-145

The level of cardiac output affects the relationship between pulmonary artery and transpulmonary aortic thermodilution measurements in an animal model

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Background and Goal of Study: For measurements of cardiac output (CO) with thermodilution the detection site can be either in the pulmonary artery

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(CO(PA)) or in the aorta (CO(AT)). We compared the relationship between the two detection sites under conditions of increasing CO.

Materials and Methods: After approval of the animal protection committee, 8 pigs were anaesthetized and instrumented with a pulmonary artery catheter and an aortic thermistor catheter. Both catheters were connected to one CO monitor (COLD-Z021). The CO range was between 3 and 7 l/min. Dobutamine was used as a means for increasing CO. After each l/min increase thermo-dilution CO was measured with ice cold normal saline in triplicate and averaged. Bland and Altman analysis was used for the determination of agreement (Fig 1).

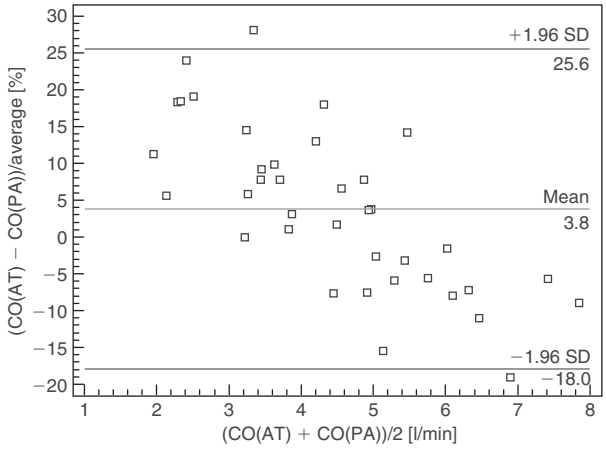

Figure 1. Agreement between aortic (CO(AT)) and pulmonary artery (CO(PA)) thermodilution CO.

Conclusion: Our study suggests, that despite an overall good agreement of the two measurements methods the amount of CO affects the relationship between CO(PA) and CO(AT).

A-146

QT interval and QT dispersion during the induction of anaesthesia: a comparison of remifentanil and fentanyl

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Background and Goals: QT dispersion may represent nonuniform ventricular repolarisation, and it has been proposed as a simple, noninvasive measure for identifying patients at risk of ventricular arrhythmia (2). The aim of this study was to determine if there is any significant difference between the effects of remifentanil and fentanyl on the QT segment and QT dispersion during anaesthetic induction and tracheal intubation.

Material and Methods: *Design:* prospective, single blind and randomised study. Thirty ASA I–II patients, undergoing general anaesthesia for noncardiac surgery, were enrolled to receive remifentanil (group R) or fentanyl (group F). Anaesthesia was induced with propofol 2.0 mg · Kg^{-1} and remifentanil 0.25 mcg·Kg^{-1}·min^{-1} or fentanyl 1.5 mcg·Kg^{-1}. QT_{Max} and QT_{Min} were monitored by a computerized ECG (12 leads) (NORAV Medical Ltd, Israel) from baseline to 2 min after tracheal intubation. QT dispersion (QTD) and QTD corrected (QTDc) were also calculated. Corrected QT_{Max} interval (QT_{Maxc}) was evaluated by using Bazett's formula, and analysis of variance for repeated measures was used to determine intergroup and intragroup differences.

Results: Data (mean) are shown in the table:

	QT_{Max}	QT_{Maxc}	QTD	QTDc
Group R				
Baseline value	400	14.7	84.4	3.2
Induction	398	14.1	34.8	1.2*
Intubation	397	14.8	29.6	1.1*
Group F				
Baseline value	399	14.6	52.6	1.97
Induction	400	15.0	49	1.79
Intubation	428	15.9	64	2.3**

*$P < 0.01$ vs baseline value; **$P < 0.05$ vs group R.

Conclusions: Data indicate that both remifentanil and fentanyl did not prolong the QT_{Max} and the corrected QT_{Max} intervals during the study. A significant decrease in QTDc was found in group R in comparison with group F. In conclusion, remifentanil improved QT dispersion, and this effect may be important in preventing dysrhythmias during tracheal intubation.

References:

1 Zabel M, Portnoy S, Franz M. Electrocardiographic indexes of dispersion of ventricular repolarization: an isolated heart validation study. J Am Coll Cardiol 1995; 25:746–52.
2 Higham PD, Campbell RWF. QT dispersion. Br Heart J 1994;71:508–10.

A-147

Haemodynamic impact of spinal anaesthesia measured with a new pulse contour method (PRAM)

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Background and Goal of Study: Spinal anaesthesia is associated to several hemodynamic modifications: the type of surgery performed with spinal anaesthesia usually does not justify the use of invasive methods of hemodynamic measurement. PRAM (Pressure Recording Analytical Method, FIAB – Florence, Italy) (1) is a new method based on the pulse contour analysis that uses an indwelling arterial catheter (radial) only. It measures and calculates: Invasive Blood Pressure (IBP), Cardiac Output (CO), Systemic Vascular Resistances (SVR), Cardiac Index (CI), Stroke Volume Index (SVI).

Materials and Methods: PRAM was applied to 20 patients, (75–89 yo, 12 F, 8 M) scheduled for elective orthopedic surgery. Patients with cardiac diseases, hypertension, renal failure were excluded. Each patient received Lactated Ringer 8 ml/kg 30 min before anaesthesia. Spinal (sitting position) was performed with 27-25G Whitacre needle and 12–14 mg hyperbaric bupivacaine. PRAM recording started 10 min before the injection and was stopped 30 min later. Sensory blockade averaged T6.

Results and Discussions: Results are displayed in the table (percentage means and standard deviations).

	DIA	SIS	MEAN	HR	SVR	CI	SVI
Mean	−35%	−37%	−36%	−2%	−23%	−15%	−11%
SD	7%	12%	11%	10%	10%	14%	17%

Conclusion: These results are comparable to previous reports (2–3) determined by pulmonary artery catheter and bioimpedance. PRAM could be a reliable, minimally invasive method to measure and study hemodynamic changes after spinal anesthesia in the operating room setting.

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1 Romano SM, Pistolesi M. Crit Care 2002; 30 (8): 1834–1841.
2 Rooke GA, Freund PR, Jacobson AF. Anesth Analg 1997; 85: 99–105.
3 Critchley LAH, Stuard JC, Short TG, et al. Br J Anaesth 1994; 73: 464–470.

A-148

Blood pressure monitored by Vasotrac correlates to that by the oscillometric arm cuff method

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Background and Goal of Study: A noninvasive device, Vasotrac™, provides oscillometric blood pressure (VBP) monitoring displaying a calibrated arterial waveform of the radial artery. In this study, we examined the characteristics and reliability of this device compared to the usual oscillometric arm cuff method at the brachial artery (CBP) and direct arterial blood pressure monitoring at the radial artery (ABP).

Materials and Methods: After institutional approval and written consent, 24 patients classified ASA I–II, were enrolled in this study. The difference in CBP was within 10 mmHg for both arms before anesthesia. Anesthesia was induced with sevoflurane in oxygen. VBP was monitored for 30 min from the beginning of anesthetic induction before start of surgery, in addition to either CBP (11 patients) or ABP (13 patients) on the contralateral side. Measurements were recorded every minute for 30 min.

Results and Discussion: There were no significant differences in patients' background between both groups.

In systolic BP and mean BP, correlation coefficients (r^2) between VBP and CBP were significant higher than VBP and ABP (0.81 ± 0.13, 0.47 ± 0.28; $p < 0.01$, and 0.73 ± 0.28, 0.54 ± 0.29; $p < 0.05$, respectively). Intraclass correlation (ICC(1,1)) of systolic BP, mean BP and diastolic BP between VBP and CBP was also significantly higher than VBP and ABP (0.73 ± 0.21, 0.04 ± 0.41; $p < 0.01$, 0.63 ± 0.28, 0.14 ± 0.50; $p < 0.05$, and 0.54 ± 0.53, 0.25 ± 0.36; $p < 0.05$, respectively).

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Conclusion: Blood pressure monitoring by Vasotrac™ showed a higher correlation to the oscillometric arm cuff method of the brachial artery than to arterial blood pressure monitoring of the radial artery. We should recognize the difference of blood pressure between the monitoring devices during anesthesia.

A-149

Effect of thigh tourniquet deflation on hemodynamic variables assessed by measuring suprasystolic brachial artery signals

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Background and Goal of Study: It is not known whether the hypotension after deflation of a thigh tourniquet is due to reduction in cardiac output or arterial dilatation. To study this, we assessed changes in suprasystolic brachial artery signals measured during total knee arthroplasty performed under epidural anesthesia (EA). The Pulsecor® monitor records signals with a piezoelectric sensor placed beneath a blood pressure cuff over the brachial artery. From these signals, the monitor calculates augmentation index (AI) as a measure of arterial tone (1) and dv and dt as indices of cardiac performance.

Materials and Methods: After IRB approval, 22 patients were enrolled. Measurements were made in the supine position: (1) at baseline; (2,3) pre and post tourniquet inflation; (4,5) pre and post tourniquet deflation. Data (mean ± SD) were compared by paired t-test and ANOVA with $p < 0.05$ considered significant.

Results: Upon tourniquet inflation, mean arterial pressure (MAP) and AI increased while dv and dt were unchanged. Deflation of the tourniquet resulted in a decrease in MAP and AI and an increase in dt. There were no changes in dv or heart rate. Changes in MAP, AI and dt after tourniquet deflation did not correlate with the duration of tourniquet inflation time (range: 33–83 min).

	Pre inflation	Post inflation	Pre deflation	Post deflation
MAP	58 ± 10	62 ± 12*	70 ± 9	58 ± 7†
AI	18 ± 16	24 ± 18*	15 ± 17	7 ± 11†
dt	0.09 ± 0.01	0.09 ± 0.01	0.08 ± 0.01	0.09 ± 0.01‡
dv	0.46 ± 0.18	0.47 ± 0.19	0.94 ± 0.5	0.87 ± 0.37

*$p < 0.05$ compared to pre inflation; †$p < 0.0005$ compared to pre deflation; ‡$p < 0.05$ compared to pre deflation.

Conclusion: Changes in suprasystolic signals suggest that both arterial dilatation and some degree of cardiac depression contribute to the hypotension which follows deflation of a tourniquet during total knee arthroplasty.

Reference:

1 Nichols WM. *Am J Hypertens* 2005; 18: 3S–10S.

A-150

Cardiac index measured by Impedance Cardiography correlates with CO_2-production under exercise conditions

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Background and Goal of Study: Impedance Cardiography (ICG) has been shown to be a feasible and accurate method for non-invasive measurement of cardiac index (CI) (1,2). Under exercise conditions, the cardiovascular system is challenged to increase blood flow in order to match increased metabolic needs (3). Therefore, aim of this study was a correlation of CI with metabolic variables as measured by indirect calorimetry.

Materials and Methods: 10 healthy volunteers were included in the study doing treadmill exercise with a standardised workload protocol (5 minute equilibration period followed by sequences of 5 minutes each of 50, 75, 100 and 125 W exercise). CI was measured by ICG (Solar IKG-Modul, Version 3.0, GE-Healthcare, Freiburg, Germany). Metabolic variables were assessed with the Deltatrac II monitor (Datex Ohmeda, Helsinki, Finland) using a helmet for spontaneous respiration. Correlation analysis was performed between CI and CO_2-production (VCO_2) (Sigmaplot; SPSS Erkrath, Germany). Data are mean ± SD.

Results and Discussions: The correlation between CI and VCO_2 was $R^2 = 0.77 \pm 0.22$. The median fit was $R^2 = 0.82$ (best fit $R^2 = 0.98$, worst fit $R^2 = 0.23$).

Increased metabolic requirements due to muscle work under exercise conditions seem to be well represented by CI in a linear relationship.

Conclusion(s): CI in healthy volunteers, as measured by ICG, correlates well with VCO_2 indicating the metabolic needs under exercise conditions in healthy individuals.

References:

1 Sagemann WS, Riffenburgh RH, Spiess BD *J Cardiothorac Vasc Anesth* 2002; 16: 8–14.
2 Scherhag A, Kaden JJ, Kentschke E, et al *Cardiovasc Drugs Ther* 2005; 19: 141–147.
3 Rowland *Chest* 2005; 127: 1023–1030.

A-151

Performance of continuous pulse contour derived cardiac output during uncontrolled haemorrhage

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Background and Goal of Study: Reliable measurement of cardiac output (CO) reflecting rapid haemodynamic changes is of great importance in the critically ill. Pulse contour derived cardiac output (PCCO) requires calibration for the individual vascular impedance by transpulmonal thermodilution cardiac output (TPCO) [1]. It is currently under debate, how frequently recalibration is necessary if the shape of pulse contour is altered by catecholamines or changing intravascular volume [2]. We studied performance of PCCO during uncontrolled haemorrhage compared to continuous pulmonary artery cardiac output (CCO) and TPCO.

Materials and Methods: Following approval of the Animal Investigational Committee, 16 pigs (42 to 48 kg) underwent a simulated penetrating liver trauma. When mean arterial pressure was less than 25 mm Hg, therapy was started with hypertonic-hyperoncotic starch solution and either arginine vasopressin or norepinephrine. TPCO was performed at baseline (BL) and 15 min of therapy (Th 15′) in triplicate; PCCO was obtained after calibration. Paired CCO and PCCO measurements were taken every 5 to 10 minutes. CO measurements were analysed using a Bland-Altman Plot yielding mean difference between methods (bias) ± standard deviation (precision).

Results and Discussions: While agreement between PCCO with CCO and TPCO was acceptable at BL and Th 15′, increasing blood loss (Tr 15′), HHS and vasopressor therapy provoked large bias and unacceptable precision of PCCO (Table 1).

Conclusion: PCCO needs frequent recalibration during vasopressor therapy and intravascular volume shift.

References:

1 Crit Care Med 2002; 30:52–58.
2 Acta Anaesthesiol Scand 2002; 46:424–429.

Table 1. Bland-Altman Plot with mean differences between methods (bias) ± standard deviation (precision).

	BL	Tr 15′	Th 5′	Th 15′
PCCO-CCO	−0.08 ± 0.76	−2.73 ± 2.54	−5.08 ± 3.95	−0.48 ± 0.75
PCCO-TPCO	0.18 ± 0.79			0.11 ± 0.24
CCO-TPCO	0.26 ± 0.61			0.59 ± 0.75

A-152

Use of intravenous electrocardiogram in placement of the tip of peripherally inserted central catheters in an optimum position

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Background: Insertion of the CVP catheters through internal jugular and subclavian veins has a high incidence of major complications like pneumothorax, arterial puncture and nerve injury. Sometimes we use peripherally inserted central catheters (PICC) which have few major complications. As correct placement of the tip of these catheters is difficult, intravascular ECG, was used to determine the position of these catheters tip.

Materials and Method: In 105 patients undergoing coronary artery bypass graft, 16 g, 70 cm length catheters (cavafix) were inserted through basilic and median basilic veins. The patients were divided into two groups of right and left hand randomly. Before insertion a guide wire (used in urologic endoscopic surgery) was inserted into the catheters, so that the tip of the wire extended just to the tip of the catheter. The proximal end of the guide wire attached to a chest lead, and the negative electrode of the lead II (right arm) was joined to this chest lead. While advancing the catheter toward the right atrium, the P wave height of the lead II was recorded from the wire on the

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monitoring screen. The tallest P ware was recorded when the tip of the guide wire was close to SA node, which is located at the junction of SVC and RA. The guide wire was removed at this point and the catheter was fixed. The correct position of the catheter tip was confirmed by the surgeon during operation.

Results: In 76 patients (72.4%), the tip of the catheter was located exactly at the junction of SVC and RA. In 14 patients (13.3%), it was within 1 cm of the junction. In six patients (5.7%), the tip of the catheter was not palpated by the surgeon although P wave changes were observed. In 9 patients (8.6%) no P wave changes were detected, and the tip of the catheter was not palpated by the surgeon. In this group, the catheters had been misplaced into the internal jugular veins, that was confirmed after the operation by chest x-ray. In 8 patients of this group, the catheter had been inserted through the right hand.

Conclusion: Placement of PICC is a safe method. We can place the catheters tip in an optimum position by the use of IVECG. Performing this procedure is very easy and does not need much experience. If the catheter is misplaced during insertion, we will be able to detect this problem and we can insert it through other veins.

A-153

Quazepam as preoperative hypnotic decreases resting energy expenditure at pre-induction period

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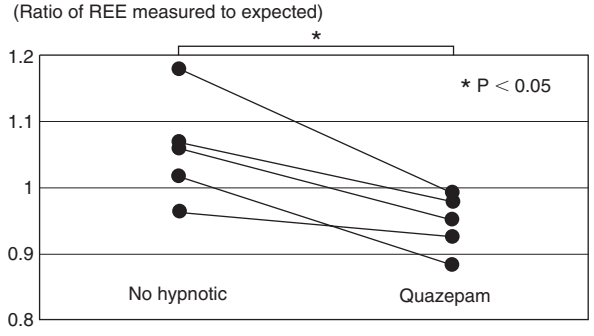
Background and Goal of Study: Premedication such as midazolam (1) or droperidol (2) can influence perioperative hypothermia mainly by affecting preoperative body heat distribution state. However changes in resting energy expenditure (REE) induced by premedication have not been reported. We investigated the efficacy of quazepam, a long acting benzodiazepine often given as hypnotic the night before surgery, to change in preoperative REE.

Materials and Methods: Five healthy male volunteers participated in this study. In a randomized and cross-over design, each volunteer had oral hypnotic (quazepam 30 mg) or no hypnotic on a different day with at least one week interval. Core and mean skin temperature, digital finger tip blood flow and REE were measured on each following morning. REE was measured by using mass-spectrometry AMIS 2000 SP. Paired t-test was used for data comparison between those with and without hypnotic.

Results and Discussions: The ratio of the measured REE to expected energy expenditure by Harris-Benedict formula was significantly lower with hypnotic (0.95 ± 0.04, mean ± SD) than those without hypnotic (1.06 ± 0.08).



Conclusion(s): Quazepam as preoperative hypnotic decreases REE at pre-induction period.

References:

1 Toyota K, Sakura S, Saito Y, et al. Anaesthesia 2004; 59: 116–121.
2 Toyota K, Sakura S, Saito Y, et al. Can J Anaesth 2001; 48: 854–858.

A-154

Experiences with a web-based support system for the preoperative assessment of surgery patients

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Background and Goal of Study: Our goal was to facilitate the preoperative assessment of 18,000 elective surgery patients per year in our hospital, situated in two locations 10 km separated from each other. For each location 2 nurses per day are needed to perform the assessment and the education of patients. Each nurse is scheduled to screen patients 1 or 2 days per week, resulting in at least 10 nurses to be trained. On top of that our 15 anesthesiologists also are supposed to adhere to all the protocols, execute the same procedures, inform patients in a similar way and deliver the compiled information to the anesthesiologist scheduled to perform the anesthesia.

Materials and Methods: In our search for software to ease this challenge, we run into a web-application (WebExpertModule®, WEM), a decision support tool used for triage and supporting call-centre personnel. The functionality of this system corresponds very well with our ideas how to support our preoperative screening.

The WEM facilitates the creation of a chain of questions to collect the needed data and building algorithms to present the right information. It proved to be feasible to 'translate' the National Good Practice Guidance on pre-operative assessment as published by the NHS Modernization Agency into the system.

Another potentially useful feature of the WEM is e-learning, resulting in a reduction of time (and costs) to train nurses.

Beside our primary goal to support and train inexperienced nurses in this assessment process, we hoped to find out whether patients were willing and able to perform their preoperative screening via the Internet.

Results and Discussions: We present and discuss our first experiences with the WebExpertModule in our preoperative assessment setting.

A-155

The vertical difference between the reference levels of central venous pressure and pulmonary capillary wedge pressure in the supine position

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Background and Goal of Study: The most important technical consideration for accurate measurements of central venous pressure (CVP) and pulmonary capillary wedge pressure (PCWP) is appropriate positioning the pressure transducers. The ideal reference levels would be the uppermost fluid levels in the right atrium (RA) and the left atrium (LA) (1). This study was performed to investigate the external reference levels of CVP and PCWP, respectively.

Materials and Methods: Retrospective review of chest computed tomographic images of 96 patients without cardiothoracic surgery and heart disease history and anatomical abnormalities in the thorax was performed. The anteroposterior thickness of the thorax (AP thickness) and the vertical distances from the anterior surface of the sternum to the uppermost portion of the RA (RA depth) and to the LA (LA depth) were measured (Fig. 1).

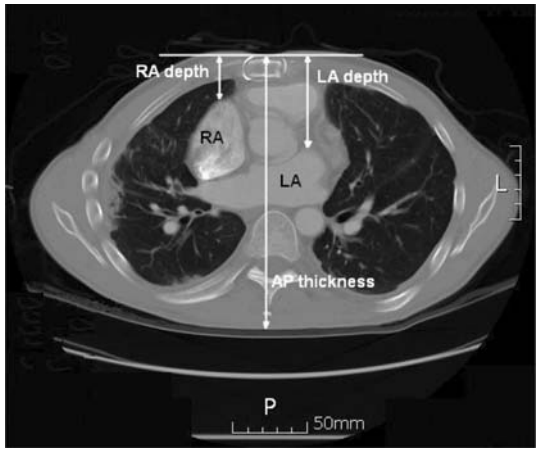

Figure 1.

Results and Discussions: Data are mean ± SD. RA depth was 36.3 ± 8.6 mm, RA depth/AP thickness was 0.17 ± 0.03, LA depth was 82.1 ± 12.1 mm and LA depth/AP thickness was 0.38 ± 0.03. There was significant difference between the RA and LA depths ($P < 0.01$).

Conclusion(s): The pressure transducers should be positioned at the different reference levels (vertical difference of 45.8 mm) to accurately measure CVP and PCWP in the supine position. The external reference levels appear to be about one fifth of the AP thickness of the thorax from the anterior surface of the sternum for CVP and about two fifths for PCWP.

Reference:

1 Courtois M, Fattal PG, Kovacs SJ, et al. Circulation 1995; 92: 1994–2000.

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A-156

A new catheter for detection and treatment of venous air-embolisms (VAE)

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Background and Goal: Due to improved methods of detection VAE is not only a problem in neurosurgical interventions (incidence is up to 80%) but is increasingly diagnosed in laparoscopic, pelvic, orthopedic procedures. In order to reduce the morbidity and mortality of such events through early detection and efficient therapy a central venous catheter with an integrated Doppler probe (Schregel-Catheter) was developed. Using the Schregel-Catheter (SC) it is possible to safely and reliably recognize even smallest air-bubbles [2]. Our aim was to improve the air-recovery capacity of the SC by a multiorifice-design.

Materials and Methods: We used the circulation model that was developed by Bunegin and Albin [1] in order to evaluate the Bunegin-multiorificed-Catheter. Our test-protocol was also similar to the experiments of Bunegin et al. Beside the improved SVC we tested the 16 G Vygon standard single-lumen catheter, the Arrows 14 G standard double-lumen catheter, the Vygon 8 Fr single-lumen multiorificed Shaldon-catheter and the 14 G Bunegin multiorificed catheter. All catheters were tested by injecting 10 mls of air in the superior vena cava (SVC) of the circulation model. It was then tried to aspirate the air by the catheters positioned above the SA-junction in the SVC. All catheters were tested at atrial inclinations of 60°, 80° and 90° simulating the seated or half-seated position. The catheters were compared by the percentage of air recovery.

Results and Discussion: The air aspirated was compared by analysis of variance (ANOVA) and Tukey's multiple comparison, the improved SC was best with $p < 0.05$ for all combinations. The rank order of the air aspiration capacity in this comparison: SC (92%) > Vygon Shaldon-catheter (83%) > Bunegin-Catheter (73%) > Arrows double-lumen (58%) > Vygon single lumen (25%). As expected, the multi-orificed catheters were more efficient in this test than the single-orificed.

Conclusion(s): The experiments showed the efficacy of the improved Schregel-Catheter for treatment of air embolism. Apparently, after the improved multiorifice-design, the Schregel-Catheter proofed even more efficient than the gold-standard, the Bunegin-Albin-Catheter.

References:

1 Bunegin L, Albin MS, Helsel PE, et al. *Positioning the right atrial catheter: a model for reappraisal.* Anesthesiology, 1981. **55**(4): p. 343–8.

2 Volk O, Schnitker W, Brass P, et al. [Detection of air embolism by a re-usable Doppler probe integrated in a central venous line-application in-vivo]. Anaesthesist, 2002. **51**(9): p. 716–20.

A-157

Reference point for central venous pressure measurement in lateral decubitus position

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Background and Goal of Study: The intersecting point between the fourth intercostal space and the midaxillary line (phlebostatic axis) is used as a reference point for measuring the central venous pressure (CVP) in the supine position. Lateral decubitus position may be accompanied by positional shifting of the heart and great vessels. Accordingly the phlebostatic axis may also shift in the lateral decubitus positions. The aim of our study is to establish the reference points in lateral decubitus positions.

Materials and Methods: Forty patients scheduled for thoracotomy were enrolled in the study. Using the CT scan, the vertical distance from the anterior chest wall to the uppermost point of the right atrium was measured and was used as a reference point of CVP in the supine position. In right or left lateral decubitus positions, the reference point was determined as the level at which CVP was identical to that in the supine position. Mann-Whitney Rank Sum test was used for statistical analysis.

Results and Discussions: In the right lateral decubitus position, the reference point was higher compared to the supine position (15.6 ± 0.6 cm vs 13.9 ± 0.3 cm, $p < 0.05$). However, there was no statistical difference in the reference point between the left lateral decubitus position and the supine position. Data were expressed mean ± standard deviation.

Conclusion(s): In the right lateral decubitus position, the level of the transducer should be placed higher than in the supine position.

A-158

Ulnar artery versus radial artery approach for continuous arterial monitoring: a prospective comparative study

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Background and Goal of Study: Although radial artery cannulation is considered as the standard technique for hemodynamic monitoring, it has been mentioned as the dominant artery of the hand (1,2). The primary concern about using the ulnar artery as the first choice may be its deeper location compared to the radial artery and the risk of injury to the ulnar nerve. The purpose of this study was to evaluate clinical outcomes comparing ulnar and radial approaches in continuous arterial monitoring.

Materials and Methods: One hundred patients (ASA 1–3, aged 18–65 yr) were randomly divided into two groups, 50 in each (radial and ulnar cannulation groups). Presence and fullness of artery pulses (strong-weak-no pulse), success rate of cannulation, the time of successful catheter insertion, difficulty of cannulation, and complications were noted. Modified Allen test and reverse allen test was performed before cannulation. Data were compared with analysis of variance, chi-square, Fisher's exact test where appropriate. $p < 0.05$ was considered statistically significant

Results and Discussions: Total success rate of cannulation for ulnar and radial artery was 76% and 86% respectively ($p > 0.05$). Time for successful cannulation in ulnar and radial group was 30.2 ± 27.2 and 31.8 ± 35.0 sec, respectively ($p > 0.05$). Number of patients with a strong radial artery pulse was higher than number of patients with a strong ulnar artery pulse ($p < 0.01$). There were significant differences in cannulation success rate between patients with strong and weak pulses of ulnar artery ($p < 0.0001$). Success rate of cannulation in patients with a strong ulnar artery pulse was 100%. Complication rates were also similar between groups ($p > 0.05$).

Conclusion(s): Our study suggest that ulnar artery may be chosen as a first cannulation side for continuous hemodynamic monitoring especially in patients with a strong ulnar artery pulse.

References:

1 Mark JB, Slaughter TF, Reves JG. Cardiovascular monitoring. In: Miller RD, ed, Anesthesia, 5th edn. Philadelphia: Churchill Livingstone, 2000, 117–1206.

2 Hearle M, et al. *Plast Reconstr Surg* 2003; 111(6): 1891–8.

A-159

Intraoperative arterial hypotension recorded by an electronic anesthesia record

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Introduction: Since 2005, we introduced an electronic anesthesia record keeping system. In order to evaluate the benefits arising from automatic recording of all intraoperative events, we extracted from our database all episodes of intraoperative hypotension and analysed the risk factors of this event. This issue may become the more important, as recently, intra-operative hypotension was found to be an independent predictor of one-year mortality (1).

Patients and Methods: From January 2005 till November 2005, all anesthesia data collected in 2 neurosurgical OR suites from adult patients scheduled for elective surgery under general anesthesia were reviewed. These data included as well all vital parameters registered during anesthesia, as patient's characteristics and anesthetic technique. Arterial hypotension was defined as one measure of systolic blood pressure below 90 mmHg. All data underwent univariate and multivariate analysis.

Results: A total of 1865 pts were selected. The overall incidence of intra-arterial hypotension was 15.3%. The most relevant associated factors were age, ASA, induction period of anesthesia (first 15 min after induction) and non-invasive blood pressure measurement. Patients receiving invasive arterial pressure management had a significantly lower risk of developing arterial hypotension. In these patients, incidence of arterial hypotension was 7.8%. There were no differences in other patient characteristics (such as age or ASA classification) between patients with or without invasive arterial pressure monitoring. The main reason for invasive monitoring was related to the type of surgery (f.i. intracranial surgery).

Conclusion: Overall, we found an acceptable, referring to the existing literature, incidence of arterial hypotension. Nevertheless, we were surprised by the difference in incidence of hypotensive episodes between patients with or without invasive pressure monitoring.

Reference:

1 Monk et al., Anest Analg, 2005.

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A-160

Acute pain unit: an informatic model of patient's follow-up

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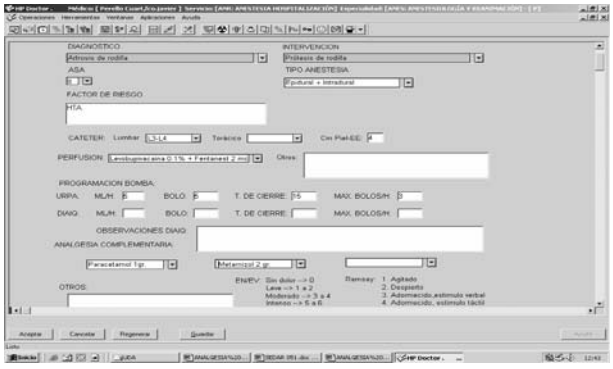
Background and Goal of Study: The implementation of Electronic Medical Records (EMR) requires local development of multiple links among data, forms and programs, adapted to the procedures of each hospital. Supported on our Hospital Information System (HP-Doctor-Hewlett Packard) we developed a computerized form to record Acute Pain Unit follow-up data (EMR-APU form).
Materials and Methods: In May 2004 we launched at our hospital the EMR-APU form. It has the following features: 1) Started in the operating room by the anaesthesiologist, who prescribes the postoperative analgesia. 2) It permits input, output information coming from each one of the staffs involved (doctors and nurses), gathering and linking all the info obtained. 3) Mainly input variables: Numeric pain score pattern, adverse effects and treatments. 4) Special ward round report containing APU data, vital signs and doctor's and nurse's observations. 5) Spread list fields: Diagnostic, Surgical an Anaesthetic Procedures, Analgesic techniques, Drugs, Adverse effects and Treatments. All data except information from free text fields may be managed.
Results: From May 2004 to October 2005 we have recruited 1519 patients. We show an extract of our dynamic AMR-APU form (print screen).



Conclusion: The EMR-AU form allows to asses analgesic procedures guaranteeing the patient's safety. The connection between APU form and EMR improves the level of input-output-information for those involved in patient's care. The management of data allows us to evaluate the outcomes of effectiveness and safety of APU treatments.

A-161

The cuff method: a new device to monitoring neuromuscular function

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Background and Goal of Study: A new method of monitoring neuromuscular blockade based on a modified blood pressure cuff[1,2] that incorporates stimulating electrodes was compared with mechanomyography (MMG) 'gold standard'.
Materials and Methods: 100 adults (ASA I–II) underwent neuromuscular blockade monitoring on the contralateral using the new cuff method and MMG. Only train-of-four (TOF) ratios >0.1 and T1 heights >0 were studied. A device based on a PC with an analogue-to-digital conversion card was used to control and synchronize MMG and the cuff method. The agreement between both methods was assessed using the statistical method of Bland and Altman.
Results and Discussions: When TOF ratios were >0.9, the bias between the two methods was −0.09 with the limits of agreement ranging from −0.14 to 0.10 (95% CI 0.08 to 0.1). The T1 >0 heights bias was −0.016 with the limits of agreement ranging from −0.29 to 0.22 (95% CI 0.001 to 0.03). The sensitivity of the cuff method for a TOF ratio >0.9 was 1%, with a specificity of 92% and an accuracy of 94%[3].
Conclusion(s): This study indicates that the cuff method could be useful to monitor neuromuscular blockade according to the bias and limits of agreement compared with MMG, particularly when the degree of blockade was evaluated by TOF ratios >0.9. The new cuff method is easy and simple to use. Further studies in a larger number of patients are necessary to confirm these favourable results.

References:
1 Eriksson LI. Evidence-based practice and neuromuscular monitoring. It's time for routine quantitative assessment? Anesthesiology 2003; 98: 1037–9.
2 Rodiera J, Serradell A, Alvarez-Gomez JA, et al. The cuff method: A new method to monitoring neuromuscular blockade. Acta Anesthesiol Scand 2005; 49: 1552–8.
3 Kern SE, Johnson JO, Westenskow DR, et al. An effectiveness study of a new piezoelectric sensor for train-of-four measurements. Anesth Analg 1994; 78: 978–82.

A-162

The effect of lateral decubitus position on intraocular pressure in anesthetized patients undergoing lung surgery

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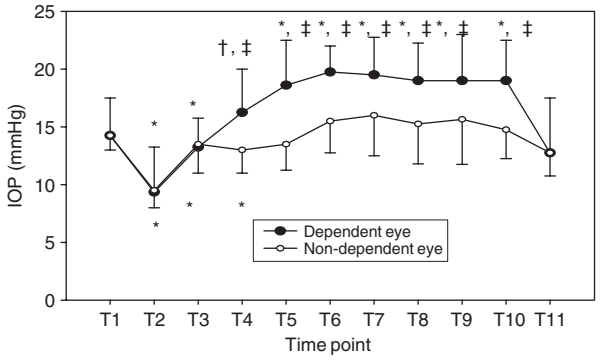
Background and Goal of Study: Changing body position alters intraocular pressure (IOP). The aim of this study was to investigate alteration of IOP in two eyes after positional change from supine position to lateral decubitus position (LDP) in anesthetized patients and to detect differences of IOP between two eyes, due to probably gravity effect, in LDP.
Materials and Methods: IOP was measured in 20 patients undergoing lung surgery. The IOP in both eyes was recorded prior to anesthesia in supine position (baseline, T1), after anesthetic induction but before tracheal intubation in supine position (T2), at the end of central venous catheterization in Trendelenberg down position (T3), 5 minutes after positional change to LDP (T4), and then once every 30 minutes until the end of surgery in LDP (T5–10), and 5 minutes after re-supine position (T11).
Results and Discussions: Data are expressed as Median and 25–75% percentile, and shown in the figure.



*: $p < 0.01$ vs. baseline, †: $p < 0.05$ vs. baseline, ‡: $p < 0.01$ vs. non-dependent eye.

Conclusions: The IOP was higher in dependent eye than that in non-dependent eye in anesthetized patients during LDP, and the IOP in dependent eye increased in anesthetized patients placed LDP, compared with awakened and supine positioned patients.

References:
1 Hunt K. J Neurosurg Anesthesiol 2004; 16: 287–90.
2 Cheng MA. Anesthesiology 2001; 95: 1351–5.

A-163

Calibrated vs. uncalibrated acceleromyography to assess neuromuscular recovery: a Bland-Altman-analysis

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Background and Goal of Study: It remains controversial whether calibration influences the accuracy of train-of-four-ratio (TOFR) measurements to assess residual paralysis with an acceleromyograph (AMG) (1,2). Aim of this study was to assess the agreement of TOFR-measurement with an individually calibrated AMG vs. a standard intensity (50 mA) before emergence from anaesthesia.
Materials and Methods: IRB-approved observational study in 50 patients receiving a total intravenous anaesthesia. Before anaesthesia a TOF-Watch SX® AMG with hand adapter (Organon Ireland Ltd., Dublin, Ireland) was placed in typical style. After induction calibration of the AMG at optimal intensity (CAL2-Modus) followed by injection of a single dose of atracurium (0.5 mg/kg) and intubation. TOFR (2 Hz duration, 4 pulses of 0.2 ms) was monitored in a 15 s-interval continuously. At the end of surgery the AMG was switched off. One minute later two additional uncalibrated measurements with

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standard intensity (50 mA) were made at the same hand. Bias, precision, and limits of agreement of the last calibrated (CAL) vs. the second uncalibrated AMG measurement (UNCAL) using a Bland-Altman-analysis were made (3).
Results and Discussions: Data of all patients were analyzed. Mean duration of surgery was 112 min (range 43–313 min).

TOFR CAL (mean %, range)	103 (30–116)
TOFR UNCAL (mean %, range)	102 (42–132)
Bias ± SD (%)	−0.42 ± 8.16
Upper/lower limit of agreement (%)	−20.1/21.1
Precision ± SD (%)	6.4 ± 7.7

Conclusion(s): These preliminary data show that there may be a variability between calibrated and uncalibrated measurements of TOFR. The wide limits of agreement suggest that uncalibrated AMG did not allow to detect moderate degrees of residual paralysis (TOFR < 0.9) reliably.
References:
1 Baillard C et al. *Anesth Analg* 2004; 98: 854–7.
2 Capron F et al. *Anesthesiology* 2004; 100: 1119–24.
3 Bland JM, Altman DG. *Lancet* 1986; 8476: 307–10.

A-164

Acceleromyography in children: influence of stabilization method on pharmacodynamic results

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Background and Goal of Study: In neuromuscular transmission monitoring, repeated indirect stimulation might enhance the evoked mechanical response of the stimulated muscle[1]. Recalibration and tetanic stimulation (50 Hz for 5 s) are methods used to stabilize baseline signal[2]. We studied the effect of these stabilization methods on pharmacodynamic (PD) results in children.
Materials and Methods: After Ethical Committee approval and written parental consent, 45 children (2–10 yrs) scheduled for elective surgery were included. Standard anesthesia procedures (remifentanil-propofol) were followed. Neuromuscular blockade (NMB) was obtained with a bolus of rocuronium (0.4 mg/kg). NMB was measured simultaneously at both hands (TOF Watch SX). The adductor pollicis muscles of both hands were stimulated in a train of four (TOF) mode. Three groups were studied: initiating tetanic stimulation (Group T, n = 15), recalibration to 100% after 3 min (Group R, n = 15) and prolonged stabilization period of 10 min (Group S, n = 15). The signals of the contralateral registrations were used as control (Group TC, RC, SC, n = 3 × 15). PD data were assessed during onset and recovery of NMB.

	T	R	S	TC	RC	SC
Onset (min)	2.1 (0.5)*	3.4 (1.0)	3.2 (1.0)	3.2 (1.0)	3.2 (0.8)	3.4 (1.5)
Max block (%)	99 (2)	97 (4)	98 (4)	94 (9)	98 (4)	99 (2)
RI (min)	8.3 (2.6)*	6.5 (1.3)	5.4 (1.3)	6.4 (1.8)	6.4 (1.5)	5.9 (1.5)
TOF 0.7 (min)	21.4 (4.1)	23.7 (5.9)	21.6 (3.1)	21.3 (4.5)	23.5 (6.4)	22.7 (2.8)
TOF 0.9 (min)	26.3 (5.4)	28.5 (5.3)	26.0 (5.9)	25.6 (5.4)	27.6 (7.4)	26.2 (3.4)

Results and Discussions: All groups were comparable for age, sex, weight and duration of operation.
Values are mean (SD). *: $p < 0.05$ vs. all other groups.
$RI_{25–75\%}$ = Recovery Index (difference in time from T_{25} to T_{75} of the initial T_1). The results in the T group differed both for onset and recovery data when T1 is used for analysis.
Conclusion: Correct interpretation of PD results based on T1 values is not possible without indication of the stabilization procedure used.
References:
1 Kopman AF et al. Anesthesiology 2001;95:403–7.
2 Lee GC et al. Anesthesiology 1997;86:48–54.

A-165

Is Sevoflurane an ideal drug for anesthetic induction?

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Background and Goal of Study: As a result of previous studies which noticed motor reactions shortly after Sevoflurane induction and tracheal intubation we proposed neuromuscular monitoring during this first step of general anesthesia.
Materials and Methods: After Ethics Committee approval and written Informed Consent, 65 patients, ASA I–II, 20–50 years old, BMI = 20–25 kg/m^2, undergoing elective abdominal surgery under general anesthesia, were double blind, randomly divided in 2 groups: group P (32 patients) – Placebo and group R (33 patients) – Rocuronium. All patients were premedicated i.v. before induction with Midazolam 0.03 mg/kg and Fentanyl 1.5 μg/kg. Full monitoring including Bispectral index (BIS, Aspect Medical) and neuromuscular blockade (TOF-Watch, Organon Teknika) was performed. After priming the circuit with Sevo 8% for 2 minutes anesthesia was induced with Sevo 8% in O_2 100%–8 l/min using tidal-breathing technique. When BIS = 40–45 and end-tidal Sevo gained 3.5% for 2 minutes, group P received saline i.v. 0.03 ml/kg and group R received Rocuronium 0.3 mg/kg. Tracheal intubation was performed by a trained anesthesiologist at 60 s whatever the value of TOF. Tracheal intubating conditions were assessed by a blinded anesthesiologist at 30 s using GCRP in Studies of Neuromuscular Blocking Agents (Viby-Mogensen & coll. 1996). Data were considered significant at $P < 0.05$; Fisher exact test was used for evaluation of intubating conditions.
Results and Discussions: Intubating conditions were clinically acceptable (excellent or good) and TOF/T3 in 93.75% of patients group R *vs*. 66.7% group P. Mean difference is 27.05%. Standard error of mean was 9.32 and the 95% confidence interval from 8.77% to 35.82% with a two tailed mid P = 0.01.
Conclusion(s): During induction with high dose of Sevo despite a long (3 min) and profound level of hypnosis (BIS = 40) the value of TOF remained around 110% ± 8. Regarding neuromuscular monitoring Sevo alone does not provide excellent conditions for tracheal intubation at young patients; to facilitate intubation a small dose of nondepolarizing drug is advisable at this category.
Reference:
1 Motamed C., Kirov K., Duvaldestin P. Observations with the TOF-Watch/Guard on train-of-four fade during onset of relaxation, *EJA* 2001, **18**, 267–269.

A-166

The perioperative comparison of efficacy of forced air warmer and radiant warmer

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Background and Goal of Study: The forced-air warming device is the most commonly used method of active perioperative warming. A new radiant warming device functioning by focused radiant heating of arteriovenous anastomoses rich sites may provide an alternative. The goal of our study was to compare the efficacy of the radiant device Suntouch (Fischer and Paykel, Healthcare, PW 820) and forced air warming device Warmtouch (MSM).
Materials and Methods: The surgical patients scheduled for abdominal surgery with duration of operation anticipated to be greater than 2 hours were enrolled. The patients were allocated randomly to either Warmtouch (W) or Sountouch (S) warming device. The devices were set according to manufacturers recommendations. After induction of anaesthesia the bladder catheter with termistor was inserted to monitor core temperature (C), electronic thermometers were used to measure axillary temperature (A), temperatures were measured in 10 minutes intervals. Mann-Whitney U test was used to compare baseline parameters between groups, changes in temperatures over time were compared using ANOVA test.
Results and Discussions: 13 pts in group W and 14 pts in S were included. Results are summarized in Table, demographic as median (and min-max), temperatures (°C) as mean (and 95% confident intervals) of all measurements. Statistically significant lower C temperatures during surgery were measured in patients warmed by Suntouch methods. The course of axillary temperatures did not differ between groups (p = 0.9).

	Warmtouch	Suntouch	p
Age	47 (20–82)	63 (41–88)	0.08
Body weight	80 (60–93)	70 (50–102)	0.45
Duration of surg.	220 (90–460)	170 (70–440)	0.46
Initial C	36.4 (36.2–36.6)	36.3 (36.1–36.5)	0.66
Perioperative C	36.6 (36.5–36.6)	36.1 (36.1–36.6)	0.01

Conclusion(s): The Suntouch method is less effective in maintaining the perioperative body temperature than forced air method.

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A-167

Complex Myograph: a novel clinical measuring device allows to analyse the consecutive steps of muscle function on a molecular level

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[2]*Institute of Physiology, University of Wuerzburg, Germany*

Background and Goal of Study: Anaethesists intraoperatively influence the muscle function with drugs or are confronted with a number of muscular problems on an intensive care unit, but they have no tools to satisfyingly measure them. A technical solution is presented here which measures the classical electrophysiological parameters together with the whole spectrum of muscular mechanics.

Materials and Methods: The experiments in this study were conducted on the *musculus adductor pollicis*. which has been stimulated indirectly by means of supra-maximal nerve pulses. By means of a laser beam the extremity of the test object could be adjusted and by an automatic setting design hold into position. Two adjustable stopping mechanisms could independently restrict the maximum and minimum length of a muscle during each experiment which thus could be performed at any physiological sarcomer length. An electromagnetic and contact free counterforce unit could expose the muscle with definable pre- and afterloads which stayed constant independently of the status of contraction, velocity, and acceleration. The measurements were simultaneously performed by eight electrical and mechanical sensors. The device is non-invasive and internationally patented.

Measurements on 700 healthy test subjects were conducted.

Results and Discussions: With this diagnostic device it was possible to investigate over 50 parameters on different levels of the neuromuscular function: parameters for the membrane functionality, the endplate transmission, the electromechanical coupling, the time of actin-myosin interaction, and different aspects of myosin capacity, as well as the mechanics of serial and parallel elastic elements. Standard values with standard deviation were determined.

Conclusions: By these means, the technical requirements for quantitative and accurate reports about the individual efficiency of the contractile proteins and its interaction with other cellular structures of a person and the changes to this capacity through time, have been created for the first time. This has yielded new perspectives for the diagnos is and therapy control of muscle illnesses and the monitoring of influences of drugs on the muscular function.

A-168

Quantitative study of the peripheral sensory dysfunction in lumbosacral radiculopathy with Neurometer CPT-test

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Background and Goal of Study: Lumbosacral radiculopathy (LR) is a pathology characterized by pain and peripheral sensory abnormalities. The aim of this study was to evaluate the amount of peripheral impairment and its variations using Neurometer CPT-test.

Materials and Methods: After informed written consent we recruited 48 patients (Group LR) suffering from discal herniation at L4–L5 or L5–S1 according to a MRI and 48 healthy subjects (Group NLR). Patients suffering from neuromuscolar, neurological, psychiatric and tumoral diseases were excluded. The patients were both male and female, aged 53 $\pm$ 6, complaining of dysaesthesia at inferior limbs for more than 8 months and VAS 4–8. After collecting the patient's history and after the neurological assessment, we measured pain using SF-MPQ and VAS. In a period, 6 months long, the physical therapy was administerd during regular sessions: lasertherapy, magnetotherapy TENS and drugs to reduce the pain were prescribed, in order to be administered on request. The Neurometer CPT-test was executed, testing 5 cutaneous sites at the first session (T0) and at the end of the treatment (T1),

The Statistical Analysis was carried out using independent and paired samples *t*-test. $P < 0.05$ was significant with a power of 80%. The statistical data were examined using the software SPSS version 12.0 for Windows XP.

Results and Discussions: Our results showed that the group NLR had no peripheral sensory dysfunction (Grade 0); the group LR at T0 had a severe peripheral sensory dysfunction VAS 6 $\pm$ 2 (Grade 7 $\pm$ 1) and at T1 had a moderate peripheral sensory disfunction VAS 5 $\pm$ 1 (Grade 6 $\pm$ 0.5).

Conclusion(s): Neurometer CPT-test is an useful device in order to evaluate the grade of a peripheral sensory dysfunction and the treatment efficacy.

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Clinical and Experimental Circulation

A-169

Predictive value of different non-invasive tests to determine perioperative complications after myocardial revascularization using the radial artery

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Background and Goal of Study: Perioperative vasospasm as well as perfusion deficits in the upper extremity after myocardial revascularization with the radial artery are well known complications. Duplex sonography has been shown to determine the quality of the vessel but no information is given on the functionality of the graft. Therefore we developed a modified Allen test using thermoprovocation.

Materials and Methods: After approval by the ethical committee sixty-five pts. (90% male, 59 $\pm$ 8 yrs) who received myocardial revascularization using a radial artery were included into the study. In all pts., the Allan test, pulse oxymetry under thermo provocation as well as a duplex sonography were performed preoperatively.

Results and Discussions: In 65 pts. the radial artery was used. Sensitivity of the standard Allen test concerning perioperative complications was 36% with a specificity of 72%. There was no correlation between the Allen test and the Doppler pressure, but a small diameter correlated well with the delay in the Allen test ($p < 0.05$). Thermoprovocation led in 6 pts. to a pathological Allen test with a myocardial infarction in 3 of them. Fourteen pts. with normal Allen tests showed sensibility or motoric disorders, which resolved completely before discharge. In 2 pts. the radial artery was not used since no ulnary artery was found in the duplex despite a normal Allen test.

Conclusion(s): Our results demonstrate that a preoperative duplex sonography seems to be the only reliable tool to determine the blood supply of the extremity. To evaluate the risk for perioperative vasospasms the Allen test should be combined with thermoprovocation.

A-170

Pretreatment by hyperoxia improves myocardial contractility after coronary artery bypass grafting

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Background and Goal of Study: Ischemic preconditioning protects myocardium against ischemia-reperfusion (IR) injury. Similar beneficial effects have been reported after pretreatment with hyperoxia in animal experiments (1,2). We investigated the effect of hyperoxic pretreatment on the human heart.

Materials and Methods: 40 patients undergoing coronary artery bypass grafting were ventilated with either FiO_2 0.4 or 1.0 before cardiopulmonary bypass (CPB). Blood for Tn I and CK MB mass was sampled from arterial and coronary sinus cannulae before CPB, and at 1, 5, 10, 20 min of reperfusion. Additional arterial samples were drawn at 60 min and on the 1st postoperative morning. Cardiac index (CI), right and left ventricular stroke work indices (RVSWI, LVSWI) were measured before sternotomy, 15 min and 1, 2, 4, 6, 9, 12 hours after CPB.

Results and Discussions: Release of Tn I and CK MB did not differ between groups. Hemodynamic data (mean $\pm$ SD) are shown on the figure as a change from baseline (ΔCI-panel A, ΔRVSWI-panel B). ΔLVSWI and heart rate did not differ between groups.

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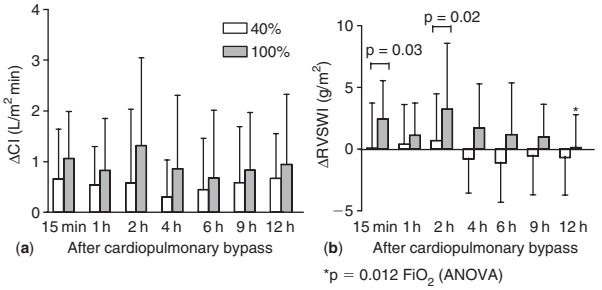

Conclusion: Preconditioning by hyperoxia improves the contractility of the heart after cardioplegic arrest.

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A-171

Tolerance to acute normovolemic hemodilution with coronary artery disease depends on heart rate as determinant for myocardial oxygen consumption

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Introduction: The effects of acute normovolemic hemodilution (ANH) on myocardial function in patients with coronary artery disease still are not fully elucidated. We hypothesized that in these patients tolerance to ANH might depend on determinants of myocardial oxygen consumption. To test this hypothesis we evaluated myocardial function before and after ANH at two different heart rates.

Materials and Methods: 30 elective coronary surgery patients received a midazolam based anesthesia. In group A (n = 20), heart rate was paced at 90 bpm. In group B (n = 10), heart rate was paced at 70 bpm. A pressure microcatheter was inserted in the left ventricle (LV). The measurements consisted of recordings of electrocardiographic and LV pressure tracings during an increase in systolic and diastolic pressures, obtained by leg elevation. Measurements were obtained before and after ANH. Data were compared using paired t-test. All data were expressed at mean ± SD. Data were considered significant if $p < 0.05$.

Results: After ANH, cardiac output increased in both groups. This was associated with a significant decrease in systemic vascular resistance. In group A, dP/dt_{max} decreased significantly after ANH (from 975 ± 167 to 843 ± 91 mmHg/sec). In group B, dP/dt_{max} was not significantly altered after ANH. The change in dP/dt_{max} with leg elevation was significantly lower after ANH in group A (from 66 ± 31 to −20 ± 45 mmHg/sec), but was unchanged in group B. Rate of isovolumic relaxation was significantly slower after ANH in group A (time constant τ increased from 59 ± 6 to 65 ± 5), whereas in group B, τ was similar before and after ANH.

Conclusion: In patients anesthetized with midazolam, pacing at 90 bpm during ANH was associated with depression of myocardial function which was not present in patients paced at 70 bpm.

A-172

The use of a volatile anesthetic regimen protects against acute normovolemic hemodilution induced myocardial depression in patients with coronary artery disease

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Introduction: Preliminary results(1) indicated that acute normovolemic hemodilution (ANH) was associated with a depression of myocardial function in coronary surgery patients. It was suggested that this phenomenon would be explained by the occurrence of myocardial ischemia. In the present study we hypothesized that the cardioprotective properties of a volatile anesthetic regimen might protect against the ANH related myocardial functional impairment.

Materials and Methods: 30 elective coronary surgery patients received a sevoflurane based anesthesia. In group A, heart rate was paced at 90 bpm. In group B, heart rate was paced at 70 bpm. A pressure microcatheter was inserted in the left ventricle (LV). The measurements consisted of recordings of electrocardiographic and LV pressure tracings during an increase in systolic and diastolic pressure, obtained by leg elevation. Measurements were obtained before and after ANH. All patients included were paced at 70 bpm. Data were compared using a paired t-test. All data were expressed as mean ± SD. Data were considered significant if $p < 0.05$.

Results: After ANH, cardiac output increased significantly in both groups. This was associated with a significant decrease in systemic vascular resistance. The variables of myocardial contractility (dP/dt_{max} and the change in dP/dt_{max} with leg elevation) remained unchanged in both groups with ANH. Rate of isovolumic relaxation increased significantly after ANH in group A (time constant τ increased from 60 ± 5 to 64 ± 5), but not in group B.

Conclusion: In patients anesthetized with sevoflurane, pacing at 70 bpm during ANH did not result in depression of myocardial function. With pacing at 90 bpm, systolic function remained preserved but rate of myocardial relaxation was slower after ANH.

Reference:

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A-173

Osteoprotegerin predicts perioperative myocardial lesion in patients undergoing coronary artery bypass grafting

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Background and Goals: We investigated whether osteoprotegerin (OPG), involved in arteriosclerosis and bone formation, is able to identify patients at risk for perioperative myocardial infarction measured as cardiac troponin I and signs of myocardial ischemia in the ECG after coronary artery-bypass grafting (CABG).

Material and Methods: In this observational study, we investigated 97 patients (67 m/30 f) aged 66.8 ± 9.4 years undergoing elective CABG. Blood samples were obtained before surgery at induction of anesthesia and approximately 24 hours later. ECG was done before and immediately after CABG. OPG was measured by ELISA (Biomedica, Vienna, A). Correlations were calculated by Pearsons Rank test and a logistic regression analysis was performed to estimate predictive value. A $p > 0.05$ was regarded as significant.

Results: OPG before CABG (OPG pre) correlated highly with cTNI after 24 hours ($r = 0.7727$, $P < 0.0001$). OPG pre correlated with signs of ischemia in the ECG after surgery ($r = 0.65$, $p < 0.0001$). There was a positive correlation between OPG pre and the number of bypasses ($p < 0.0001$; $r = 0.95$). Patients were divided into two groups: no myocardial infarction (NOMI) and signs of myocardial infarction (MI).

	NOMI	MI	p
OPG (pmol*L^{-1})	9.48(3.67/14.5)	24.9(22.6/27.8)	<0.001
cTNI12 (μg*L^{-1})	2.58(1.59/4.38)	6.47(2.81/12.1)	0.005
cTNI 24 (μg*L^{-1})	2.67(1.70 /5.30)	16.5(10.0/22.6)	<0.001

Values are given as median (lower/upper quartile)

Conclusions: OPG appears to be a useful marker in estimating risk for perioperative MI in patients undergoing CABG, as demonstrated by signs of ischemia in the ECG.

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A-174

Effects of different mean arterial pressures on fluid extravasation during cardiopulmonary bypass in piglets

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Background and Goal of Study: The factors held responsible for fluid accumulation during cardiopulmonary bypass (CPB) are hemodilution, hypothermia and possibly inflammation. We wanted to evaluate the effect of

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different mean arterial pressures (MAP, mmHg) on fluid extravasation during CPB in piglets.

Materials and Methods: 30 anaesthetised piglets underwent 60 min normothermic and 90 min hypothermic CPB before they were killed. CPB flow rate was set to 110 ml/kg/min. Fluid was added to keep a constant level in the machine reservoir. During CPB, 13 animals were given high MAP by norepinephrine (HP) while 9 animals had low MAP by nitroprussid (LP-N) and 8 animals had low MAP by phentolamine (LP-P). Fluid balance, hemodynamics, serum albumin (g/l) and plasmavolumes (CO-methode) (PV, ml/kg) were measured. Fluid extravasation rate (FER, ml/kg/min) was calculated. Statistical analysis by repeated measurements analysis with posttests (SPSS 13) Results as mean (SD).

Results:

Time on CPB (min)	0	60	150
MAP			
HP	53.6(8.8)	66.6(5.1)***	74.7(6.8)***
LP-N	59.3(5.5)	42.1(3.3)	42.2(4.5)
LP-P	60.6(4.4)	42.1(3.3)	43.5(2.7)
Alb			
HP	27.3(2.8)	19.5(3.3)	15.8(2.6)
LP-N	26.2(3.1)	16.9(1.9)	13.0(2.4)
LP-P	27.0(2.9)	16.4(3.1)	13.0(3.1)
PV			
HP	51.3(4.3)	44.5(9.9)*	59.1(13.4)
LP-N	51.5(5.6)	51.4(6.6)	65.1(9.6)
LP-P	57.5(5.3)	61.0(11.7)	71.8(11.6)
FER			
HP	0.26(0.07)	1.37(0.6)	1.21(0.6)
LP-N	0.21(0.06)	1.20(0.5)	0.80(0.3)
LP-P	0.24(0.1)	1.55(0.8)	0.85(0.2)

***: $P < 0.001$ compared with the other groups, same time.
*: $P < 0.05$ compared with the LP-P, same time.

Only statistics for between group differences are included.

Conclusion: In this model, different MAP did not have a significant impact on fluid extravasation during CPB.

A-176

The application of norepinephrine reduces 6-hour mortality at the critical hemoglobin concentration

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Background and Goal of Study: The limit of normovolemic anemia is characterized by 1) a disparity of oxygen (O_2) demand and O_2 delivery, and 2) circulatory failure due to a fall of coronary perfusion pressure. The aim of the present study was to investigate, whether the sole stabilization of CPP with norepinephrine (NE), i.e. without simultaneous red blood cell transfusion, could prevent death of otherwise lethal normovolemic anemia.

Materials and Methods: 14 anesthetized pigs were hemodiluted by exchange of whole blood for 6% hydroxyethyl starch (200,000:0.5) until the individual critical hemoglobin concentration ([Hb_{crit}]) was met. For the next 6 h, animals were either observed without further intervention (control group), or their mean arterial pressure was maintained by adapted infusion of NE (NE group). The main outcome parameter was the 6 h-survival rate in both groups.

Results and Discussions: All animals of the control group died within the 6-hour observation period. In contrast 6 of the 7 animals of the NE group survived ($p < 0.05$; control vs. NE). Parameters of macrohemodynamics (mean arterial pressure, cardiac index) and oxygen transport (oxygen delivery, oxygen consumption) improved significantly after initiation of the NE infusion, whereas parameters of peripheral tissue oxygenation (tissue oxygen partial pressure of skeletal muscle, arterial lactate concentration, arterial base excess) only slightly improved after initiation of the NE infusion. However, all favourable effects of NE infusion diminished throughout the 6 h-observation period.

Conclusion(s): Application of NE increases short term tolerance to acute anemia. However, this increase of survival is accompanied by a redistribution of nutritive organ blood flow, limiting the benefit of NE to organs of central circulation for a short period of time.

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2 Meier, et al., Anesthesiology 2004, 100:70–76.

A-177

Perioperative outcome after Aortic arch repair with standardized deep hypothermic circulatory arrest: role of a multimodal protocol to enhance perioperative organ protection

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Background and Goal of Study: Aortic arch repair (AAR) requiring deep hypothermic arrest (DHCA) is still associated with significant mortality (10%–25%)[1], end-organ injury[1–3], and major variations in DHCA technique. AAR – DHCA at our institution has been standardized.[2–3] The purpose of this study was to evaluate perioperative outcome in adults <70 years after AAR with standardized DHCA.

Materials and Methods: With IRB approval, all adults <70 years undergoing AAR-DHCA (1999–2002) were studied. Standardized DHCA[2–3] included an antifibrinolytic, a balanced anesthetic technique, transesophageal echocardiography, anticoagulation with heparin, cooling on cardiopulmonary bypass (CPB) to an isoelectric electroencephalogram, retrograde cerebral perfusion, and protocolized care in the intensive care unit (ICU).

Results: Cohort total was 199: mean age (50 years); % female (26.6%); history of hypertension (57.8%), diabetes (6.0%) stroke (5.5%), and previous cardiac surgery (16.6%). Operative factors were: emergencies (31.7%); mean CPB/DHCA times (204.2/35.1 min); mean temperature nadir (14.3°C) and mean CPB hematocrit nadir (22.1%). Clinical outcomes were: mean ICU stay (5.2 days); in-hospital mortality (4.5%); stroke (3.0%); delirium (12.6%); atrial fibrillation (28.6%); exploration for bleeding (1.5%); mean chest tube drainage in first 24 hours (809.7 mL); % cohort requiring no transfusion (15.6%) and renal dysfunction, defined as >50% rise in serum creatinine (19.1%). Mean transfusion for first 24 hours included 4.0 units red blood cells, 4.8 units fresh frozen plasma, and 1.8 units platelets.

Conclusions: AAR in adults <70 years with standardized DHCA is associated with superior clinical outcome. A multimodal perioperative protocol appears to ameliorate perioperative organ system dysfunction, despite high preoperative risk.

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3 J Cardiothorac Vasc Anesth 2005; 19: 446.

A-178

Evaluation of risk factors on red blood transfusion in coronary surgery under cardiopulmonary bypass

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Background and Goal of Study: Low hematocrit (hct) and blood transfusion are associated with an increased postoperative morbidity and mortality in cardiac surgery patients.The aim of the current study was to compare the need of blood transfusion in patients undergoing elective coronary surgery with 2 different cardiopulmonary bypass (CPB) priming volumes (standard CPB with 1500 ml, and MiniCPB with 500 ml) and to identify the associated demographic variables.

Materials and Methods: We prospectively followed up all patients undergoing non emergent coronary surgery under CPB in an 18th month period (259 patients).

We registered hct evolution due to CPB hemodilution, drainage bleeding in the postoperative period and requirement of blood transfusion until hospital discharge.

In a multivariate analysis using a forward stepwise logistic regression model we evaluated which factors apart of hemodilution would contribute to blood transfusional requirement, such as, age, sex, body surface area (bsa) and previous hct.

Results and Discussions: No statistical differences among demographical, surgical characteristics and CPB times between both groups were observed. The 98 patients undergoing standard CPB bleeded 501 ± 223 ml and 35.7% were transfused. The 161 patients undergoing MiniCPB bleeded 425 ± 183 ml and 21.7% were transfused ($p < 0.01$). Table shows risk factors of transfusion:

	OR	95% CI	Significance
Age	1.04	0.99–1.08	0.062
Female sex	1.12	0.48–2.64	0.784
BSA	0.19	0.001–0.306	0.005
MiniCPB	0.43	0.21–0.87	0.019
Previous hct	0.75	0.68–0.83	0.000

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We obtained a predictive model of probability of transfusion: $P = 1/(1 + e^{-(19.03 - 4.59\ bsa - 0.77\ CPB - 0.29\ hct)})$

The predictive model efficiency was calculated with the area under ROC curve of 0.84. The model has a sensitivity = 67, specificity = 92, PPV = 79 and NPV = 86.

Conclusion: The main variables that influence on blood transfusional requirement were, low bsa, low previous hct and high CPB priming volume. The use of MiniCPB allowed us to reduce blood transfusion in high risk population.

A-179

TEE confirms improved myocardial preservation following beating heart valve surgery

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Background and Goal of Study: Transesophageal echocardiography (TEE) has been shown to be superior in detecting new ischemic episodes during cardiac surgery compared to ECG, pulmonary artery catheters, or central venous catheters alone (1). Myocardial dysfunction is common following cardioplegic arrest in valvular operations (2). Beating heart surgery for valvular disease provides normal myocardial metabolism, shorter aortic cross clamp and CPB times, and lower need for inotropes. It is proposed to result in decreased new LV wall motion abnormalities compared to conventional valve operations.

Materials and Methods: 20 patient TEE examination videotapes were reviewed independently by 4 experienced echocardiographers for new left ventricular wall motion abnormalities after valve surgery. 13 were performed during conventional valve surgery using aortic cross clamping and cardioplegic arrest and 7 were performed during valve surgery performed with a beating heart and continuous myocardial perfusion.

Results and Discussions: Of the 13 patients who received surgery using aortic cross clamping and cardioplegic arrest, 12 showed new posterior septal wall hypokinesis after CPB. Of the 7 patients who had surgery performed with a beating heart, none were found to have any new wall motion abnormalities. Beating heart valve surgery has become increasingly accepted as a means to avoid the consequences of ischemia/reperfusion injury associated with aortic cross clamping and cardioplegic solutions. Efficacy and safety of on-pump beating heart surgery for valvular disease has been shown to be superior to conventional valvular operation (3,4).

Conclusion: TEE confirms the preservation of myocardial function following on-pump beating heart valve operation by detecting fewer new wall motion abnormalities than following conventional valve operations using an aortic cross clamp and ischemic arrest.

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A-180

Comparison of dynamic indexes of cardiac preload in cardiac surgical patients

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Background and Goal of Study: In cardiac surgical patients with normal ventricular function, we tested dynamic indexes of preload responsiveness: respiratory changes in aortic blood velocity (ΔVpeak) and in superior vena cava collapsibility (ΔSVC) using transoesophageal echocardiography, in arterial pulse pressure (ΔPP); stroke volume variation (SVV) and pulse pressure variation (PPV) using arterial pulse contour analysis.

Materials and Methods: 6% hydroxyethyl starch (7 mL kg^{-1}) was administered to 19 patients with a constant tidal volume of 8 mL kg^{-1}. Responders to volume expansion (VE) increased stroke volume index (SVI) by ⩾10%. We analyzed the effects of VE on parameters using Wilcoxon's rank sum test, differences between responders and non-responders using Mann-Whitney U test, Spearman's correlation coefficients and receiver operating characteristics (ROC) curves. *P < 0.05 was significant.

Results: All parameters changed significantly after VE. 14 patients were responders. Baseline values of SVV (P = 0.004*) and PPV (P = 0.044*) were significantly lower in non-responders. SVV correlated significantly to PPV (r = 0.60, P = 0.018*) and ΔPP to PPV (r = 0.83, P < 0.001*).

ROC curves	Area	95% Confidence intervals		
ΔV peak	0.536	0.182	0.890	P = 0.890
ΔSVC	0.550	0.298	0.802	P = 0.746
ΔPP	0.707	0.448	0.967	P = 0.179
SVV	0.910	0.757	1.063	P = 0.012*
PPV	0.830	0.611	1.049	P = 0.043*

Conclusion: Our study suggests that SVV and PPV are sensitive dynamic predictors of preload responsiveness in cardiac surgical patients with normal ventricular function.

Reference:

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A-182

Endogenous nitric oxide reduces the efficacy of the endothelin system to maintain blood pressure during epidural anaesthesia

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Background and Goal of Study: Nitric oxide (NO) impairs vasoconstrictive properties of endothelin during physiologic conditions (1). This phenomenon could explain the reduced efficacy of endothelin to maintain blood pressure during high epidural anaesthesia (2). To clarify this, we studied the interaction between NO and endothelin during high epidural anaesthesia in conscious dogs, in comparison to the interaction of NO and vasopressin.

Materials and Methods: With approval of the local ethics committee, the animals were randomly assigned to each of the following 6 experimental and 2 control groups: L-NAME 0.3–10 mg · kg^{-1} with and without high epidural anaesthesia (lidocaine 1%) and L-NAME 0.3–10 mg · kg^{-1} after preceding endothelin or vasopressin receptor blockade with or without high epidural anaesthesia. During control experiments normal saline was injected either intravenously (n = 6) or into the epidural space (n = 4).

Results and Discussions: L-NAME increased mean arterial pressure dose-dependently in all groups. However, the increase in blood pressure was substantially reduced in the presence of endothelin receptor blockade compared to L-NAME alone, both during control conditions (9 ± 4 vs. 21 ± 3 mmHg; p < 0.05) and during high epidural anaesthesia (17 ± ? vs. 30 ± ? mmHg; p < 0.05). Vasopressin receptor blockade did not affect the increase in blood pressure during L-NAME.

Conclusion(s): The diminished increase in mean arterial blood pressure after injection of L-NAME only during endothelin receptor blockade therefore indicates that endogenous nitric oxide inhibits the action of endothelin during high epidural anaesthesia and might thus explain the reduced efficacy of endothelin to maintain blood pressure during high epidural anaesthesia.

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A-183

Cutaneous microcirculation effect of ephedrine in case of spinal anaesthesia

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Background and Goal of Study: Spinal anaesthesia (SpAn) results in a reduction in the skin blood flow of the shoulder and chest, evaluated by Laser-Doppler Flowmetry (LDF), and in an increase in the skin blood flow of the lower part of the body[1]. This study compared the effect of ephedrine (Eph), commonly used to treat hypotension secondary to SpAn, on cutaneous microcirculation of the lower and the upper part of the body, in patients under SpAn.

Materials and Methods: After local Ethics Committee approval, 18 ASA I–II informed patients were included in this study. SpAn was adjusted to achieve a T7 sensory block level after injection of 12.5 mgr hyperbaric bupivacaine 0.5% plus 2.5 μg sufentanil. Plasmalyte® was administered to maintain mean arterial pressure within 30% of the preoperative value. When motor block was achieved, 0.1 mgr/kg of Eph was given intravenously. Two fiberoptic light guides (Probe 407-4, Perimed®) were applied on the sternum and the leg and connected to LDF. LDF was expressed by Unit of Perfusion (PU). PU

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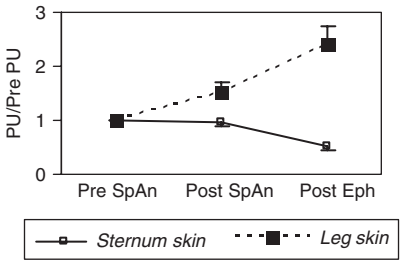
was recorded before (Pre SpAn) and after SpAn (Post SpAn), and 3 minutes after Eph injection (Post Eph). Data (mean ± SEM) were analysed using ANOVA. $p < 0.05$ = statistically significant.

Results and Discussion: SpAn resulted in a non significant decrease of the sternum skin PU, and a non significant increase of the leg skin PU. These changes were enhanced and became significant after Eph injection (Post SpAn vs Post Eph; Sternum skin: 0.98 ± 0.03 vs 0.52 ± 0.06 – Leg skin: 1.56 ± 0.2 vs 2.42 ± 0.3) (Figure).



Conclusion(s): Eph significantly enhances the opposite changes in cutaneous blood flow induced by SpAn above and below the level of sensory block. These observations should be considered when maintenance of the cutaneous blood flow is mandatory (plastic surgery, burns, …).

Reference:

1 Bengtsson M. Acta Scand Anaesth 1983; 27: 206–210.

A-184

Effects of angiotensin converting enzyme inhibitors (ACEI) on cardiovascular system in elderly scheduled for regional anaesthesia

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Background and Goal of Study: Many elderly patients have prescribed antihypertensive treatment with angiotensin converting enzyme inhibitors (ACEI). The purpose of the study was to find out how do ACEI affect cardiovascular system during early period of regional blockade.

Materials and Methods: 100 patients of ASA III group, aged 70 yrs and over, treated for stage 2 and 3 hypertension with ACEI, were scheduled for elective procedures (hernia repair, stripping of saphenous vein(s), total hip replacement) under regional anaesthesia. One day before surgery the patients were randomly allocated into two groups: in group 1 (n = 50) ACEI treatment was withheld 24 hrs before surgery; group 2 (n = 50) continued taking ACEI tablets till the day of surgery. All the patients, 2 hrs before the procedure were premedicated with midazolam (7.5 mg orally) and were administered 500 ml of 6% hydroxyethyl starch. The spinal anaesthesia was performed with a 27G Whitacre needle, and 10 mg of hyperbaric bupivacaine plus 0.025 mg of fentanyl was administered intrathecally. The non-invasive blood pressure (NIBP) measurement was taken 60 min before anaesthesia, then (0 min) during intrathecal administration of local anaesthetic, and 5, 10, 15 and 20 min after the blockade was established. Statistics was performed with Student *t* test and chi-square test with $p < 0.001$ considered significant.

Results: The demographic parameters were similar between the groups. The significant difference was noticed in results of NIBP measurements recorded in the 5th, 10th and 15th min after the block was established.

NIBP measurement [min]	−60	0 (blockade performed)	+5	+10	+15	+20
Group 1	162 ± 21	165 ± 17	149 ± 11	136 ± 15	137 ± 14	141 ± 13
Group 2	155 ± 11	158 ± 12	131 ± 8	125 ± 13	126 ± 14	135 ± 12

Conclusions: The antihypertensive treatment with ACEI reduces systolic NIBP significantly (<25%) 5 min after the spinal block has been established; total reduction is more pronounced in patients who had ACEI on the day of procedure. ACEI treatment, continued till the surgery, gives better control of hypertension.

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A-185

Arterial pressure wave reflection during hypotensive epidural anesthesia

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Background and Goal of Study: Hypotensive epidural anesthesia (HEA) combines extensive neuraxial sympathetic blockade with low-dose epinephrine infusion to produce profound hypotension (MAP 40–50 mmHg) while preserving cardiac output (1). We hypothesized that the marked arterial dilatation associated with this technique would result in a profound reduction in reflection waves from the distal aorta and a reduction in pulse wave velocity (PWV).

Materials and Methods: After IRB approval, 34 patients undergoing total hip replacement in the lateral decubitus position under HEA were studied. Arterial wave reflection was determined with the Pulsecor® monitor that records suprasystolic signals from a piezoelectric sensor placed over the brachial artery beneath the distal edge of a blood pressure cuff to identify both incident and reflection waves. Automated processing quantifies wave reflection as augmentation index (AI) (2). The delay between incident and reflected wave peaks (TR) is calculated as an index of change in PWV (2). Recordings were obtained from the non-dependent arm upon arrival in the operating room (Baseline), after sedation with propofol (Propofol), after induction of HEA (HEA1), after implantation of the prosthesis (HEA2) and with an ephedrine infusion initiated upon wound closure (Ephedrine). Data (mean ± SD) were compared by repeated measures ANOVA with $p < 0.05$ considered significant.

Results: Patients ranged in age from 32 to 87 years (mean 67 ± 13). The substantial decline in systolic and MAP produced by HEA was associated with a marked reduction in AI ($p < 0.0001$) and increase in TR ($p < 0.0001$).

	Baseline	Propofol	HEA1	HEA2	Ephedrine
Systole	153 ± 20	108 ± 18	65 ± 8	67 ± 10	90 ± 13
MAP	95 ± 9	74 ± 12	42 ± 5	42 ± 6	59 ± 7
HR	73 ± 12	73 ± 11	73 ± 12	71 ± 11	79 ± 13
AI	41 ± 13	33 ± 17	7 ± 8	6 ± 7	10 ± 13
TR	0.16 ± .02	0.15 ± .012	0.19 ± .04	0.19 ± .03	0.17 ± .03

Conclusion(s): Arterial pressure wave reflection measured with suprasystolic brachial artery recordings is profoundly altered by HEA.

References:

1 Sharrock et al. *Br J Anaesth* 1991; 67: 694–698.
2 McEniery et al. *J Am Coll Cardiol* 2005; 46: 1753–60.

A-186

The influence of positive end-expiratory pressure on stroke volume variation and central blood volume during open and closed chest conditions

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Background and Goal of Study: Positive end-expiratory pressure (PEEP) affects cardiac preload, which can be assessed by stroke volume variation (SVV) and central blood volume (CBV) variables. In this study we compared the effect of PEEP on SVV and CBV during open and closed chest conditions.

Materials and Methods: Fourteen anesthetized pigs (25–40 kg) were mechanically ventilated without PEEP and with PEEP 15 cmH_2O during open and closed chest conditions. Left and right ventricular SVV were determined with ultrasonic flowprobes placed around the pulmonary artery and ascending aorta. CBV was estimated using global end-diastolic volume (GEDV) (transcardiopulmonary thermodilution) and right ventricular end-diastolic volume (RVEDV) (pulmonary artery thermodilution).

Results and Discussions: Right and left ventricular SVV increased during ventilation with PEEP both during open and closed chest conditions (Table 1). Concomittantly, RVEDV was reduced by application of PEEP, but the decrease in GEDV was not significant.

	Open chest		Closed chest	
	PEEP 15	PEEP 0	PEEP 15	PEEP 0
LVSVV (%)	15 ± 5†	8 ± 5	19 ± 6†	9 ± 3
RVSVV (%)	17 ± 5†	8 ± 3	54 ± 11†*	33 ± 10*
GEDV (ml)	531 (144)	562 (140)	449 (113)*	486 (115)*
RVEDV (ml)	111 (23)†	128 (32)	91 (27)†*	121 (35)

*$P < 0.05$, closed chest vs. open chest, same PEEP level.
†$P < 0.05$, PEEP 15 cmH_2O vs. no PEEP.

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Conclusion(s): We conclude that ventilation with PEEP reduces cardiac preload as reflected by increased left and right ventricular SVV and decreased RVEDV both during open and closed chest conditions.

A-187

Stroke volume variation during changing loading condition: impact of different tidal volumes

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Background and Goal of Study: Previous studies have shown that stroke volume variation (SVV) may be used as a predictor of preload and fluid responsiveness (1). It is currently under debate, if SVV is a reliable tool for determination of dynamic volume changes during ventilation with clinically used tidal volumes (2). The aim of this study was to assess whether the predictive value of SVV depends on the tidal volume applied particularly during acute changes of preload.

Materials and Methods: The study protocol was approved by the institutional animal research committee. 14 anesthetized piglets (43 to 46 kg) were studied during changing tidal volumes (5 mL/kg, 10 mL/kg, 15 mL/kg) at normovolemia (BL), after removal of 500 cc of blood (Hypo) and after retrans-fusion plus additional 500 cc 6% hydroxyethyl starch (Hyper). SVV was recorded continuously, and global end-diastolic volume (GEDV) was obtained by transpulmonal thermodilution at each experimental stage (PiCCO plus, Pulsion Medical Systems, Munich, Germany).

Results and Discussions: GEDV changed significantly comparing the different experimental stages (BL to Hypo to Hypervolemia: 978.8 ± 211 to 755.8 ± 143 to 1328.7 ± 268 mL m^{-2}). During ventilation with both 5 mL/kg and 10 mL/kg SVV did not change significantly at the different experimental stages. In contrast during ventilation with 15 mL/kg, SVV changed significantly, reflecting different intravascular volume. However, in this group SVV was above the recommended range throughout the experiment.

SVV%	V_T5 mL/kg	V_T10 mL/kg	V_T15 mL/kg
BL	7.53 ± 3.3	12.2 ± 4.5	21.3 ± 5.0*
Hypo	8.32 ± 4.5	15.3 ± 7.3	28.6 ± 5.0*#
Hyper	10.6 ± 3.6	9.5 ± 6.2	15.5 ± 6.6#○

*p < 0.001 vs 5 mL/kg; #p < 0.05 vs BL; ○p < 0.001 vs Hypo

Conclusion(s): In this animal model SVV was not sensitive to acute changes in preload when clinically used tidal volumes were applied. Moreover, ventilation with high tidal volume may suggest volume loading even during Hypervolemia.

References:

1 Crit Care Med 2003; 51:1399–1404.
2 Intensive Care Med 2004; 30:1008–1010.

A-188

Interventional lung assist in an experimental model of apneic ventilation: haemodynamics, intrathoracic blood volume and extravascular lung water monitoring

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Background and Goal of Study: A new extracorporeal pumpless artificial lung iLA (interventional Lung Assist – Novalung®) has been developed. Associated haemodynamic and volumetric pulmonar changes in combination to different PEEP are unknown. Present study compares haemodynamic changes, intrathoracic blood volume (ITBV) and extravascular lung water (EVLW) using the iLA and different PEEP in a pig model.

Materials and Methods: Eight yorkshire pigs (weight: 55.1 ± 2.7 kg) mechanically ventilated with: TV 527 ± 62 mL, MV 11 L/min, PEEP 5 cm H_2O, RR 21.9 ± 2.8 breaths/min and FiO_2 1. Animals were attached to the iLA across the right axillary vessels and were managed as follows by near apneic ventilation: TV 98 ± 15 mL, MV 0.5 L/min, RR 4 ± 0.3 breaths/min and FiO_2 1). PEEP was escalated 5 cm H_2O every 15 min until 20 cm H_2O. Haemodynamic, ITBV and EVLW values were continuously monitoring by PiCCO System.

Results and Discussion: Data are shown in the Table. Significant systemic and pulmonary haemodynamic changes were observed. However, ITBV and EVLW values did not change significantly with iLA implantation. Oxygenation improved parallel to the increase of PEEP.

Conclusion(s): Apneic ventilation and iLA induces systemic vasodilatation, pulmonary hypertension and hypoxemia. Oxygenation is restored by increasing PEEP levels. Interestingly ITBV and EVLW were not affected.

TABLE.

	Mechanical ventilation	Apneic +iLa	Apneic +iLa	Apneic +iLa	Apneic +iLa
PEEP	5	5	10	15	20
mBP (mmHg)	100 ± 11	87 ± 11*	83 ± 10*	70 ± 9*	71 ± 10*
CO (l/min)	6 ± 2	8 ± 2*	8 ± 3*	7 ± 2	7 ± 2
SVR (d/s/cm^{-5})	1101 ± 376	705 ± 185*	657 ± 236*	621 ± 345*	629 ± 265*
mPAP (mmHg)	28 ± 6*	37 ± 9*	36 ± 9*	35 ± 8*	38 ± 4*
SpO_2 (%)	99 ± 0	80 ± 3*	90 ± 3*	99 ± 1	99 ± 0
ITBV (ml/Kg)	759 ± 109	771 ± 194	1032 ± 355	830 ± 193	856 ± 91
EVLW (ml/Kg)	534 ± 162	771 ± 248	563 ± 147	604 ± 95	597 ± 67

Mean ± SD, *p < 0.05.

References:

1 Reng M., Phillipp A., Kaisse M., et al. Lancet 2000; 356: 219–220.
2 Deeren H., Dits H., Daelemans R., Malbrain M. Clin Intensive Care 2004 (15): 19–122.

A-189

ACC-AHA guidelines are not sufficiently accurate for screening cardiac risk before abdominal aortic surgery

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Background and Goal of Study: Use of ACC-AHA guidelines (1) for stratifying cardiac risk before surgery is intended to detect patients at risk of postoperative myocardial ischemia and to optimize prescription of cardiac testing. The goal of the study was to determine the accuracy of ACC-AHA guidelines for detecting a significant coronary artery disease (CAD) in patients scheduled for abdominal aortic surgery.

Materials and Methods: After Local Committee's approval and informed consent, 183 consecutive were enrolled between january 2002 and january 2005. Significant CAD was defined as 1) a positive dobutamine stress echocardiography (DSE) 2) CAD confirmed by angiography and 3) cardiac care management decision. Patients were classified into 2 groups: absence or presence of significant CAD. In the meantime, a blinded observer classified patients into 2 categories following ACC-AHA guidelines: need for cardiac stress testing (ST+) or not (ST−). Sensibility (Se), specificity (Sp), positive predictive value (PPV), and negative predictive value (NPV) of ACC-AHA guidelines for detecting presence of significant CAD were calculated by crossing the 2 classifications, using Youden's test.

Results and Discussion: Among 183 patients, 29 were excluded of the study (recent cardiac testing or coronary angiography, patient's refusal, recent revascularization procedures). Following ACC-AHA guidelines, 28% of the remaining 154 patients would not have to pass ST (Table 1). Among them, 9.3% had significant CAD. Se and Sp were respectively 88% and 32%. PPV was 26% and NPV was 91%. Youden's test value was 0.2.

Table 1. Repartition of the patients

	Presence of CAD	Absence of CAD	Total
ST+	29	82	111
ST−	4	39	43
Total	33	121	154

Conclusion: Before aortic surgery, NPV and Youden's test value are too low with ACC-AHA guidelines. Systematic preoperative ST using DSE should be recommended in this context.

Reference:

1 Eagle KA. J Am Coll Cardiol 2002;39(3):542–53.

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A-190

Effects of dexmedetomidine on hemodynamics and systemic oxygenation during abdominal aorta cross-clamping in sevoflurane-anesthetized dogs

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Background and Goal: Abdominal aorta cross-clamping (AAX) for surgical treatment of aorta may result in deleterious cardiovascular response[1]. We tested the hypothesis that dexmedetomidine (D), a highly selective α_2-agonist, improves circulatory stability and systemic oxygenation during sevoflurane anesthesia for AAX.

Materials and Methods: In a blinded study, sevoflurane-anesthetized dogs were instrumented and after baseline measurements (BL), were divided into three groups of 10 animals: control group (C), injection of 20 mL of normal saline (NS) in 10 min, followed by 20 mL/h of NS; group D_1, injection of a 20 mL solution of D 1 μg/kg, in 10 min, followed by D 1 μg/kg/h; and group D_2, injection of a 20 mL solution of D 2 μg/kg, in 10 min, followed by D 2 μg/kg/h. Variables were studied before AAX, during AAX, and after aorta unclamping (AAU).

Results: Data (Mean ± SD) are shown in the Table: HR (beats/min); MAP (mmHg); CI (L/min/m^2); SVRI (dyne.sec/cm^5.m^2.10^3); DO_2I (L/min/m^2).

		BL	before AAX	AAX	AAU
HR	C	134 ± 20	132 ± 14*	133 ± 18*	137 ± 17*
	D_1	127 ± 16	83 ± 16	92 ± 18	85 ± 15
	D_2	116 ± 22	69 ± 11	94 ± 18	83 ± 25
MAP	C	84 ± 17	82 ± 16	104 ± 12*	88 ± 14*
	D_1	94 ± 16	91 ± 7	119 ± 14	105 ± 15
	D_2	89 ± 16	93 ± 16	123 ± 22	103 ± 16
CI	C	3.8 ± 1.0	3.9 ± 1.0*	4.2 ± 0.8*	4.1 ± 1.1*
	D_1	3.8 ± 0.8	3.0 ± 0.8	2.9 ± 0.8	2.7 ± 0.9
	D_2	3.4 ± 0.7	2.4 ± 0.5	2.3 ± 0.6	2.1 ± 0.6
SVRI	C	1.8 ± 0.4	1.7 ± 0.4*	2.0 ± 0.6*	1.8 ± 0.5*
	D_1	1.8 ± 0.4	2.3 ± 0.6	3.1 ± 1.0	2.7 ± 0.9
	D_2	1.9 ± 0.4	3.0 ± 0.9†	4.2 ± 1.3$^{\#}$	4.0 ± 1.6$^{\#}$
DO_2I	C	0.6 ± 2.3	0.7 ± 2.4*	0.7 ± 1.6*	0.7 ± 2.5*
	D_1	0.6 ± 1.3	0.5 ± 1.2	0.5 ± 0.9	0.4 ± 0.9
	D_2	0.6 ± 1.9	0.4 ± 1.2	0.4 ± 1.3	0.4 ± 1.2

There were no differences among groups in oxygen consumption ($P > 0.05$). *$P < 0.05$: C vs. D_1 and D_2; $^{\#}P < 0.05$: D_1 vs. D_2; $^{\dagger}P < 0.05$: C vs. D_2.

Conclusion: Anesthesia with sevoflurane and D (mainly higher doses) accentuates the deleterious circulatory response during AAX, decreasing oxygen transport to the tissues.

Reference:

1 Gelman S. *Anesthesiology* 1995; 82: 1026–57.

A-191

Volume expansion effects on cardiac function in a canine model of renal transplantation

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Background and Goal of Study: It is known that volume expansion (VE) improves the outcome of renal transplantation (Rtx) (1). However, there are no controlled studies on the effects of this practice on cardiac function.

Materials and Methods: Three groups of beagle dogs (8–12 Kg) were scheduled for an autoRTx; one group with normal hidratation, CVP = 5 mmHg (G5H, n = 6), a second to receive VE with colloid solution until it increased its CVP to 10 mmHg (G10H), and a third, to elevate its CVP to 15 mmg (G15H), before renal reperfusion were studied. A PA catheter was placed to measure cardiac filling pressures and cardiac output (CPV, PwP, CO). Cardiac function was evaluated using the Starling and the venous return curves, plotting CO values against its CVP and PwP values, and systolic cardiac performance by peak velocity (PV) changes from an esophageal Doppler, as we have previously reported (2). The study design was: stage 1 = baseline, stage 2 = before VE and stage 3 = after VE. ANOVA and paired t-test were used as statistical analysis.

Results and Discussions: Volume expansion caused in G10H dogs an increase in CVP of 58% and in PwP of 32%, while CO only but significantly increased a 21%. This practice also caused a significant elevation in CVP and in PwP of a 329% and a 254% respectively, while CO only increased a 105% in G15H dogs. However, all these changes were different to those observed in G5H and in G10H groups. Peak velocity significantly increased in G10H and in G15H, a 13% and a 28% as a result of VE. Volume expansion shifted the starling curve to the right when plotted within the venous return curve, in a treatment response way, suggesting a loss in cardiac diastolic function.

Conclusion(s): The present study shows that acute VE has a significant negative lusotropic effect. Thus, our data suggest that VE should be performed with caution or even avoided, especially at CVP values higher than 10 mmHg, in patients with a deteriorated cardiac function.

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1 Willms CD, et al. Transplantation proceedings.
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A-192

Sevoflurane is superior to Propofol in reducing reperfusion injury induced by severe abdominal-ischaemia in pigs

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Background and Goal of Study: Patients requiring thoracic aortic surgery are at high risk for developing multiple organ failure due to abdominal ischaemia-reperfusion injury (IRS). Sevoflurane (Sevo) has been shown to protect the heart by ischaemic-preconditioning-like effects. Propofol (Prop) was reported to have anti-inflammatory properties. We compared both agents with respect to their potential for reducing abdominal IRS.

Materials and Methods: Experiments had been approved by local committees. After instrumentation in midazolam-anaesthesia, pigs were randomised to receive either Prop or Sevo (n = 9, each). The thoracic aorta was occluded for 90 min using a balloon-catheter. Study medication was continued for 120 min after reperfusion. For the remaining 180 min of the experiment, midazolam was restarted. Fentanyl was given throughout the experiment for analgesia. During reperfusion, a standardised goal-directed therapy (volume replacement, buffers, vasopressors) was performed. Tissue injury was assessed from arterial lactate concentration, and from lactate dehydrogenase (LDH)-, alanine aminotransferase (ALT)-, and aspartate transaminase (AST) activities.

Results and Discussions: Severe declamping shock occurred in both groups. Norepinephrine was reduced significantly in the reperfusion period after Sevo (p = 0.004). This resulted in cessation of vasopressors in 4/9 Sevo-treated animals, whereas all animals after Prop remained norepinephrine-dependent. This was accompanied by significantly lower activities of LDH (4471 ± 2996 vs 2329 ± 1464 U/l), AST (1908 ± 1432 vs 906 ± 685 U/l), ALT (107 ± 37 vs 78 ± 26 U/l) after 300 min reperfusion, and by a significant reduction of lactate concentration over time in the Sevo-group ($p < 0.05$).

Conclusion(s): Sevoflurane reduces the thoracic-aortal-occlusion induced ischaemia-reperfusion injury as compared to Propofol. This is indicated both, by improved haemodynamic stability and reduced serum markers of tissue injury.

A-194

The influence of 'fast track anesthesia' on the endogenous stress response in patients undergoing cardiac surgery with extracorporeal circulation: a prospective randomized study

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Background and Goal of Study: The influence of 'fast track' anesthesia on the endogenous stress response, activation of the immunosystem and the release of ischemic markers in myocardial revascularization with extracorporeal circulation (ECC) has not been evaluated so far.

Materials and Methods: Forty-two patients, who were scheduled for elective myocardial revascularization with ECC were prospectively randomized in two groups: group A (n = 21) received classic 'high dose opioids' (intermittent doses of Fentanyl), group B (n = 21) 'fast track anesthesia' (0.15–0.3 μg/kg/minute Remifentanil). BIS, stress parameters (Cortisol, ADH, ACTH, epinephrine, norepinephrine), IL-8, IL-6, TNF alpha. and myocardial ischemic markers (CK, CKMB, troponin-t) were assessed during the peri- and postoperative course at 7 time points. Repeated measurement analysis of variance (ANOVA) was applied with group (treatment) as between subject factor, time as within subject factor and group by time as interaction term. Repeated

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measurement ANOVA and t-tests were applied to the log-transformed data in case of positive skewed variables.

Results and Discussions: Preoperative data showed no differences between groups, but CPB-times as well as aortic cross-clamp times were longer in group A (93 ± 26 vs. 74 ± 22 min, $p < 0.05$; 48 ± 20 vs. 36 ± 16 min, $p < 0.05$, respectively). Group B was significantly earlier extubated (240 ± 182 min. vs. 418 ± 212 min., $p = 0.006$) Analysis of stress parameters 30 min after establishment of CPB revealed lower values in group B vs. group A (ADH: 39.94 ± 30.98 vs.11.7 ± 22.8 pg/ml, $p = 0.002$, ACTH: 111.5 ± 116.8 vs. 21.81 ± 24.71 pg/ml, $p = 0.01$; Cortisol 185 ± 86 vs. 131 ± 82 ng/ml, $p = 0.04$). Furthermore, interleukins showed also significant lower perioperative values in group B vs. group A for IL-8, IL-6 and TNF alpha.

Conclusion(s): 'Fast track' anesthesia using Remifentanil led to a significant reduced perioperative endocrine stress response. The reduced release of interleukins in the postoperative may also be influenced by this type of anesthesia but may be also attributed to shorter CPB-times in the 'fast track group'.

A-195

Comparative study of haemodynamic and ventilatory changes caused by infrarenal aortic cross-clamping during laparoscopic or conventional vascular surgery in an experimental animal model

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Background and Goals: To compare the haemodynamic and ventilatory effects of prolonged infrarenal aortic crossclamping during sevoflurane anaesthesia in pigs undergoing laparotomy or laparoscopy and to assess physiological limitations to the laparoscopic approach.

Methods: 10 healthy swine were randomly assigned to 2 groups (group I laparotomy, group II laparoscopy). Anaesthesia was induced with propofol and maintained with sevoflurane, fentanyl and vecuronium. An infrarenal aortic cross-clamping was performed during 60 minutes. Arterial blood gases, arterial blood pressure (ABP), cardiac output (CO), and heart rate (HR) were determined at baseline (T1), 5′ before cross-clamping (T2), 30′ and 60′ after cross-clamping (T3,T4), 5′, 30′ and 60′ after de-clamping (T5, T6 and T7). Changes were analysed using ANOVA followed by Tukey's test. $P < 0.05$ was considered significant (*).

Results and Discussion: Haemodynamic changes were similar in both groups. During aortic cross-clamping a significant decrease in cardiac output and increase in ABP were observed (Group I from 4.16 ± 4.06 to 3.11 ± 1.04 L/min and from 68 ± 7 to 83 ± 16 mmHg. Group II from 4.06 ± 0.62 to 2.80 ± 1.21 L/min and from 58 ± 2 to 79 ± 8 mmHg). After de-clamping, a significant increase in CO and a significant decrease in ABP were seen (Group I from 3.11 ± 1.04 to 6.50 ± 2.12 L/min and from 83 ± 16 to 52 ± 12 mmHg. Group II from 2.80 ± 1.21 to 5.50 ± L/min and from 79 ± 8 to 62 ± 9 mmHg).

Acid-Base state data are shown in the Table:

	pH		$PaCO_2$	
Times	Group I	Group II	Group I	Group p II
T1	7.48 ± 0.01	7.47 ± 0.01	36 ± 5	43 ± 3
T2	7.43 ± 0.02	7.32 ± 0.07*	33 ± 9	56 ± 18*
T3	7.46 ± 0.04	7.27 ± 0.16*	31 ± 6	73 ± 28*
T4	7.46 ± 0.05	7.28 ± 0.17*	37 ± 7	80 ± 38*
T5	7.40 ± 0.06	7.22 ± 0.18*	39 ± 7	81 ± 47*
T6	7.41 ± 0.06	7.34 ± 0.07	38 ± 7	59 ± 12*
T7	7.38 ± 0.01	7.32 ± 0.07	38 ± 8	43 ± 12*

Conclusions: Anaesthetic management of aortic surgery is similar for both surgical approaches. However, laparoscopy causes respiratory acidosis that needs to be monitored and managed.

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1 Gelman S. Anesthesiology 1995;82:1026.
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A-196

Cardiopulmonary bypass does not influence negatively fast track extubation after coronary artery bypass surgery

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Background and Goal: Considering the discussion about respiratory effects of cardiac surgery and cardiopulmonary bypass (CPB) (1), the authors decide to test the hypothesis, whether the influence on respiratory function after coronary artery bypass graft surgery (CABG) is identical when performed with or without CPB.

Materials and Methods: Were included retrospectively 215 patients who underwent CABG between years 2000–2004, anesthetized by the same anaesthesiologist and submitted to a FTE protocol. After exclusion criteria (lack of collaboration, critical pre-operative status, emergent surgery, and missing data), 122 patients were studied, 37 in off-pump and 85 in CPB group.The anesthetic technique included remifentanyl, propofol, rocuronium or vecuronium and sevoflurane/air/oxygen. For post-operative analgesia, was used morphine and NSAID. Differences were considered significant where p was less than 0.05.

Results: No differences in demographic characteristics or mean (max-min) extubation time (hours), [0.4 (0–18.5) vs. 0.3 (0–3) respectively with and without CPB], were found between the groups. The percentage of patients extubated in the operation room was higher in off-pump group (71.3 vs. 68.7, $p = 0.273$) and the mean (max-min) length of stay (LOS) (days) was significantly higher in the group with CPB [5.8 (2–43) vs. 4.8 (3–12), $p = 0.02$]. The alveolar-arterial oxygen gradient (*mmHg*) was lower in the off-pump group only at ICU admission [277.7 (108.1) vs. 354 (115.6), $p = 0.001$] and the incidence of respiratory complications was identical in both groups.

Conclusion: Despite shorter entubation time and LOS, our data suggest that in this study, CPB did not influence negatively FTE protocol in patients who underwent CABG.

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A-197

Ultra-fast track anesthesia for off-pump coronary artery surgery without epidural analgesia

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Background and Goal of Study: The expansion of the off-pump coronary artery surgery (OPCABG) has led to increasing interest in ultra-fast track anesthesia, allowing extubation of the patient in the operating room (OR). It is common practice to achieve this purpose by general anesthesia combined to thoracic epidural analgesia. Aim of the study was to validate the clinical applicability of performing ultra-fast track anesthesia in OPCABG surgery, avoiding thoracic epidural analgesia.

Materials and Methods: Prospective study enrolling 86 consecutive patients (aged 40 to 88 yrs, 73M/13F) scheduled for OPCABG surgery, who underwent general anesthesia with a view to extubation immediately after skin closure. Ultra-fast track anesthesia technique was based on remifentanil, without epidural catheter insertion. Criteria for extubation in the OR, included hemodynamic stability and absence of early surgical complications. Postoperative pain control was achieved by continuous intravenous infusion of remifentanil (0.0125 to 0.05 μg/kg/min), targeting to a Visual Analogue Score (VAS) <3. Data referring to time and to pain scores are presented as mean (SD).

Results: Demographic data revealed a rather high risk population (NYHA III–IV: 52.3% and EF < 40: 43%). There were an average of 2.8 procedures per patient. OR extubation was performed within 12.4 (2.8) min after chest closure. Postoperatively, duration of remifentanil infusion was 13.9 (4) h, while VAS was 3.1 (1.5), 2.2 (0.7), 1.8 (0.8) immediately, 6 h and 12 h postsurgery, respectively. Repeated episodes of vomiting were recorded in 7 (8.3%) patients, demanding pharmacologic treatment. Postoperative newly developed atrial fibrillation occurred in 5.9% (n:5) of the patients, while major complications included myocardial infarction and transient neurological disorders in 1.2% (n:1) and 3.5% (n:3) of the study group, respectively. Length of ICU stay was 1.46 (1) days. One re-admission was recorded due to cardiogenic shock , while ICU mortality was 2.3% (n:2).

Conclusion: Ultra-fast track anesthesia with appropriate postoperative analgetic protocol based on remifentanil, seems to be feasible and safe. It constitutes a further step in minimizing invasiveness in OPCABG surgery, whereas there is no need for thoracic epidural analgesia.

A-198

Myocardial ischemia after major vascular surgery

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Background and Goal of Study: The aim of this prospective, observational study was to evaluate changes in cardiac troponin-I levels after major vascular

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surgery and their association with early and late postoperative cardiac complications.
Materials and Methods: 75 patients undergoing major vascular surgery received a standard sevoflurane-fentanyl anesthesia during the procedure. Blood levels of creatine kinase with MB subtype, and cardiac troponin-I were assessed before surgery and then every day for the first three days after surgery. At the same times a 12 lead ECG was also performed, and the occurrence of any cardiac adverse event was recorded. Patients were then followed for 1 month after surgery.
Results and Discussions: Troponin-I levels increased in 25 patients (33%) during the first three days after surgery; 9 of these patients (12%) had myocardial infarction. At the univariate analysis uncontrolled hypertension was the only risk factor for perioperative infarction (odds ratio: 16; (95% CI: 3–74); however, multivariate logistic regression analysis failed to show statistically significant associations. Increases in troponin-I had a 100% sensitivity and 75% specificity in detecting myocardial ischemia with a 36% positive and 100% negative predictive values. Severe cardiac complication 1 month after surgery was reported in 5 patients (6.6%). The increase of cardiac troponin-I levels during the first 3 postoperative days was associated with an increased incidence major cardiac complication at the 1 month follow up ($P = 0.003$), with a 100% sensitivity, 71% specificity, and 100% negative predictive value.
Conclusion(s): Myocardial infarction after major non-cardiac vascular surgery occurs in up to 12% of cases. Perioperative monitoring of troponin-I plasma levels may allow to identify patients with an increased risk for cardiac morbidity, not only early after surgery, but also during the first month.

A-199

The impact of overweight and pneumoperitoneum on hemodynamics and oxygenation during prolonged laparoscopic surgery

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Background and Goal of Study: Anesthesia adversely affects respiratory function and hemodynamics in obese patients. Although many studies have been performed in morbidly obese patients, data is limited concerning overweight patients [BMI 25–29.9 kg m^{-2}]. The aim of this study was to evaluate the effects of prolonged pneumoperitoneum in Trendelenburg position on hemodynamics and gas exchange in normal and overweight patients.
Materials and Methods: We studied 15 overweight and fifteen non-obese [BMI 18.5–24.9 kg m^{-2}] patients who underwent totally endoscopic robot assisted radical prostatectomy under general anesthesia with an inspired oxygen fraction of 0.5. A standardized anesthetic regimen was used and patients were examined at standard times: after induction of anesthesia and Trendelenburg posture, every 30 minutes after establishing pneumoperitoneum, and after the release of the pneumoperitoneum with the patient still in Trendelenburg position.
Results and Discussions: After induction of anesthesia and Trendelenburg positioning arterial oxygen pressure [P_aO_2] and alveolar-arterial difference in oxygen tension [A_aDo_2] differed significantly between both groups with lower P_aO_2 [235 ± 27 vs. 164 ± 51 mmHg] and higher A_aDo_2 [149 ± 48 vs. 76 ± 28 mmHg] values in overweight patients. During pneumoperitoneum, P_aO_2 transient increased above baseline values in overweight patients, whereas A_aDo_2 decreased. Hemodynamic parameters [HR, MAP and CVP] did not differ significantly between groups.
Conclusion(s): Arterial oxygenation and A_aDo_2 are significantly impaired in overweight patients under general anesthesia in Trendelenburg posture. In overweight patients pneumoperitoneum transient reduced the impairment of arterial oxygenation and lead to a decrease in A_aDo_2. Hemodynamic parameters were not affected by body weight.

A-200

Adrenergic blockers improve physiologic hepatic blood flow control during CO_2 pneumoperitoneum in pigs

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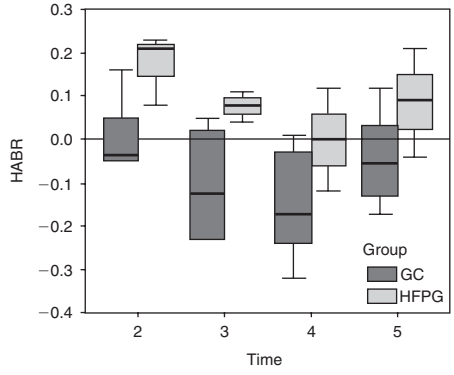
Background and Goal of Study: The hepatic arterial buffer response (HABR) is a regulatory mechanism of the hepatic artery (HA) that compensates for reduction in portal venous (PV) blood flow (1). During CO_2 pneumoperitoneum it seems to be impaired (2) and improvement of hepatic microcirculation (HMC) could maintain this response.
Materials and Methods: We studied 29 pigs that were randomly allocated in five groups related to HMC improvement therapy: 6 animals received phentolamine at low dose (bolus of 4 μg/Kg and 2 μg/Kg/h; *FG*) and 6 at high dose (bolus of 0.5 mg/Kg and 50 μg/Kg/h: *HFG*). 5 animals received high dose of phentolamine plus a single dosis of propanolol (0.25 mg/Kg; *HFPG*). 6 pigs were treated with endothelin-1 receptor antagonist (10 mg/kg of tezosentan; *EG*) and 6 animals were treated with saline as a control group (*CG*). In all animals CO_2 pneumoperitoneum was increased from 0 to 10, 15, 20 and 25 mmHg and decreased to 0. Systemic hemodynamic parameters, hepatic artery (HA) and portal vein (PV) blood flow and HABR ((HA2-HA1)/PV1) were recorded at different levels of IAP and after deflation.
Results and Discussions: No differences were found in systemic hemodynamic parameters between groups. Except in FPG, HABR was impaired in all groups and was higher as IAP increase. In all groups, HABR recovered when IAP returns to basal value.



Conclusion(s): During CO_2 pneumoperitoneum HABR was impaired. The addition of α and β blockers could have some benefit in maintaining HABR.
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A-201

Use of N-terminal pro-Brain Natriuretic peptide in pre-operative assessment

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Background and Goal of Study: B-Type Natriuretic peptide (BNP) is released by ventricular myocytes in response to stretch. Its prohormone, pro-BNP is used to diagnose and monitor heart failure. Pro-BNP levels of <35 pmol/l have excellent negative predictive value (NPV) for cardiac impairment. Resting echocardiography (Echo) is often used during preoperative assessment to rule out cardiac dysfunction. We investigated the use of pro-BNP in this context and examined its role in reducing the requirement for pre-operative Echo.
Materials and Methods: Patients attending anaesthetic preassessment clinic and who were due to undergo echocardiography were studied. All patients had a pro-BNP added to their preoperative bloods. A questionnaire including history of Myocardial Infarction (MI) and functional status was completed. Reported abnormalities in Echo findings included regional wall motion defects, overall contractility and valve lesions.
Results and Discussions: All 58 patients had a pro-BNP taken, 57 (98%) presented for echocardiogram and 47 (81%) answered the cardiac questionnaire.

	MI	No MI	BNP > 35	BNP < 35	BNP > 35 and MI	BNP < 35 and no MI
Abnormal Echo	10	7	21	2	23	0
Normal Echo	3	23	11	20	12	15
Sensitivity		77% (23/30)		91% (20/22)		100% (15/15)
Specificity	77% (10/13)		66% (21/32)		66% (23/35)	
NPV		83%		92%		100%

Conclusions: The use of pro-BNP coupled with a negative history of MI in our study, correctly identified all patients with a normal Echo (sensitivity 100%), eliminating the need for a more expensive and invasive test. This significantly improved on either clinical history or pro-BNP levels alone. This data

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suggests that a protocol based on clinical history and pro-BNP levels may correctly identify patients presenting for preoperative assessment who do not need an echocardiogram, reducing further preoperative cardiovascular investigation.

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A-202

The influence of pneumoperitoneum and anti-Trendellenburg position on Cardiac Output in morbidly obese

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Background and Goal of Study: Pneumoperitoneum has important impact on haemodynamic function during general anaesthesia. The reports on cardiovascular effect of pneumoperitoneum in morbidly obese are scarce. The aim of the study was to estimate influence of laparoscopic procedures on Cardiac Output in morbidly obese during gastric banding surgery.

Materials and Methods: After obtaining the consent of Institutional Bioethics Review Board, 21 patients were enrolled into the prospective, controlled study. Sufficient data was collected from 13 pts. Haemodynamic function was measured by transaesophageal Doppler probe using HemoSonic 100 device (Arrow, USA). Measurements were taken in three time points: T1- after induction to anaesthesia, T2- pneumoperitoneum in vertical position, T3- anti-Trendellenburg (Fowler) position and pneumoperitoneum. All patients were anaesthetised using sevoflurane/O_2/air, FNT, midazolam and atracurium. Pneumoperitoneum pressure was 15 mmHg.

Results and Discussions: Demographic data (mean ± SD): BMI 45.979 ± 7.7 kg/m^2, weight 138.77 ± 26.67 kg, high 173.54 ± 8.29 cm, age 38.15 ± 11.31 yrs; CO in time points (l/min): T1- 6.88 ± 1.13, T2- 5.15 ± 0.91, T3- 5.55 ± 1.12. In 11 pts (84.62%) CO in T3 increased comparing to T2, in 2 pts decreased furthermore. The difference between time points: D1 (T1-T2)- 1.73 ± 0.72 (26.36 ± 7.89% of T1), D2 (T2-T3, increase)- 0.4 ± 0.88 (9.92 ± 7.37% of T1); D2 (decrease)- 1.21 (17.8% of T1); p values when comparing time points: T1 vs T2: $p = 0.00026$; T1 vs T3: $p = 0.00568$; T2 vs T3: $p = 0.32531$. The changes in CO were not accompanied by important changes in blood pressure and HR. No complications were observed in perioperative period.

Conclusions: Although clinical significance of changes of CO were not observed the influence of pneumoperitoneum on cardiac function is important. The serious decrease in CO may not be recognised basing solely on BP and HR measurements. The Fowler position used in laparoscopic gastric banding procedures has no positive or negative effect on cardiac function. Further investigation on organ perfusion in abdomen during pneumoperitoneum in morbidly obese are needed.

A-203

45 degree Trendelenburg position for robot-assisted endoscopic prostatectomy – influence on haemodynamics, echocardiography and VA/Q ratios

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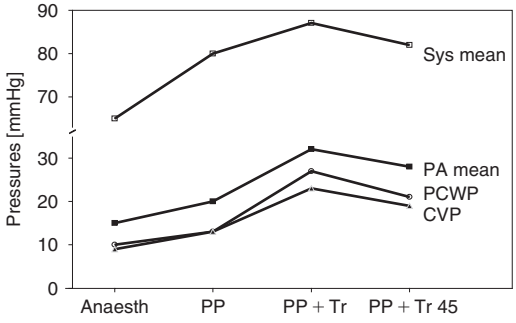
Background and Goal of Study: Pneumoperitoneum (PP) induces a well-known haemodynamic response (1). The consequences of combining PP with a pronounced Trendelenburg position (Tr) are not well characterized.

Materials and Methods: After ethical committee approval and informed consent, eight healthy (ASA 1–2) male patients (mean age 60 yrs) undergoing robot-guided (Da Vinci) endoscopic prostatectomy with 45°Tr were studied during propofol-remifentanil anaesthesia and controlled ventilation. Transesophageal echocardiography (Acuson Sequoia 512 with a multiplane probe) and systemic and pulmonary pressure measurements were made. Cardiac output (CO) was measured by thermodilution. Ventilation-perfusion relationships were studied by the multiple inert gas technique (2). Statistical analysis was performed by Friedman's non-parametric ANOVA. A p value below 0.05 was considered significant.

Results and Discussions: Central pressures increased substantially ($p < 0.05$), see Figure CO and stroke volume decreased after PP and again increased during PP + Tr, $p < 0.05$. Right-sided heart dimensions were slightly increased by PP, but did not further increase during PP + Tr. Mean airway pressure increased by 50% during PP and PP + Tr, $p < 0.05$. With high intrathoracic pressure and an unaltered pulmonary artery pressure gradient, transmural pressures were probably unchanged. Thus, the pressure change does not reflect volume status. Shunt was low and unaffected, whereas dead space decreased by 25% during PP + Tr, $p < 0.05$.



Conclusions: The very high filling pressures during PP and 45° Tr were not paralleled with proportionally increased heart dimensions. Shunt remained low.

References:

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A-204

Effects of increased IAP on plasma lactate levels during short carbon dioxide pneumoperitoneum

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Background and Goal of Study: Acute increases in intraabdominal pressure (IAP) induce systemic and regional circulatory changes. Besides, mechanical compression on the capillary beds may decrease oxygen availability to the tissues. The purpose of this clinical study was to analyze the effects of increased IAP on plasma lactate levels during short carbon dioxide pneumoperitoneum.

Materials and Methods: Forty consecutive patients undergoing laparoscopic cholecystectomy were included in this study. Eleven of them were ASA II and thirty were overweight. IAP was kept between 13 and 15 mmHg, and $PaCO_2/P_{ET}CO_2$ between 38 and 40 mmHg.

Results and Discussions: PaO_2 increased significantly in anesthesia and pneumoperitoneum phases and decreased significantly during recovery. Plasma lactate levels significantly increased after induction (1.3 ± 0.2 vs 1.6 ± 1.2 mg/dl, $p < 0.001$), after insufflation (1.3 ± 0.2 vs 2.5 ± 0.2 mg/dl, $p < 0.001$) and reached the highest value in recovery (1.3 ± 0.2 vs 2.9 ± 0.22 mg/dl, $p < 0.001$). Simultaneously, arterial pH and base excess decreased through the whole procedure. There was a significant positive correlation between lactate levels and duration of surgery ($r = 0.36$, $p < 0.05$).

Conclusion(s): Increased IAP is associated with an increase in lactate. Its role as an anaerobic metabolite in the presence of severe hypoxia, and an aerobic metabolite in the presence of an adequate O_2 supply and utilization of glucose as a fuel is discussed.

A-205

Hemodynamic changes during robotic prostatectomy

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Background and Goals: We studied changes in hemodynamic variables associated with steep trendelenburg position and pneumoperitoneum in patients undergoing robotic prostatectomy. Understanding and anticipating critical changes in hemodynamic variables can lead to avoidance of hypotension and hypertension.

Materials and methods: We studied 35 ASA II–III patients. A standardized anesthetic protocol was used. An arterial line and a transesophageal echo-doppler probe were placed. Hemodynamic data including: heart rate, mean arterial blood pressure (MAP), cardiac output (CO), systemic vascular resistance (SVR), stroke volume (SV) and aortic diameter was collected in the supine,

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trendelenburg, trendelenburg + pneumoperitoneum and end of surgery supine position. Data was analyzed with the t-test, and the results adjusted for multiple comparisons using the Bonferroni adjustment.
Results: Significant p-values (less than 0.0001): Supine MAP (least square mean) 94.2 mmHg lower than pneumoperitoneum MAP (least mean square) 112.7 mmHg, Supine MAP 94.2 mmHg higher than end of surgery supine MAP 76.5 mmHg, Supine SVR 1441.5 dynes-sec/cm^5 lower than pneumoperitoneum SVR 2014.1 dynes-sec/cm^5, Supine aortic diameter 26.7 mm higher than pneumoperitoneum aortic diameter 25.1 mm.
Conclusions: Pneumoperitoneum and trendelenburg position significantly increases MAP and SVR. There is also a significant decrease of aortic diameter, and these may reflect the impact of intrabdominal pressure on intrathoracic pressure. There are not significant changes in CO or SV during pneumoperitoneum.

A-206

Hemodynamic changes in liver surgery

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Background and Goal of Study: Liver resections are reasonable and effective surgical procedure for treatment of benign lesions and malignant tumours of the liver and biliary tract. Potencial risk of massive blood loss and intraoperative hemodynamic instability remain main factors compromising perioperative outcome. Hypotensive episodes should be avoided during operation to ensure oxygen supply to the liver, maximize the chances of recovery of hepatic function and prolong disease-free survival. This study was undertaken to evaluate the causes of intraoperative hemodynamc instability (hypotension and/or low cardiac output).
Materials and Methods: Fifty-eight consecutive ASA I–II patients scheduled for elective liver resections were included in the study. Standard anesthesia protocol (Sevoflurane (ET 2.1–2.5‰)), Fentanyl, Pipecuronium) was carried out for all the patients and a number of hemodynamic parameters were recorded along with the standard anesthesia monitoring: ECG with ST monitoring, invasive arterial blood pressure, blood pressures in superior vena cava (SVC) and inferior vena cava (IVC), cardiac output (CO), systemic vascular resistance (SVR), pulmonar artery pressures, wedge pressure and oxygen transport parameters, blood loss and diuresis. Hypotensive episodes (decrease of systolic blood pressure >20% during 1 minute) and low cardiac output episodes (decrease >30% if not associated with hypotension) were recorded and analyzed.
Results: In 86% of cases episodes of hemodynamic instability (total number 197) were registered, 46% of them lasted longer than 1 min. Blood loss was responsible only for 14%, cardiac rhythm abnomarlities – 2%, low SVR – 6%, the undetectable reasons – 6%, and 72% of hypotensive episodes were preceded with abrupt increase in IVC pressure, 82% of which were followed with decrease in SVC pressure and CO.
Conclusion: These results suggest, that surgical manipulations, disturbing blood flow in IVC (retraction or pressing of IVC) is the main reason of hemodynamic events in our study. It is highly recommendable to monitor IVC pressure in liver surgery to avoid hypotension and low CO.

A-207

BIS monitoring and different remifentanil doses in rapid sequence anaesthesia induction

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Background and Goal of Study: Rapid sequence anesthesia induction (RSAI) is often associated with significant hemodynamic changes which are potentially harmful (1). This randomized, prospective trial was designed to examine the hemodynamic effects and intubation conditions of different remifentanil dose on RSAI.
Material and Methods: With IRB approval and written informed consent 54 ASA I–II adult patients were allocated to two groups at random to receive either remifentanil 1 mcg/kg (Group I n = 26) or 0.5 mcg/kg (Group II n = 28) as adjunct to propofol 2 mg/kg, and rocuronium 1 mg/kg (60 sec. after propofol) based RSAI. After preoxygenation for 3 minutes, induction and tracheal intubation was performed in a 30° head-up position. Laryngoscopy and endotracheal intubation conditions were assessed via a standard scoring system. Hemodynamic and Bispectral Index (BIS) recordings were done at before induction, after induction, at intubation and at 1, 3, 5, 10 minutes following intubation. Area under hemodynamic variables, BIS values and time curves (AUC) were calculated and assessed with T test. Repeated measures for ANOVA and Chi-Square tests were also used and $p < 0.05$ was considered as significant. Values are expressed as mean and standard deviation.
Results: Patients characteristics and demographic data were similar among groups. AUCBIS was similar among groups (Group I 300 ± 45 cm^2 vs Group II 315 ± 49 cm^2 p = 0.432). Heart rate, systolic, diastolic and mean blood pressure measurements and the area under hemodynamic vs time curves were similar among groups. Total intubation score (max. 14 points) was higher in Group I (12.6 ± 1.67) compared to Group II (10.3 ± 4.79) (p = 0.03). The number of patients with intubation score equal to max. 14 points in Group I (n = 13) was higher than Group II (n = 6) (p = 0.028).
Conclusion: Remifentanil 0.5 mcg/kg as adjunct to RSAI provides similar hemodynamic and BIS profile like remifentanil 1 mcg/kg. However, use of remifentanil 1 mcg/kg as an adjunct offers superior laryngoscopy and intubation conditions.
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A-208

Incidence of postoperative myocardial infarction in non cardiovascular surgery

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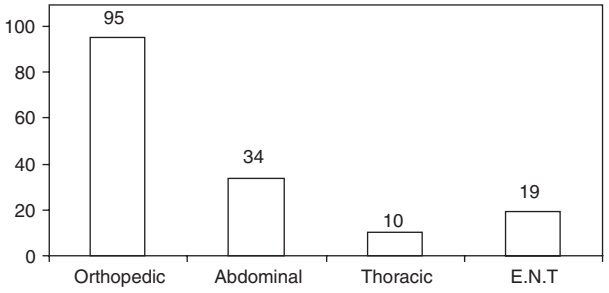
Background and Goal of Study: Incidence of postoperative myocardial infarction (POMI) is poorly described in non cardiovascular surgery (1). Mortality and morbidity are related to post operative troponine I (cTnI) levels (2).
Materials and Methods: In 158 patients (age 70 ± 11 yrs), included over a 9 months period, and scheduled for major non cardiovascular surgery, cTnI and electrocardiograms were analyzed post operatively at day 0, 1, 2, and 3. cTnI serum concentration >0.3 ng/mL was considered abnormal. LEE score was calculated preoperatively to predict cardiovascular risk. Anesthetic procedure was not standardized.
Results and Discussion: Only 1 patient had cTnI > 0.3 ng/mL. POMI incidence was 0.6%. LEE (mean ± SD) was 2 ± 0.9. Electrocardiograms remained unchanged and physical examination was normal. Data (%) for type of surgery are shown in Table:



Low rate of elevated cTnI can be related to small sample size, or better management of patients at high risk for cardiovascular events. These results must be confirmed by larger sample of patients.
Conclusion: In our findings, POMI's incidence in non cardiovascular surgery seems lower than yet described in literature: 5% in (1).
References:
1 Badner NH. *Anesth* 1998;88:572–8.
2 Kim LJ. *Circ* 2002;106:2366–71.

A-209

The incidence and clinical significance of the left ventricular dysfunction related to duration and treatment of hyperthyreosis

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Background and Goal of Study: Hyperthyroidism has a multifarious effect on the cardiovascular system. (1) Enhanced left ventricular contractile function is a consistent finding in hyperthyroidism. The aim of the study was to analyze retrospectively surgically treated patients with different types of hyperthyroidism and establish the incidence and clinical significance of the left ventricular dysfunction related to duration and treatment of hyperthyroidism.

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Material and Methods: Evaluation of left ventricular function was based on the ejection fraction during exercise. The number of patients included in this study was 423. The incidence of various forms of hyperthyroidism in our patients was the following: Graves-Basedow's disease in 69.3% of patients, toxic adenoma in 14.5%, toxic polynodal struma in 13.3% and hyperthyroidism of other etiology in 2.9% of the subjects. Preoperative medicamentous therapy lasted on average 5.6 years in the case of Graves-Basedow's disease, 6.8 years in the case of toxic adenoma and 14.0 years in the case of toxic polynodal struma.
Results and Discussion: Pathological response of the ejection fraction during exercise was recorded in 60.0% of the patients, hypertrophy of the left chamber in 17.0% and the insufficiency of the left chamber with congestive stasis in the lungs in 4.6% of the patients.
Conclusion: Clinical features of the left ventricular dysfunction in hyperthyroidism include the occurrence in younger patients with the history of hyperthyroidism, progressive course and the occurrence of congestive cardiac failure, as well as the reversible nature of all cardiac changes after surgical therapy of hyperthyroidism.
Reference:
1 Smallrdge RC. *Rev. Crit. Care Med*. 1992;276:56–9.

A-210

Remifentanil-induced mechanic responses and membrane potential changes in human umbilical arteries

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Background and Goal of Study: The aim of the study was to evaluate the characteristic features of mechanical responses and membrane potential changes induced by remifentanil in human umbilical arteries (HUAs). The ionic mechanisms underlying the electrophysiological responses were pharmacologically assessed using two K^+ channel blockers.
Materials and Methods: Following faculty ethic committee approval, thirty-eight human umbilical arteries were obtained. Contraction–relaxation, membrane potential changes and electrical responses of the HUAs were recorded.
Results and Discussions: Remifentanil produced concentration-dependent relaxation in both endothelium-intact and denuded HUA rings. Remifentanil produced a significantly greater relaxation response in intact HUA rings than in denuded HUA ones. In endothelium-intact rings, pretreatment with L-Nitroarginine [N_w-NITRO-$_L$-ARGININE (L-NO-ARG) or indomethacin reduced the degree of remifentanil-induced relaxation. Remifentanil (10^{-9}–10^{-6} mol L^{-1}) produced a transient concentration dependent membrane hyperpolarization which was not reduced by pretreatment with L-NO-ARG or indomethacin. It also produced a small concentration-dependent hyperpolarization in the presence of charybdotoxin or tetraethylammonium.
Conclusion(s): In both endothelium-intact and denuded HUAs, remifentanil induces concentration-dependent vasorelaxation and simultaneously releases nitric oxide, prostaglandins and possibly an endothelium-derived hyperpolarizing factor. In addition, it dose-dependently produces hyperpolarization. Hyperpolarization induced by remifentanil involves the activation of Ca^{2+}-dependent and -independent potassium channels regulated by intracellular Ca^{2+}.

A-211

Effects of levosimendan versus dobutamine on pressure load-induced right ventricular failure

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Background: A transient increase in pulmonary arterial (PA) pressure can persistently depress right ventricular (RV) contractility (1). We investigated the effects of dobutamine and levosimendan on RV-PA coupling in an experimental model of RV failure.
Material and Methods: Twenty-three anesthetized dogs underwent a transient (90 min) PA constriction to induce persistent RV failure. Random assignation was made to control, dobutamine or levosimendan group, with administration of dobutamine 5 and 10 μg/kg/min or levosimendan 12 μg/kg in 10 min followed by 0.1 and 0.2 μg/kg/min. PA distal resistance, proximal elastance and pulmonary vascular impedance were measured by pressure-flow relationships. RV contractility was determined by the end-systolic pressure-volume relationship (Ees), PA effective elastance by the end-diastolic to end-systolic relationship (Ea), and RV-PA coupling efficiency by the Ees/Ea ratio (2).
Results: Transient PA constriction persistently increased PA resistance and elastance, increased Ea from 0.83 ± 0.02 to 2.57 ± 0.57 mmHg/ml, decreased Ees from 1.04 ± 0.04 to 0.5 ± 0.05 mmHg/ml, and decreased Ees/Ea from 1.27 ± 0.04 to 0.26 ± 0.05. Dobutamine markedly increased RV contractility and cardiac output. RV-PA coupling was normalized for the highest dose. Compared to dobutamine, levosimendan decreased pulmonary arterial elastance and characteristic impedance. RV-PA coupling was restored since the first dose by both increase RV contractility and RV afterload decrease.
Conclusions: A transient increase in PA pressure persistently worsens PA hemodynamics, RV contractility, RV-PA coupling and cardiac output. Levosimendan restores RV-PA coupling better than dobutamine at low dose, because of its more pronounced pulmonary vasodilatory effect.
References:
1 Kerbaul F, Rondelet B, Motte S, et al. *Crit Care Med* 2004; 32: 1035–1040.
2 Brimioulle S, Wauthy P, Ewalenko P, et al. *Am J Physiol Heart Circ Physiol* 2003; 284: H1625–1630.

A-212

Reduction of coronary flow by non-invasive establishment of a coil in a coronary artery in pigs: a validation study

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Background and Goal of Study: We have developed a non invasive model of coronary flow reduction by insertion of a coil in a coronary artery. Objectives of the study are (1) to evaluate cardiac function at rest after intra-coronary insertion of a coil and (2) to quantify impact of a stressful test on myocardial viability.
Material and Methods: For all procedures (coil insertions, transthoracic echocardiography (TTE) and stressful test), pigs were anesthetised with isoflurane and ventilated with 100% O_2. Seven days after coil insertion, a coronary angiography was realised and quality of flow was classified using TIMI classification. Stressful test (inflation of an occluding balloon in thoracic aorta during 10 minutes) was conducted in 6 normal pigs (NP) and in ten 7-days coil implanted pigs (IP). Dosages of troponine Ic (Tr Ic) were done during 3 days and animals were sacrificed 6–8 days after stressful test. After sacrifice, hearts were immediately explanted and fixed in a formaldehyde solution for further histological analysis. In the meantime, a TTE was realised in NP (n = 7) and IP (n = 7). Mitral flow, Tissue Doppler Imaging (TDI), end-diastolic and end-systolic areas and diameters were evaluated with 2-chambers long-axis and short axis views. Data are expressed as mean ± SD or %. Statistical analyses were done using Mann-Whitney or χ^2 tests as required. A p value <0.05 was considered as significant.
Results and Discussion: A total of 17 pigs weighing 51 ± 8 kg were enrolled. One pig died the day of coil insertion procedure. Two lengths of coils were used: 6 cm (n = 2) and 10 cm (n = 8). Coils were released in left anterior artery (n = 4), circumflex artery (n = 5) and astride circumflex and left arteries (n = 1). After 7 days, 1 pig was TIMI 0, 4 were TIMI 1 and 5 TIMI 2. TTE evaluation showed an E′/A′ ratio lower in IP (0.87 ± 0.48 cm.s^{-1} vs 1.19 ± 0.33 cm.s^{-1} p = 0.04) and a longer E wave Deceleration Time (153 ± 24 sec vs 96 ± 25 sec; p = 0.016). Systolic function was never altered. Maximal values of T Ic were higher in IP (1.16 ± 1.44 ng/mL vs 0.04 ± 0.01 ng/mL; p = 0.002) after stressful test. Histological analysis highlighted a significantly higher incidence of necroses in coil implanted pigs (70% vs 17%; p < 0.05).
Conclusion: Intra-coronary insertion of a coil in pigs induces a diastolic dysfunction at rest and myocardial damage after a hemodynamic stress.

A-213

Involvement of reactive oxygen species in signal-regulation on endothelin-1 in modulating vascular injury

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Background and Goal of Study: This study is to search for some possible mechanisms related to the involvement of reactive oxygen species (ROS) in signal-regulation on endothelin-1 in modulating hypertensive vascular injury.

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Materials and Methods: Cultured rat aortic SMCs were stimulated with Ang II, [3H]thymidine incorporation and the ET-1 gene expression was examined. Antioxidants pretreatment on Ang-II induced extracellular signal-regulated kinase (ERK) phosphorylation were performed to elucidate the redox-sensitive pathway in proliferation and ET-1 gene expression.
Results and Discussions: Ang II-increased DNA synthesis was inhibited by AT_1 receptor antagonist (olmesartan) and ET_A receptor antagonist (BQ485). ET-1 gene was induced with Ang II as revealed by Northern blotting and promoter activity assay. Ang II-increased intracellular ROS levels were inhibited by olmesartan and antioxidants. Antioxidants suppressed Ang II-induced ET-1 gene expression and ERK phosphorylation. An ERK inhibitor U0126 fully inhibited Ang II-induced ET-1 expression. Co-transfection of dominant negative mutant of Ras, Raf and MEK1 attenuated the Ang II increased ET-1 promoter activity, suggesting that the Ras-Raf-ERK pathway is required for Ang II-induced ET-1 gene. Truncation and mutational analysis of the ET-1 gene promoter showed that activator protein-1 (AP-1) binding site was an important cis-element in Ang II-induced ET-I gene expression. Moreover, Ang II or H_2O_2 induced AP-1 reporter activities were also inhibited by antioxidants.
Conclusion(s): Our data suggest that ROS are involved in Ang II-induced proliferation and the redox-sensitive ERK pathway plays a role in ET-1 gene expression in rat aortic SMCs. These results may provide important insight that contribute to the therapeutic concern the influence of Ang II on the hypertensive cardiovascular diseases.
References:
1 Cheng TH *J AM Col Cardiol* 2003; 1845–1854.
2 Cheng TH *J Mol Cel Cardiol* 2001; 33:1805–1814.

A-214

Role of nitric oxide cGMP pathway to prevent endothelial dysfunction and acute lung injury induced by cardiopulmonary bypass

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Background and Goal of Study: Cardiopulmonary bypass (CPB) may induce pulmonary endothelial dysfunction and acute lung injury (ALI)[1]. In this study we investigated the role nitric oxide (NO)-cGMP pathway to prevent endothelial dysfunction and ALI induced by CPB.
Materials and Methods: Twenty-four anaesthetized and mechanically ventilated pigs were studied in four groups: Group control (received no treatment), group iNO (received 10 ppm of inhaled NO), group cGMP (received 5 μg.kg.min^{-1} of nebulized cGMP analog) and group LNAME (received 5 mg.kg.min^{-1} of LNAME). Endothelial function was assessed by measuring the change in pulmonary vascular resistance induced by acetylcholine (endothelial-dependent relaxation) and by sodium nitroprusside (endothelial-independent relaxation). Acute lung injury was assessed by measuring arterial blood gases and pulmonary haemodynamics. All measurements were performed before and after 2 hours of CPB.
Results and Discussions: Pulmonary endothelial function, PaO_2 and mean pulmonary artery pressure (mPAP) are shown in the Table.

	Control group		iNO group		cGMP group		LNAME group	
	Before	After	Before	After	Before	After	Before	After
PVR change ACH (%)	−31 ± 27	8 ± 7*	−34 ± 21	20 ± 31#	−34 ± 21	−20 ± 31#	−34 ± 21	+10 ± 6*
PVR change SNP (%)	−33 ± 3	−26 ± 9	−26 ± 30	−36 ± 16	−26 ± 30	36 ± 16#	−30 ± 3	−20 ± 10
PaO_2 (mmHg)	214 ± 23	94 ± 11*	227 ± 38	217 ± 33#	227 ± 38	216 ± 11#	220 ± 38	92 ± 12*
mPAP (mmHg)	18 ± 2	23 ± 2*	16 ± 3	15 ± 3#	16 ± 3	15 ± 2#	16 ± 3	22 ± 1*

**Mean ± SD, ANOVA* and *Bonferroni, #P < 0,05 vs before, #vs control group.*

Conclusion(s): Endothelial dysfunction and ALI induced by CPB was completely prevented by increasing cGMP pathway.
Reference:
1 Li S, Price R, Phiroz D. et al, J Extra Corpor Technol. 2005 Jun;37(2):180–8.

A-215

Influence of sepsis on local cerebral blood flow in rats

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Background and Goal of Study: Sepsis and septic shock are often complicated by encephalopathy, neuroendocrine dysfunction and cardiovascular autonomic failure. Brain dysfunction is poorly explored and the reasons for these abnormalities remain unclear. The aim of the present study was to analyse mean cerebral blood flow (CBF) of the whole brain and local cerebral blood flow (LCBF) of defined brain areas in a septic rat model.
Materials and Methods: 29 male Wistar rats (250–350 g) were randomly assigned to a sepsis group (22 rats, Coecal Ligature and double Perforation with a 18G needle [1]) or a control group (7 rats, Sham). 20 hours after initial surgery (sepsis induction), rats were reanesthetized (sevoflorane) and femoral artery and vein catheterized. LCBF measurement was performed 24 h after initial surgery using the autoradiographic technique by Sakurada et al. with 4-iodo[N-methyl-^{14}C] antipyrine [2]. In 43 different brain regions LCBF was determined by bilateral optical density measurements. Data are presented as means ± SD. For statistical analysis the Mann-Whitney-U-test was used, a $P < 0.05$ was considered significant.
Results and Discussion: 10 rats of the sepsis group died within 24 hours, the remaining 12 rats were investigated. No rat of the control group (N = 7) died. Septic rats (vs. control) presented tachycardia (507 ± 37 vs. 452 ± 44 min^{-1}, $P < 0.02$), leukocytopenia (3.0 ± 2.4 vs. 8.8 ± 3.0 · 10^9/L, $P < 0.002$), hypocapnia (29.3 ± 4.6 vs. 36.4 ± 3.9 mmHg, $P < 0.004$), and higher serum lactate concentration (5.7 ± 3.9 vs. 2.2 ± 2.0 mmol/L, $P < 0.02$). LCBF of all 43 areas investigated and mean CBF (116 ± 59 vs. 115 ± 52 mL · 100 g^{-1} · min^{-1}), as well as data for CO-oximetry and electrolytes were not statistically significantly different between the two groups.
Conclusion: In a common animal model of sepsis mean CBF and LCBF were similar when compared to controls despite a mortality of 45% within 24 hours. It remains unclear, if CBF and LCBF are unaffected or fully compensated despite severe sepsis.
References:
1 Wichterman KA et al. J Surg Res 1980;29:189–201.
2 Sakurada O et al. Am J Physiol 1978;234:H59–H66.

A-216

Correlation between arterial and subcutaneous tissue oxygenation in lean and obese volunteers

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Background and Goals: Incidence of wound infections is inversely related to subcutaneous tissue oxygen pressure ($PsqO_2$) and $PsqO_2$ is dependent on arterial oxygen pressure (paO_2). In the anesthetized and ventilated obese patient it has been shown that $PsqO_2$ is considerably lower compared to the lean patient.(1) Furthermore obese individuals are more likely to develop perioperative infection.(2) We tested the hypothesis that $PsqO_2$ in obese but otherwise healthy volunteers is lower compared to lean individuals.
Material and Methods: 7 lean and 7 obese (BMI > 35) but otherwise healthy volunteers were subjected to 4 different oxygen challenges. PaO_2 was continuously monitored (Paratrend7®) in the radial artery. Simultaneously $PsqO_2$ was measured with a polarographic sensor placed subcutaneously in the upper arm. Several linear and non linear functions were fitted to the data using a population approach. Models were selected based on visual inspection of the residuals and the AKAIKE criterion. Covariates tested were age and BMI and were included in the model if the fit was significantly improved (log likelihood test, $p < 0.05$). All calculations were performed using NONMEM.
Results: All 126 data points from 14 volunteers were included in the data analysis. A linear relationship between paO_2 and $PsqO_2$ adequately described the data. Neither age nor BMI displayed a significant relationship with slope and intercept.

Parameter	Population value (SE)	Inter-individual variability
Slope	0.48 (0.03)	13.8%
Interception	19.3 (1.9)	20.3%

Mean residual error: 12.8% (SE = Standard error)

Conclusions: Our results show a linear relationship between paO_2 and $psqO_2$ that can be approximated by the following equation: $psqO_2 = 0.5\ paO_2 + 20$ mmHg. Tissue oxygenation did not differ between lean and obese volunteers.
References:
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2 Namba RS. *J Arthroplasty* 2005; 20:46–50.

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A-217

Clonidine induces prolonged depression of microcirculatory mucosal perfusion-compared to systemic and skin perfusion during propofol and sevoflurane anesthesia

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Background and Goal of Study: Clonidine is increasingly used in anesthesia as sedative and antihypertensive agent. Maintenance of microcirculatory perfusion of barrier-tissues (i.e., skin and digestive tract mucosa) is crucial for intact barrier-function [1]. Since microcirculatory effects of clonidine may differ between distinct barrier-tissues, we studied microcirculatory effects of clonidine on skin and enoral mucosa, respectively. Furthermore, since the type of baseline anesthesia may modulate the effects of clonidine, we studied microcirculatory effects of clonidine during propofol- and sevoflurane-anesthesia, respectively.
Materials and Methods: Chronically instrumented dogs (25–35 kg bodyweight, n = 6 per group) were anesthetized (randomly: propofol 15 mg/kg/h or sevoflurane 1.5 MAC), intubated and mechanically ventilated. The animals were instrumented for measurements of systemic hemo-dynamics and regional microcirculatory perfusion (laser Doppler fluxmeters: probes at the skin (leg) and enoral mucosa). After baseline measurements, clonidine (2.0 μg/kg) was infused within 1 min. Data are mean ± SEM; Statistics: Fisher PLSD, $p < 0.05$.
Results and Discussions: Clonidine significantly reduced cardiac output from 75 ± 5 and 75 ± 6 ml/kg/min (under propofol and sevoflurane, respectively) to a minimum of 40 ± 3 and 49 ± 5 ml/kg/min, however with full recovery to baseline already after 30 min (70 ± 4 and 71 ± 6 ml/kg/min). In accordance, clonidine also significantly reduced skin perfusion (by 28 ± 4% and 27 ± 8%), again with full recovery (−7 ± 2% and 3 ± 10%). In contrast, clonidine reduced microcirculatory mucosa perfusion by 44 ± 8% and 54 ± 4%, but herein perfusion remained significantly depressed (by 25 ± 5% and 27 ± 4%).
Conclusion: Clonidine markedly depresses systemic and microcirculatory perfusion of skin and mucosa, similarly both during propofol- and sevoflurane-anesthesia. While rapid recovery of systemic and microcirculatory skin perfusion occurred, the depression of the microcirculatory mucosa perfusion persisted. Given the crucial role of maintained microcirculatory perfusion for intact mucosal barrier function [1], our data may indicate that clonidine compromises mucosal barrier function.
Reference:
1 Sato N, et al. Dig Dis Sci 1986; 31:35–41.

A-218

Heart rate response to intravenous landiolol during propofol anesthesia

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Background and Goal of Study: Propofol attenuates both sympathetic and parasympathetic nervous system (1). There is no clinical study examining the infusion rate-related hemodynamic interaction between propofol and landiolol, an ultra-short acting $ß_1$-bloking agent.
Materials and Methods: Twenty-four patients (ASA class I, 20–50 yr) were assigned to one of two groups. Patients in the P-1.25 group (n = 12) received intravenous (IV) propofol 1.25 mg/kg over 1 min followed by a continuous infusion of propofol 5 $mg \cdot kg^{-1} \cdot hr^{-1}$. Tracheal intubation was facilitated with IV vecuronium, and anesthesia was maintained with propofol 5 $mg \cdot kg^{-1} \cdot hr^{-1}$ and 67% nitrogen in oxygen. Mechanical ventilation was adjusted to maintain Et-CO_2 at 35 mmHg. Patients in the P-2.5 group (n = 12) received IV propofol 2.5 mg/kg over 1 min followed by propofol 10 mg $kg^{-1} \cdot hr^{-1}$. The other protocol is identical to that in the P-1.25 group. Fifteen min after tracheal intubation, patients in both groups received IV landiolol at incremental infusion rates (40, 50, 60, 70, 80, 90, 100 $\mu g \cdot kg^{-1} min^{-1}$ for 2 min at each dose) until heart rate (HR) decreased more than 15 beats/min (bpm) from baseline values. At the end of each infusion period, HR and blood pressure (BP) were measured.
Results: Patients' age and basal HR (before landiolol infusion) were similar between groups. The changes in HR were greater in patients in the P-1.25 group in whom the landiolol infusion at 40, 50, and 60 $\mu g \cdot kg^{-1} \cdot min^{-1}$ caused HR decreases of −6 ± 4, −9 ± 6, and −13 ± 6 bpm, as compared with HR decreases of −1 ± 3, −4 ± 2, and −6 ± 4 bpm in the P-2.5 group, respectively (mean ± SD, $P < 0.05$). When landiolol was infused at a rate of 90 $\mu g \cdot kg^{-1} \cdot min^{-1}$, HR decreased by more than 15 bpm in all patients of the P-1.25 group, but in only 40% of patients in the P-2.5 group. There were no significant differences between groups in systolic, diastolic and mean BPs in each landiolol dose.
Conclusion: The less HR response to IV landiolol at the more infusion rate of propofol is possibly due to propofol-induced dose-dependent depression of the sympathetic nervous system.
Reference:
1 Deutschman CS. *Anesth Analg* 1994; 79:373–377.

A-219

Protective effect of prostaglandine E2 and endothelin-1 receptor antagonist in hepatic microcirculation and oxygenation during acute increased intra-abdominal pressure: experimental study

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Background and Goal of Study: Acute increase of intra-abdominal pressure (IAP) may impair the function of multiple organs including liver blood flow decrease, hepatic tissue hypoxemia and organ dysfunction. We evaluate the effect of prostaglandine E2 and endothelin-1 receptor antagonist (tezosentan) on liver blood flow during IAP.
Materials and Methods: We studied 20 anesthetized and mechanically ventilated pigs randomly assigned to three groups: 1) EG (n = 7) treated with tezosentan (10 mg/Kg). 2) PG (n = 7) received prostaglandine E2 (8 ng/Kg/min). 3) CG (n = 6) control with saline. IAP increased from 0 to 10, 15, 20 and 25 mmHg (20 minutes at each level). Cardiac output was maintained by increasing fluids. Systemic hemodynamic parameters, total hepatic blood flow (THBF), hepatic microcirculation (HMC) and hepatic oxygen tissue (HpO_2) were recorded at the different IAP and after deflation.
Results and Discussions: No differences were found in systemic hemodynamic variables between groups. THBF decreased significantly in all groups respect to the baseline as the IAP increased. HpO_2 was significant higher in the EG group at IAP of 10 ($p < 0.02$), 15 ($p < 0.02$), 20 ($p < 0.01$) and 25 mmHg ($p < 0.01$). However it was in the PG group that the HMC was significantly higher (10 and 15 mmHg $p < 0.05$; 20 and 25 mmHg $p < 0.001$). All variables reached the baseline values after deflation in the three groups.

		Baseline	10 mmHg	15 mmHg	20 mmHg	25 mmHg	0 mmHg
THBF	CG	832 ± 175	1006 ± 80	808 ± 149	724 ± 122	594 ± 150	768 ± 228
	PG	894 ± 186	1022 ± 346	846 ± 361	795 ± 219	620 ± 202	803 ± 224
	EG	762	834	807	823	741	971
HpO_2	CG	100%	−6.2 ± 18*	−70 ± 42*	−90 ± 28*	−93 ± 24*	2 ± 8
	PG	100%	−30 ± 12	−30 ± 21	−28 ± 16	−40 ± 15	14 ± 6
	EG	100%	−44 ± 15	−25 ± 14	−20 ± 12	−17 ± 12	4 ± 2
HMC %	CG	100%	−48.9 ± 20	−65.5 ± 15	−61.9 ± 24	−70.9 ± 14	−14.2 ± 22
	PG	100%	−5.3 ± 7	−17.3 ± 7*	11.4 ± 13*	8.2 ± 12*	−1 ± 2
	EG	100%	−25 ± 8	−22 ± 9	−28 ± 12	−18 ± 12	8 ± 2

THBF = Total hepatic blood flow (ml/min). HpO_2 = hepatic oxygen tissue HMC. % = hepatic microcirculation %. *p = 0.05. **p = 0.01 between groups.

Conclusion(s): The impairment in HMC and HpO_2 could be improved with non-selective endothelin-1 receptor antagonist tezosentan and prostaglandine E2 during acute increases of IAP.

A-220

Effect of landiolol on hemodynamic changes during emergence and tracheal extubation after general anesthesia

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Background and Goal of Study: We experience undesirable hemodynamic changes during emergence and tracheal extubation after general anesthesia. Our aim was to investigate the effects of ultra-short-acting beta-blocker, landiolol on the hemodynamic changes.
Materials and Methods: Forty patients classified ASA 1–2 were randomly assigned to receive landiolol 80 μg/kg/min for 1 min and then 20 μg/kg/min (group L, n = 20) or saline (group C, n = 20) during emergence and tracheal extubation. Blood pressure (BP) and heart rate (HR) were recorded during emergence and tracheal extubation.
Results and Discussions: There were no significant differences in patients' background, type of surgery and duration of anesthesia, amount of fentanyl, methods of anesthesia, and existence of cardiovascular complication between

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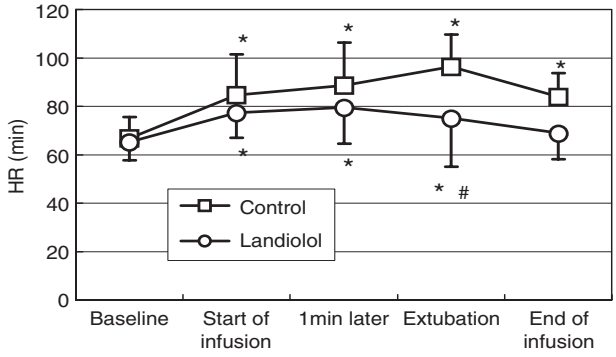
two groups. Although HR and BP were elevated during emergence in both groups, HR increase was significantly less in group L at tracheal exubation ($P < 0.05$). Hypotension, bradycardia, and ST changes in EKG was not observed at all during the study period.



as compared to Control, *as compared to Baseline

Conclusion: Infusion of landiolol effectively suppressed increase in HR without hypotension during emergence and tracheal extubation after general anesthesia.

A-221

Subcutaneous tissue oxygenation is markedly low during the postoperative period in patients undergoing cardiac bypass surgery

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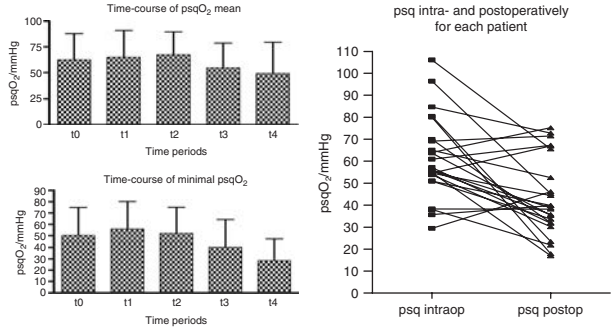
Background and Goal of Study: Tissue oxygenation ($psqO_2$) was proved to be an important parameter in the development of surgical site wound infection (SSI). Low $psqO_2$ is a predictor for SSI[1][2]. We investigated the hypothesis that $psqO_2$ values after coronary artery bypass grafting (CABG) are considerable low in the postoperative period.

Materials and Methods: 24 patients undergoing CABG were included into the survey. $PsqO_2$ was measured subcutaneously in the upper arm and reported continuously with a Licox™ analyser. Values are reported as mean ± standard deviation over 5 defined time periods: Pre-CBP (t0), CBP (t1), post-CBP till skin closure (t2), post-operatively till extubation (t3), extubation till first post-operative day (t4). Statistical analysis was done using ANOVA for repeated measurements.

Results and Discussions:



$PsqO_2$ dropped in the postoperative period to minimal values of 28 ± 25 mmHg. Three fourth (18) of the patients showed a decrease, one fourth (6) of patients stayed at equal level or increased in $psqO_2$.

Conclusion(s): Identifying the reason for the dangerously low $psqO_2$ in patients undergoing cardiac surgery and assessment of protective strategies will be focus of further investigation.

References:

1 Greif R. et al. *Supplemental perioperative oxygen to reduce the incidence of surgical-wound infection. Outcomes Research Group.* N Engl J Med, 2000; **342**(3): p. 161–7.

2 Hopf HW. et al. *Wound tissue oxygen tension predicts the risk of wound infection in surgical patients.* Arch Surg, 1997; **132**(9): p. 997–1004; discussion 1005.

A-222

Continuous intraoperative opioid administration increases subcutaneous tissue oxygen tension

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Background and Goal of Study: The incidence of wound infection is directly related to tissue oxygenation (1). Surgical stress response, which markedly increases sympathetic nerve activity and catecholamine concentrations, might contribute to peripheral vasoconstriction, reduced wound perfusion and subsequent hypoxia of tissue. In accordance additional thoracic epidural anesthesia prevents the decrease of tissue oxygen tension during major abdominal surgery (2). Opioids are known to depress the hypothalamic-adrenal response to surgery in a dose dependent manner. Consequently we tested the hypothesis that continuous opioid infusion is more effective in maintaining intraoperative tissue perfusion and oxygenation compared to intermittent opioid bolus administration.

Materials and Methods: After IRB approval and informed consent 40 patients undergoing major abdominal surgery were randomly assigned to receive either fentanyl bolus (n = 20) or continuous remifentanil infusion (n = 20). All patients received standardized general anesthesia with sevoflurane depending on the bispectral index (30–50). Subcutaneous tissue oxygen tension was measured in the upper arm with a temperature-corrected Clark-type electrode (LICOX, GMS Inc., Germany).

Results: Data are presented as mean ± SD.

	Fentanyl	Remifentanil
Intraop. opioids (mcg)	985 ± 646	4947 ± 2899
Et. sevoflurane (%)	1.9 ± 0.4	1.4 ± 0.2*
MAP (mmHg)	78 ± 6	73 ± 7*
Serumglucose (mg/dl)	128 ± 19	110 ± 10*
Tissue oxygen tension (mmHg)	49.1 ± 11.5	58.0 ± 14.7*

* indicates statistically significant different (two-sided, unpaired t-tests)

Conclusion(s): Subcutaneous tissue oxygen tension was significantly improved during remifentanil anesthesia. Thus continuous intraoperative opioid administration might blunt vasoconstriction caused by surgical stress and adrenergic responses compared to bolus opioid administration.

References:

1 Hopf H. *Arch. Surgery* 1997; 132, p: 997.

2 Kabon B. *Anesth. Analg* 2003; 97, p: 1812.

A-223

Comparative effect of isoflurane and sevoflurane on plasma level of NO

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Background and Goal: Endothelium has a role in the action of Isoflurane on endothelial vascular cells (1). Sevoflurane has inhibitory effect on nitric oxide release from cultured endothelial cells (2). *The aim*: to determinate the effect of isoflurane and sevoflurane on endogenous synthesis of NO and to compare their effect.

Material and Methods: A total of 60 patients, ASA I, were divided in 2 groups: I group of 30 patients received isoflurane during general anesthesia, to reach MAP between 60 and 70 mmHg. II group of 30 patients received sevoflurane during general anesthesia, to reach MAP between 60 and 70 mmHg.

Anesthesia: Fentanil, Propofol, Rocuronium, O_2: air.

The enzymatic method according to Conrad et al. (3) for determination of the NO plasma levels was used.

Referent plasma level of NO by this method is 40.3 ± 12 μmol/l.

Samples of venous blood were taken five times during the operation: 10 min. before, 10 min. after the induction, 1 hour after, 2 hours after induction and 10 min. after the extubation.

Results:

	Group I		Group II	
T	NO ± SD μmol/l	SVR ± SD Dyn.sec.cm^{-5}	NO ± SD μmol/l	SVR ± SD Dyn.sec.cm^{-5}
T1	40.3 ± 1.6	1175.4 ± 104.7	40.8 ± 1.6	1145.6 ± 152.1
T2	51.2 ± 1.6*	1018.6 ± 32.0*	46.6 ± 1.5	1107.6 ± 145.5
T3	51.9 ± 1.5*	984.0 ± 24.4*	47.2 ± 1.2	1069.8 ± 139.7
T4	52.7 ± 1.5*	968.5 ± 20.4*	47.6 ± 1.3	1036.8 ± 126.4
T5	42.1 ± 1.9	1178.6 ± 104.5	42.4 ± 1.3	1068.1 ± 113.6

*$p < 0.05$

Conclusions: 1) The effect of isoflurane. and sevoflurane on endothelium-dependent vasodilatation depends on endogenous NO of endothelial cells. 2) Iso (2%) produced higher plasma level of NO than sevo (4%).

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References:
1 Izumi K, Akata T, Takahashi S. Anesthesiology 2001; 95:990–98.
2 Az-ma T, Fujii K, Yuge O. Eur J Pharmacol 1995; 289:33–9.
3 Conrad KP, Joffe GM, Kruszyna H, et al. FASEB J. 1993; 7(6):566–71.

A-224

Preinduction blood glucose is an important predictor for perioperative insulin management in cardiac surgery

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Background and Goal: Abnormal glucose tolerance is common in cardiac surgical patients (1). In this study we hypothesized that the preinduction blood glucose value (BG) is an important predictor for perioperative insulin management in patients undergoing cardiac surgery.
Materials and Methods: 80 cardiosurgical patients were assigned to 2 groups: group 1 with a preinduction BG = 110 mg/dl and group 2 with a BG > 110 mg/dl. Intraoperatively, a continuous infusion of insulin was started if the BG was > 110 mg/dl, and the infusion was adjusted to maintain normoglycemia (80–110 mg/dl) until discharge from the ICU.
Results and Discussion: Data are shown in Table 1.

Table 1. Data are mean ± SD or median (range), unless otherwise stated.

Variable	Group 1 ($n = 45$)	Group 2 ($n = 35$)
Preexisting diabetes, *n* (%)	0	11 (31)
Preinduction BG (mg/dl)	101 ± 7	141 ± 47*
Intraoperative insulin consumption (U/h)	1.9 ± 0.9	3.7 ± 1.9*
Intraoperative insulin infusion changes (*n* per patient)	3.7 ± 2.0	5.3 ± 2.0*
Intraoperative periods of BG < 80 mg/dl (*n* per patient)	0 (0–3)	0 (0–9)*
Intraoperative periods of BG > 200 mg/dl (*n* per patient)	0 (0–1)	0 (0–7)
ICU insulin consumption (U/h)	1.8 ± 0.8	2.9 ± 1.6*
ICU insulin infusion changes (*n* per patient)	4.1 ± 2.1	6 ± 2.4*
ICU periods of BG < 80 mg/dl (*n* per patient)	1 (0–5)	1 (0–4)
ICU periods of BG > 200 mg/dl (*n* per patient)	0 (0–1)	0 (0–3)

*P < 0.05 versus Group 1.

Conclusions: In patients with a preinduction BG > 110 mg/dl, perioperative insulin requirements are higher and insulin management is more difficult than in patients with a normal preinduction BG. The preinduction BG seems to be a good predictor for perioperative insulin management.
Reference:
1 Van den Berghe G, et al. NEJM 2001;345:1359–67.

A-225

Perioperative insulin requirements are higher in nondiabetics with an elevated preinduction blood glucose

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Background and Goal: Abnormally elevated blood glucose is common among cardiac surgical patients and has been associated with worsened outcome (1). We hypothesized that in nondiabetics with a preinduction blood glucose value (BG) > 110 mg/dl, perioperative insulin requirements are higher and insulin management more difficult than in those with a normal preinduction BG.
Materials and Methods: Group 1 comprised 45 nondiabetic cardiosurgical patients with a preinduction BG = 110 mg/dl. Group 2 had 24 nondiabetic patients with a preinduction BG ⩾ 110 mg/dl. A continuous infusion of insulin was started intraoperatively, if the BG was > 110 mg/dl, and the infusion was adjusted to maintain normoglycemia (80–110 mg/dl) until discharge from ICU.
Results and Discussion: Data are shown in Table 1.

Table 1. Data are mean ± SD or median (range).

Variable	Group 1 ($n = 45$)	Group 2 ($n = 24$)
Preinduction BG (mg/dl)	101 ± 7	123 ± 8*
Intraoperative insulin consumption (U/h)	1.9 ± 0.9	3.5 ± 1.9*
Intraoperative insulin infusion changes (*n* per patient)	3.7 ± 2.0	4.8 ± 2.1*
Intraoperative periods of BG < 80 mg/dl (*n* per patient)	0 (0–3)	0.5 (0–9)*
Intraoperative periods of BG > 200 mg/dl (*n* per patient)	0 (0–1)	0 (0–2)
ICU insulin consumption (U/h)	1.8 ± 0.8	2.8 ± 1.8*
ICU insulin infusion changes (*n* per patient)	4.1 ± 2.1	5.6 ± 2.3*
ICU periods of BG < 80 mg/dl (*n* per patient)	1 (0–5)	1 (0–4)
ICU periods of BG > 200 mg/dl (*n* per patient)	0 (0–1)	0 (0–3)

*$P < 0.05$ versus Group 1.

Conclusions: In nondiabetic cardiosurgical patients with a preinduction BG > 110 mg/dl, perioperative insulin requirements are higher and insulin management is more difficult than in those with a normal preinduction BG.
Reference:
1 Ouattara A, et al. Anesthesiology 2005;103:687–94.

A-226

Recovery of immune function after cardiopulmonary bypass is faster with total intravenous as compared to inhalational general anesthesia

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Background and Goal of Study: Heart surgery with cardiopulmonary bypass (CPB) induces a significant suppression of the proinflammatory immune competence (1). Furthermore, it has been shown that anesthetic drugs influence perioperative immune function (2, 3). Therefore, aim of the study was to determine the influence of different general anesthetic techniques on perioperative immune function in patients undergoing heart surgery with CPB.
Materials and Methods: After approval by the regional ethics committee, 45 patients undergoing elective coronary artery bypass graft (CABG) surgery were enrolled. After obtaining informed consent, they were randomised into three groups, receiving either total intravenous anesthesia with propofol and sufentanil (13 patients) or balanced anesthesia with sevoflurane (17 patients) or desflurane (15 patients) in combination with sufentanil. Blood samples were drawn after induction of anesthesia (T1), 20 minutes after coming off bypass (T2), 6 (T3) and 24 (T4) hours postoperatively. They were then stimulated with LPS and incubated for 24 hours. TNF-α concentrations were measured by ELISA at the end of the stimulation period.
Results and Discussions: There was a significant decrease in the stimulated TNF-α response in all three groups at time points T2 and T3 when compared to the baseline levels. At T4, TNF-α concentrations remained significantly suppressed in the patients receiving either sevoflurane ($p = 0.002$) or desflurane ($p = 0.001$), while patients anesthetised with propofol had a restored TNF-α response at that time.
Conclusion(s): Stimulated cytokine response recovers to baseline levels 24 h postoperatively in patients undergoing CABG-surgery with CPB receiving a propofol based general anesthesia, while immune function remains suppressed in patients anesthetised with volatile anesthetics.
References:
1 Grundmann U, Rensing H, Adams HA, et al *Anesthesiology* 2000;93:359–369.
2 Larsen B, Hoff G, Wilhelm W, et al *Anesthesiology* 1998;89:1218–1227.
3 El Azab SR, Rosseel PM, De Lange JJ, et al *Eur J Anaesthesiol* 2003;20:380–384.

A-227

Prevention of proteic catabolism and stress response after elective cardiac surgery

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Background and Goal: Metabolic response has been described after surgery. Type and duration of surgery, bleeding or hypothermia are contributing factors to a major stress response (1). Insulin Resistance (IR) with hyperglycemia is developed, with immunologic and haematologic alterations. This can cause mean hospitalary stay prolongation. Fasting prior to intervention is an additional negative factor, due to deprivation of metabolic substrates, with increased proteic catabolism. Preoperative administration of oral or parenteral carbohydrates is purposed to aminorate stress response (2).
Materials and Methods: Twenty non-diabetic patients purposed for elective cardiac surgery, were randomly assigned to either a Control or a Glucose group (glucose-insulin administration). Insulin Sensitivity (IS), glycaemia and plasmatic levels of free fatty acids, aminoacids, IL-1, IL-6 and TNF were determined prior and after intervention. Clinical results were also evaluated.
Results and Discussion: Statistical difference ($p < 0.05$) was observed in aminoacids determination, with a postoperative decrease of nearly all them in Control group and of only two in Glucose group ($p < 0.009$). IS showed a more important, but non-significant reducton in Control group. IL and TNF increased in both groups but significancy was not detected between groups, neither in the clinical variables measured. IR appears in all patients after cardiac surgery. Proinflammatory interleukines increased in both groups.
Conclusions: Lesser use of aminoacids as metabolic substrate was appreciated in patients receiving glucose preoperatively: feeding state would mean

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a reduction of the metabolic response and proteic catabolism in patients after elective cardiac surgery. Reduction of preoperative fasting is an easy way for prevention or reduction of metabolic stress response, while reduces patient anxiety and discomfort.

References:
1 Desborough JP et al. Br J Anaesth 2000;85:109–117.
2 Nygren J, Thorell A et al. Am J Physiol 1998;275:E140–148.

A-228

Perioperative hyperglycemia following on-pump and off-pump coronary artery surgery in patients with diabetes

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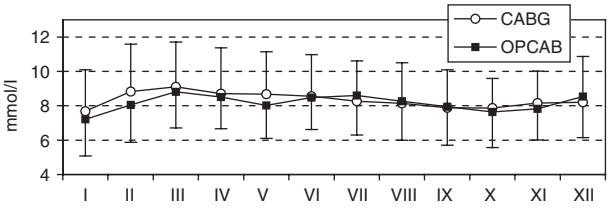
Background and Goal of Study: Glycaemia may be poorly controlled after cardiac operations [1]. High glucose levels increase the risk of coronary artery surgery [2]. The aim of this study was to establish, whether performing the operation "off pump" may influence postoperative glycaemia in diabetic patients.

Materials and Methods: 844 consecutive adults patients underwent first-time coronary revascularisation over the 11 months period. 240 patients (28.4%) had diabetes and were further analyzed. Blood glucose levels were registered every 2 hours in the first postoperative day. Mean and SD of glucose levels (all measurements), peak glucose levels and glycaemia range (per patients) and mean overall insulin consumption (per patients – for a given time period) were calculated for each patient and compared between the groups. Descriptive statistics and t-test were used, $p < 0.05$ was considered significant.

Results and Discussions: Among diabetic patients**,** 159 patients (66.3%) were operated with the use of cardiopulmonary bypass (CABG) and 81 patients (33.7%) had their operation "off-pump" (OPCAB). All the tested variables were comparable in both groups (see table).

	CABG (n = 159)	OPCAB (n = 81)
Mean glucose (mmol/L)	8.4 ± 2.3	8.2 ± 2.1
Peak glucose (mmol/L)	11.7 ± 2.6	11.0 ± 2.4
Glucose range (mmol/L)	6.3 ± 2.8	5.6 ± 2.6
Insulin consumption (U)	53.3 ± 29.4	45.7 ± 28.1

Mean values of postoperative glycaemia were also comparable between the groups (see figure).



Conclusions: Eliminating cardiopulmonary bypass has no effect on the postoperative glycaemia control in diabetic patients.

References:
1 McAlister FA et al., Diabetes Care 2003;26:1518.
2 Estrada CA et al., Ann Thorac Surg 2003;75:1392.

A-229

Impact of diabetes on perioperative outcome in patients following isolated mitral valve surgery – preliminary results

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Background and Goal of Study: Diabetic patients have poorer short-term outcome after coronary artery surgery [1]. However, little is known about the impact of diabetes mellitus on short-term outcome following mitral valve surgery. The aim of this study was to compare postoperative complications and 30-day mortality in the diabetic and non-diabetic patients following mitral valve surgery.

Materials and Methods: Of the 130 consecutive patients who underwent first-time, elective, isolated mitral valve surgery over the 3 years period. 21 patients (16.2%) had diabetes and 109 (83.8%) were non-diabetic. Patients with acute bacterial endocarditis and those in a critical preoperative condition were excluded. The youngest diabetic patient was 45 years old, so only patients aged <45 years were included among the non-diabetic patients to allow comparisons between groups. Perioperative complications and 30-day mortality were compared. The t-test and two-tailed Fischer test were used, $p < 0.05$ was considered significant.

Results and Discussions: Mean age of diabetic patients was similar to non-diabetic patients (59.6 ± 7.7 vs 60.8 ± 7.8, p = 0.52). Mean preoperative EUROscore was higher in diabetic patients (5.5 ± 2.3 vs 4.5 ± 1.7 vs, p = 0.02). Isolated and cumulative number of patients with the most common perioperative complications is shown below.

Postoperative complications	Diabetes (n = 21)	No diabetes (n = 109)	p
Ventilation >24 h	2 (9.5%)	9 (8.3%)	0.85
Stroke	0 (0.0%)	2 (1.8%)	0.53
Renal replacement	2 (9.5%)	2 (1.8%)	0.12
Infection	0 (0.0%)	1 (0.9%)	0.83
Low cardiac output	3 (14.3%)	16 (14.7%)	0.96
ICU stay >5 days	1 (4.8%)	11 (10.1%)	0.44
Complications (all)	5 (23.8%)	22 (20.2%)	0.77
Death	2 (9.5%)	1 (0.9%)	0.07

Conclusion(s): Perioperative outcome in diabetic and non-diabetic patients following isolated mitral valve surgery seems to be similar, but 3-years observational period is not sufficient to draw firm conclusions.

Reference:
1 Carson JL, et al., J Am Coll Cardiol 2002;40:424.

A-230

Dexmedetomidine sedation for endovascular abdominal aortic aneurysm repairs

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Background and Goal of Study: Dexmedetomidine (DEX) was selected for sedation along with local anesthesia for endovascular abdominal aortic aneurysm repairs as it provides cardiac protection and a cooperative, sedated patient as well as reduced opioid requirements (1). The purpose of this study is to evaluate the clinical effects of introducing DEX into this surgical procedure.

Materials and Methods: A retrospective chart review was performed of all endovascular AAA repairs from January 2001 through September 2005 at a single institution. Hemodynamic stability was determined by measuring systolic and pulse variances. See table.

Results and Discussions: 14 AAA repairs used DEX for sedation along with local anesthesia. For comparison, 22 consecutive cases performed under general endotracheal tube anesthesia (GETA) were chosen from same time period. Data (Mean ± SD) are shown in the following table:

	DEX	GETA
Age	74.1 ± 8.8	73.3 ± 7.2
Mean Syst. Variance	196.46	225.21
Mean Pulse Variance	18.46	46.46
DEX (mcg/kg/hr)	0.53	—
Sevoflurane (ET%)	—	1.82
Intraop Fentanyl (mcg)	208.9 ± 254.4	244.3 ± 117.5
PACU Fentanyl (mcg)	7.1 ± 26.7	11.9 ± 23.9
PACU Morphine (mg)	0.14 ± 0.53	3.36 ± 10.5
PACU Pain Score	1.78 ± 1.67*	3.86 ± 2.12*

*P = 0.003.

Conclusion(s): Dexmedetomidine sedation provides an acceptable alternative to GETA for endovascular AAA repairs.

Reference:
1 Wallace AW et al. Anesthesiology 101;284–93; 2004.

A-231

The effect of oral folic acid therapy on endothelial function after coronary artery bypass grafting

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Background and Goal of Study: Endothelial dysfunction is a consistent and potentially harmful result of undergoing coronary artery bypass grafting (CABG)

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with cardiopulmonary bypass (1). Folic acid improves endothelial function in patients with coronary artery disease (2). We hypothesize that oral folic acid given perioperatively will lessen endothelial dysfunction in patients after CABG.

Materials and Methods: We performed a prospective randomized placebo controlled trial of 18 patients aged 45–80 years undergoing CABG. Exclusion criteria included vitamin B_{12} deficiency, diabetes and epilepsy. Patients were randomized to receive either placebo or folic acid 15 mg on the morning of surgery followed by 5 mg on the first postoperative day. Endothelial function was measured noninvasively using flow mediated vasodilation on two separate occasions, once preoperatively and once postoperatively (3).

Results: Mean and SD are shown in table. The two groups are similar regarding demographics. A negative percent absolute change in FMD represents a decline in endothelial function postoperatively (*). $P < 0.05$ is significant.

	Folate group	Placebo group	p-value
Age (years)	65.4	66.2	0.44
% male	88%	100%	0.16
Grafts (number)	3.22 ± 0.44	3.11 ± 0.78	0.36
Op time (mins)	305 ± 62	319 ± 73	0.32
Blood loss (mls)	1546 ± 551	1507 ± 784	0.44
FMD % change (*)	−0.25%	−1.43%	0.19

Conclusion(s): We conclude that oral folic acid therapy produces a small though not statistically signifigant reduction in endothelial dysfunction postoperatively, and therefore we cannot recommend its routine use in patients undergoing CABG.

References:

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2 Doshi SN, Mc Dowell IFW, Moat SJ, et al. *Circulation* 2002;105:22–26.
3 Coretti MC, Anderson TJ, Benjamin EJ, et al. *J Am Coll Cardiol* .2002;39:257–65.

A-232

Ionic mechanisms of desflurane on action potential prolongation in guinea pig and rat isolated ventricular myocytes

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Background and Goal of Study: Recently, desflurane (DES) has been reported to prolong the QT_C interval during anesthesia in patients with normal repolarization. Several ionic currents contributing to repolarization were investigated using guinea pig [delayed outward K^+ current (I_k), inwardly rectifying K^+ current (I_{k1}), Ca^{2+} current ($I_{Ca,L}$)] and rat ventricular myocytes [transient outward K^+ current (I_{to})].

Materials and Methods: Approval of the Yonsei University College of Medicine Animal Research Committee was obtained.

1. Papillary muscle studies: The normal APs were measured in isolated guinea papillary muscles at 37°C.
2. Isolated myocytes studies

Ventricular myocytes were obtained from enzymatically treated guinea pig and rat hearts. To assess both I_K and I_{k1}, a voltage ramp protocol was used. For more detailed study on the time-dependent I_k, the cells were held at −40 mV and depolarized for 4 s to test potentials from −30 to +50 mV. The $I_{Ca,L}$ was determined from a holding potential of −40 mV to +60 mV. In rat ventricular myocytes, the I_{to} was obtained from −80 mV followed by inactivation of the Na^+ current by short pulses to −40 mV, and was then depolarized with 10 mV increments to potentials up to +60 mV. All the experiments were carried out at room temperature. Values are presented as mean ± SD.

Results and Discussions: 12% DES significantly prolonged the APD_{50} and APD_{90}. In a linear voltage ramp protocol, peak inward I_{k1} at −130 mV and peak outward I_{k1} at −60 to −50 mV were either not significantly reduced by 6% and 12% DES. However, the peak outward I_k assessed at +50 mV were significantly reduced to 63 ± 19% and 58 ± 12% of baseline by 6% and 12% DES, respectively. At membrane potential of +60 mV, 6% and 12% DES reduced the I_{to} to 80 ± 8% and 68 ± 7% of baseline, respectively. Peak $I_{Ca,L}$ were reduced to 71 ± 15% and 49 ± 17% of baseline by 6% and 12% DES, respectively.

Conclusion(s): The major electrophysiologic action of DES in guinea pig ventricular myocytes appears to be the suppression of I_k and $I_{Ca,L}$. In rat ventricular myocytes, inhibition of I_{to}, at least in part, may also contribute to the prolongation of APD.

A-233

Logistic fitting to isometric relaxation force curve is better than monoexponential fitting in murine papillary muscle

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Backgrounds and Goals: A logistic function has been shown to better fit the ventricular isovolumic pressure and myocardial isometric force curves during relaxation than the conventional monoexponential function. We have reported the superiority of the logistic fitting to the monoexponential fitting for the isometric relaxation force curves at any onset of data sampling period in the isolated rabbit right ventricular papillary muscles. In the present study, we used murine hearts and compared the generality of the logistic and monoexponential fittings for the relaxation at different onsets.

Materials and Methods: We analyzed the isometric twitch relaxation force curves from four different starting points: the maximum negative time derivative of force ($-dF/dt_{max}$), and the 10, 20, and 30% lower-developed force levels, to the same end point in 15 isolated murine left ventricular papillary muscles. We evaluated the logistic and exponential relaxation time constants: tau_L and tau_E, using the logistic function: $F(t) = F_A/[1 + \exp(t/tau_L)] + F_B$ and the monoexponential function: $F(t) = F_0\exp(-t/tau_E) + F_\infty$.

Results: The logistic fittings were always superior to the monoexponential fittings for the relaxation force curves with the four different onsets in terms of correlation coefficient and residual mean squares. tau_L and tau_E decreased significantly with the delayed starting points, whereas nonzero asymptotes F_B and F_∞ increased significantly. However, changes in normalized tau_L at the delayed starting points relative to tau_L at $-dF/dt_{max}$ were smaller than those in normalized tau_E. Delta in F_B between $-dF/dt_{max}$ and the delayed starting points were smaller than those in F_∞.

Conclusions: The superiority of the logistic fitting to the monoexponential fitting for the relaxation force curve with different onsets in murine is almost the same as that in rabbit. Logistic function fitting more reliably characterizes the isometric relaxation force curve than monoexponential function fitting regardless of the onset of myocardial relaxation irrespective of animal species, at least in the rabbit and murine.

References:

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A-234

The effect of pentoxifylline on cytokin release and pulmonary injury in patients undergoing cardiopulmonary bypass grefting

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Background and Goals: In our study we aimed to compare the effect of pentoxifylline (Ptx) on cytokin levels and pulmonary injury in patients undergoing cardiopulmonary bypass grefting (CPBG).

Material and Methods: Fifty consented patients scheduled for elective cardiac surgery were evaluated. Anesthesia was induced with fentanyl, propofol and vecuronium. Anesthesia was maintained using isoflurane and fentanyl. Patients were randomly allocated to two groups; Group I (n = 25) control group, and Group II (n = 25) Ptx group. The patients in the Ptx group had 500 mg of Ptx added to their prime solution, whereas the patients in the control group only received prime solution. Right internal jugular vein and pulmonary artery catheterization were performed following anesthesia induction. Pulmonary arterial pressure and pulmonary capillary pressures were recorded. CO, SV, SVR, PVR, dynamic compliance and alveolary-arterial O_2 gradient were recorded with cardiac output monitoring after induction (T_0), postpump 15th min (T_1), and postpump 4th hr (T_2). Arterial blood sampling was performed in every 30 minutes. Leucocyte count, CRP levels, IL-6, IL-8 and TNF-α levels were also measured in the blood samples from the pulmonary artery in T_0, T_1, T_2, and T_3 (postpump 24th hr) time and recorded down for evaluation.

Results: In our study we found that CI was higher in Ptx group compared to Ptx group ($p < 0.05$). Leucocyte count, PVR, SVR were significantly lover in Ptx group. Alveolary-arterial O_2 gradient measurements were close the their basal values at T_1 and T_2 time. Also Il-6, IL-8 and TNF-α levels were found lover in Ptx group T_1, T_2 and T_3 times ($p < 0.05$).

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Conclusion: According to our data in patients undergoing CPBG, Ptx administration attenuates inflammatory cytokins, and prevents postpump lung injury related to CABG surgery. We also think that the optimal administration time and dose needs further investigation and a larger patient population.

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A-235

The comparison of preoperative angiotensin receptor antagonist and angiotensin converting enzyme inhibiotor medications on neurohormonal changes during cardiac surgery

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Background and Goal of Study: The preoperative medication with renin-angiotensin system (RAS) antagonists frequently caused the deleterious hypotension during anesthesia (1, 2). We evaluated the effects of angiotensin II receptor antagonists (ARA) and angiotensin converting enzyme inhibitors (ACEI) on neurohormonal changes and hemodynamic changes during cardiac surgery in patients with mitral valvular disease.

Materials and Methods: With IRB approval, patients have been taking ACEI (ACEI group, n = 15) or ARA (ARA group, n = 14) more than 4 weeks, and taking no RAS antagonist (control group, n = 15) were enrolled. Neurohormonal markers including epinephrine (Epi), norepinephrine (Norepi), arginine vasopressin (AVP) and angiotensin II (AII), and hemodynamic variables were measured at before cardiopulmonary bypass (CPB, [T1]), 15 min after the initiation of CPB (T2), just before aorta cross clamping-off (T3) and 1 hr after discontinuing CPB (T4). Mean arterial pressure was maintained above 60 mmHg with phenylephrine infusion during surgery.

Results and Discussions: The plasma AVP and A II levels are presented in the table (mean (SD)). There were no significant differences in plasma Epi and Norepi levels among groups. The amount of phenylephrine infused during CPB was significantly greater in ARA group (1.6 (1.3) μg/kg/min) than in control (0.4 (0.2) μg/kg/min) and ACEI group (0.8 (0.3) μg/kg/min).

		T1	T2	T3	T4
AVP (pg/ml)	Control	19.6(11.5)	109.7(45.7)	43.9(32.4)	36.7(24.2)
	ACEI	11.9(11.9)	49.0(51.8)*	29.4(20.5)	29.1(13.7)
	ARA	7.0(3.8)*	32.2(18.1)*	30.9(21.5)	25.6(29.5)
AII (pg/ml)	Control	31(29)	61(83)	169(193)	141(124)
	ACEI	30(25)	77(81)	193(263)	90(156)
	ARA	141(127)*†	215(187)*†	508(385)*†	185(140)

*P < 0.05 compared with Control, †P < 0.05 compared with ACEI.

Conclusion(s): Preoperative ARA medication resulted in more profound hypotension during CPB than ACEI medication did, and it seemed to be associated with the low AVP level, and remarkably increase AII might be nonfunctioning in ARA group.

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A-237

The impact of anesthetic-induced preconditioning on the cardiac sodium channel

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Background and Goal of Study: Anesthetic-induced preconditioning (APC) confers cardioprotection by reducing infarct size following ischemia. This protection is well-established, but the relationship between APC and arrhythmia is still unclear. In the present study, we investigated the effects of APC on the cardiac sodium current (INa), a major depolarizing current responsible for the initiation of the action potential.

Materials and Methods: The study was approved by the Institutional Animal Care and Use Committee. Ventricular myocytes were isolated from adult Wistar rat hearts. The whole-cell configuration of the patch clamp technique was used to record INa. In the APC group, rats were exposed to 1.4% isoflurane (1.0 MAC) for 30 minutes with a 30-minute recovery period prior to cell isolation. In the control group, rats were not exposed to isoflurane prior to cell isolation. Current-voltage relationship, steady-state inactivation and activation curves, and recovery from inactivation were obtained using standard voltage protocols. The holding potential was set at −120 mV, where all available sodium channels were in the closed state. Data are reported as means ± SEM. Statistical analysis was performed using unpaired Student's t-test and $P < 0.05$ was considered as a significant difference.

Results and Discussions: Peak INa density, that was normalized to cell capacitance was significantly greater in the APC group (−19.3 ± 1.6 pA/pF in the APC group versus −14.1 ± 1.0 pA/pF in the control group; n = 11−12 per group). Furthermore, in the APC group, the steady-state activation curve shifted in the depolarizing direction relative to the control group, where the voltage at half-maximal conductance was −36.3 ± 1.0 mV and −43.7 ± 1.3 mV, respectively. The activation curve slope-factor was also significantly altered by APC (6.9 ± 0.4 and 4.1 ± 0.4 for the APC and control groups, respectively). No differences were observed in the steady-state inactivation curves and the recovery from inactivation between the two groups.

Conclusion: APC by isoflurane resulted in persistent changes in the biophysical profile of INa. The implication of these changes to cardiac rhythm requires further investigation.

A-238

Comparison of the systemic inflammatory response between conventional extracorporeal circulation and the minimal extracorporeal circulation system for coronary artery bypass grafting: preliminary results

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Background and Goal of Study: The minimal extracorporeal circulation system (MECC, Jostra) (1) might reduce the inflammatory response produced by the conventional extracorporeal circulation (CECC) in coronary artery bypass grafting surgery (CABG).

Materials and Methods: In a prospective, randomized, and controlled study we studied 20 consecutive male patients scheduled for CABG (10 with CECC and 10 with MECC). Four blood samples were withdrawn: pre-induction (0), arrival at ICU (1), 24 hours (2) and 72 hours postoperatively (3). Several inflammatory markers, including cytokines (IL6, IL8, TNF-α) and neutrophil elastase (Elas) were measured. Student's t-test and U-Mann-Whitney were used for statistical analysis.

Results and Discussions: Results are shown in the table (mean ± SD).

	Samples	MECC	CECC	p
Elas (μgr/ml)	0	226.77 ± 108.23	133.11 ± 70.87	0.045
	1	258.66 ± 164.49	635.75 ± 224.42	0.001
	2	854 ± 227.55	731.5 ± 363.06	0.432
	3	924.13 ± 249.66	813.43 ± 242.71	0.401
IL8 (pgr/ml)	0	6,33 ± 2.69	13 ± 10.71	0.093
	1	32.33 ± 30.88	102.8 ± 51.93	0.007
	2	27 ± 14.27	40 ± 12.52	0.093
	3	39.5 ± 29.47	30.67 ± 13.43	0.47

There were no statistical differences for IL6 and TNF-α values.

Conclusion(s): The performance of cardiac surgery using the MECC system can be done maintaining the surgical standards and does not produce more inflammatory response than the conventional ECC in uncomplicated patients scheduled for CABG.

Reference:

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A-239

Involvement of beta-3-adrenoceptor in the lusitropic effect of beta-adrenoceptors stimulation in diabetic cardiomyopathy

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Background: Diastolic left ventricular dysfunction is usually described in diabetic myocardium and associated to an alteration of the sarcoplasmic

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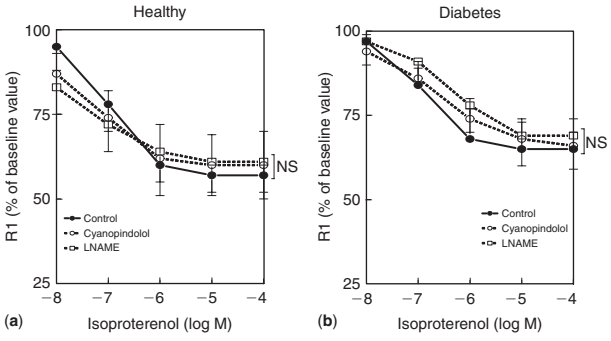
reticulum (1). Moreover, β_1-adrenoceptors down-regulation and β_3-adrenoceptors up-regulation are observed in diabetic cardiomyopathy (2). Nevertheless, lusitropic effect of β_3-adrenoceptors stimulation remains unknown in diabetic cardiomyopathy.

Methods: Effect of β_3-adrenoceptor inhibition (directly by S-cyanopindolol or indirectly by L-NAME) on the lusitropic responses of β-adrenoceptor stimulations (isoproterenol:10^{-8} to 10^{-4}M) were studied, *in vitro* (Krebs-Henseleit solution, 29°C, pH 7.40, Ca^{++} 0.5 mmol, stimulation of 12/min), in papillary muscles of diabetic rats (four weeks after intravenous injection of streptozotocin). The coefficient R1, assessing coupling between contraction and relaxation under low load, independently of inotropic effect, tests the sarcoplasmic reticulum function.

Comparison between groups was performed using ANOVA.



Figures: Lusitropic response to β-adrenoceptor stimulation in healthy (panel A) and in diabetic (panel B) rats, under low load. S-cyanopindolol (β3-adrenoceptor antagonist) and L-NAME (inhibition of NO induced by β3-adrenoceptor stimulation) have similar positive lusitropic effect than β-adrenoceptor stimulation as well as in healthy than in diabetic rats. Data are mean percentages of baseline values ±SD (n = 8 in each group).

Conclusion: β_3-adrenoceptor do not modify the sarcoplasmic reticulum activity in diabetic cardiomyopathy.

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A-240

Electrophysiogical effects of remifentanil on the normal conduction system. Study in an experimental porcine model

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Background and Goals: Remifentanil has been reported to cause reduction in heart rate and sometime severe bradyarrhythmias. The aim of this study was to identify the remifentanil electrophysiologic effect on cardiac conduction system.

Materials and Methods: 18 large white pigs were premedicated with ketamine and anesthetized with propofol (4.5 mg/kg for induction followed by 13 mg/kg/h). Femoral arterial and venous catheter were placed and a electrophysiologic evaluation was performed (baseline) and after a remifentanil bolus of 1 μg kg followed by an infusion of 0.5 μg kg min. Statistical test used: paired Student t test. $P < 0.05$.

Results and Discussions: The hemodynamic parameters and blood gas analysis were stable during procedure. Electrophysiological data are shown in the Table. (mean ± SD).

	Baseline	Remifentanil	P
SNRT	36 ± 12	45 ± 24	0.005
CSNRT	145 ± 66	353 ± 303	0.003
AH	81 ± 18	93 ± 21	0.01
HV	30 ± 8	31 ± 9	0.64
RAERP	152 ± 24	156 ± 28	0.484
RVERP	224 ± 33	234 ± 36	0.004
AVERP	250 ± 27	261 ± 35	0.09
WCL	235 ± 40	280 ± 94	0.05

SNRT: sinus node recovery time, CSNRT: corrected sinus node recovery time, AH, HV: atrio-Hisian, His-ventricular intervals, RAERP, RVERP, AVERP: right atrial, ventricular and AV node effective refractory period. WCL: AV node Wenckebach cycle length.

Conclusion: This results show that remifentanil alters sinus node function parameters. It also depresses AV nodal conduction. To the extent to which these phenomena could be extrapolated to the clinical situation, remifentanil should be use with cautions in patients with tendency to bradyarrhythmias.

References:

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A-241

Influence of lipoteichoic acid and peptidoglycan on sarcomere shortening of isolated cardiac myocytes is mediated by Toll-like receptor 2

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Background and Goal of Study: Lipoteichoic acid (LTA) and peptidoglycan (PGN) are the major cell wall components of gram-positive bacteria. Previous studies demonstrated that Toll-like receptor (TLR2) binds these components (1) leading to cardiac depression in gram-positive sepsis in vivo (2). However, TLR2 signaling in cardiac tissue is not well defined.

Materials and Methods: To investigate sarcomere shortening cardiac myocytes of wildtype (WT) and TLR2-deficient (TLR2-D) mice were isolated and incubated for >6 h in short-term culture supplemented with or without LTA (10 μg/ml) or PGN (100 μg/ml). Shortening was stimulated externally at 0.5–10 Hz and recorded optically with a special camera (IonOptics).

Results and Discussions: Untreated cardiac myocytes showed a biphasic shortening frequency relation with a minimum around 2 Hz. Sarcomere shortening amplitude was not significantly changed after 6 h of culture. However, application of LTA reduced sacromere shortenings of WT cells significantly by 14–60% depending on the stimulation frequency. Depression of shortening was most efficient at 0.5 and 1 Hz, which lead to a monophasic shortening frequency relation. Under control conditions shortening of TLR2-D cells were comparable to those of WT cells, but they were insensitive to addition of LTA. PGN reduced sarcomere shortening amplitude of WT cells comparably to the effect of LTA.

Conclusion: Taken together, lipoteichoic acid and peptidoglycan reduce sarcomere shortening amplitude in cardiac myocytes in a TLR2-dependent manner.

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A-242

Upstream Signaling of PKC-epsilon in Xenon-induced pharmacological preconditioning- Implication of mitochondrial KATP-channels and PDK-1

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Background and Goal of Study: Xenon has been shown to elicit a strong cardioprotective effect in vivo[1]. Protein kinase C-ε (PKC) was identified as a key mediator of xenon preconditioning (Xe-PC). However, which signaling pathways lead to the activation of PKC is yet unknown. We aimed to determine the implication of (1) the mitochondrial K_{ATP}-channels and (2) the phosphoinositide-dependent kinase-1 (PDK-1) in activating PKC-ε.

Materials and Methods: For infarct size measurements, anaesthetized rats were subjected to 25 min of coronary artery occlusion followed by 120 min of reperfusion. Rats received xenon during three 5-min periods before index ischemia or remained untreated for 45 min. Additional rats were pretreated with the mitochondrial K_{ATP}-channel blocker 5-HD (5 mg kg^{-1}) or Wortmannin (15 μg kg^{-1}) as PI_3K/PDK-1 pathway inhibitor in the presence or absence of Xe-PC (each group, n = 10). For western blot of PKC-ε and PDK-1, hearts were excised at five different time points (each n = 4): without further treatment (Con), after the first, the second and the third period of Xe-PC or directly before ischemia (Xe-PC I–IV). Statistical analysis: One way ANOVA with Bonferroni's correction for multiple comparisons. Data are mean ± SD.

Results and Discussions: Infarct size was reduced from 41.74 ± 6.3% in controls to 26.60 ± 8.3% after Xe-PC ($p < 0.05$). Both, 5-HD and Wortmannin abolished this cardioprotection (39.67 ± 11.9% and 40.80 ± 8.4%, both $p < 0.05$ vs. Xe-PC). Western blot revealed an increased activation of PKC-e after Xe-PC IV. This effect could be blocked by 5-HD and Wortmannin.

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Moreover, the phosphorylation of PDK-1 was induced time dependently by Xe-PC.

Conclusion(s): We demonstrate that PKC is activated downstream of mito K_{ATP} channels and PDK-1. Moreover, both enzymes are functionally involved in Xe-PC.

Reference:

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A-243

Influence of preconditioning by isoflurane on the need for inotropic support during and after coronary surgery with cardiopulmonary bypass

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Background and Goal of Study: Volatile anaesthetics exert significant protection against myocardial ischemia via preconditioning mechanism. This study was designed to assess whether preconditioning by isoflurane would decrease the need for inotropic support during and after coronary surgery with cardiopulmonary bypass (CPB).

Materials and Methods: After informed consent 56 patients scheduled for elective coronary artery bypass graft surgery under cardioplegic arrest were randomly allocated to two groups. The first group (n = 28) assigned to preconditioning after the onset of CPB via 5-min. exposure to isoflurane (2 minimum alveolar concentration), followed by 10-min. washout before aortic cross-clamping and cardioplegic arrest. Control group (n = 28) underwent an equivalent 15 min. period of placebo (isoflurane-free) bypass. No other volatile agent was administered at any time during the case. Apart from preconditioning the same anaesthetic regimen was used in all patients. In both groups inotrope and vasoactive drugs were administered according to the same protocol. Only 2 isoflurane-treated patients required vasoconstrictives during the preconditioning process to maintain mean arterial pressure above 60 mmHg. There were no differences between the two groups in any of the preoperative and intraoperative patient characteristics, including aortic cross-clamping times. Group assignment was strictly blinded to surgeons, anaesthesiologists, perfusionists, and nursing staff in the operating room (OR) and intensive care unit (ICU).

Results and Discussions: The number of patients necessitating inotropic and vasoconstrictive support in OR and in ICU in both groups is presented in the table.

	Inotropes		Vasoconstrictives	
	OR	ICU	OR	ICU
Isoflurane	*5 (18%)	*7 (25%)	6 (21%)	7 (25%)
Placebo	*14 (50%)	*15 (54%)	10 (36%)	12 (42%)

*Statistically significant difference ($P < 0.05$) between both groups.

Conclusions: Preconditioning with isoflurane was found to reduce the necessity in inotropic and vasoconstrictive treatment intraoperatively and in early postoperative period, which may be explained by better myocardial performance due to preservation of early cardiac function.

A-244

Landiolol, a new ultra-short-acting ß$_1$-blocker, reduces anesthetic requirement during sevoflurane/nitrous oxide/fentanyl anesthesia

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Background and Goal of Study: It is known that esmolol, a short-acting ß$_1$-blocker, reduces anesthetic requirement[1]. In this double-blined, controlled study, we evaluated whether a low dose of landiolol, a new ultra-short-acting ß$_1$-blocker, can reduce sevoflurane requirement during sevoflurane/nitrous oxide (N_2O)/fentanyl anesthesia in patients undergoing hip surgery.

Materials and Methods: After institutional approval and informed consent, 25 patients undergoing total hip arthroplasty were randomly assigned to group A (n = 12, saline) and group B (n = 13, landiolol; bolus injection of 0.031 mg/kg and continuous injection at a rate of 0.01 mg kg^{-1} min^{-1}). The infusion was started before the induction of anesthesia and continued until the end of anesthesia. Anesthesia was maintained with sevoflurane, 60% N_2O in oxygen and IV fentanyl. Sevoflurane concentration was controlled to keep bispectral index between 40 and 60. An end-tidal sevoflurane concentration and hemodynamics were measured during anesthesia. Statistical significance ($P < 0.05$) was determined using Mann-Whitney U-test.

Results and Discussions: The two groups were comparable with respect to their characteristics. The average of end-tidal sevoflurane concentration in group B was significantly lower than that in group A (1.188 ± 0.340% in group B vs. 1.814 ± 0.340% in group A, $P < 0.01$). Maximum value of heart rate throughout anesthesia in group B showed a significant decrease as compared to group A (61.1 ± 10.3 bpm, in group B vs. 76.4 ± 14.8 bpm in group A, $P < 0.05$).

Conclusion(s): The results suggest that a low dose of landilol infused during sevoflurane/N_2O/fentanyl anesthesia reduces the intraoperative sevoflurane requirement in patients undergoing hip surgery.

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A-245

15 min of sevoflurane preadministration is not sufficient to induce preconditioning

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Background and Goal of Study: Volatile anaesthetic agents have cardioprotective properties. They can mimic ischemic preconditioning (PC), leading to a decrease in myocardial infarct size. Previous clinical studies have shown that long administration of sevoflurane before, after or during cardiopulmonary bypass (CPB) decreased postoperative troponin I level and improved postoperative cardiac output. The present study investigated if, as shown in experimental animal model (1), 15 minutes sevoflurane administration before CPB has a cardioprotective effect in coronary surgery.

Materials and Methods: 72 patients scheduled for elective CABG surgery were randomized in 2 groups among 2 centres. Anaesthesia was performed with propofol and sufentanyl. PC group received 1 MAC sevoflurane during 15 min followed by 15 min washout before CPB. A biopsy of the atrium was taken during canulation to perform biochemical dosages. Troponin I was measured postoperatively. Results are expressed as mean ± SD.

Results and Discussions: Patients with. low postoperative cardiac index (<2.0 l.min^{-1}m^{-2}) were less in PC group (10.7% in PC *vs* 35.3% in control group). 25% of patients in PC group required an inotropic support during the postoperative period, *vs* 36.1% of patients in control group. Neither troponin I nor tissular enzyme measurement (Ecto-5′-nucleotidase, cytosolic-5′-nucleotidase protein Kinase C activity tyrosine Kinase activity P38MAPKinase activity) did show any difference between groups.

This study showed that 15 min sevoflurane preadministration is not sufficient to induce a preconditioning signal in a clinical setting.

Conclusion(s): A longer preadministration is probably necessary to induce clinical cardioprotection (2).

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A-246

Toll-like receptor 4 modulates myocardial matrix metalloproteinases after ischemia-reperfusion injury

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Background and Goal of Study: Toll-like receptor 4 (TLR4) mediates innate immune responses following endotoxemia and myocardial ischemia–reperfusion (I/R) injury. Pre-treatment with lipopolysaccharide (LPS) reduces infarct size and modulates cardiac remodelling. Matrix metalloproteinases (MMPs) and tissue inhibitors of MMPs (TIMPs) play a crucial role in cardiac remodelling and endotoxemia. We investigated the influence of TLR4 on infarct size and assessed the influence of MMP and TIMP regulation in LPS challenged I/R mice with and without functional TLR4.

Materials and Methods: Left anterior descending artery (LAD) occlusion was performed on wildtype (C_3H/HeN) and TLR4-deficient (C_3H/HeJ) mice. Animals were stimulated with LPS (1 mg/kg) or PBS 16 h ahead of 60 min LAD ligation or sham procedure. After 24 h of reperfusion, triphenyl tetrazolium chloride staining was performed and infarct size was measured by planimetry. MMP and TIMP mRNA expression were determined by ribonuclease protection assay after 3 h of reperfusion. MMP zymographic activity was monitored 6 h after occlusion.

Results and Discussions: TLR4-deficient mice and LPS-treated wildtype mice showed significantly reduced infarct areas than wildtype mice with PBS-pre-treatment. LPS-stimulation significantly increased the overall MMP/TIMP

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mRNA expression ratio due to elevated MMP-3, -8, -9, and TIMP-1 in wildtype mice. I/R overall reduced the MMP/TIMP ratio due to increased MMP-1, TIMP-1, and -3 mRNA expression.
Conclusion: LPS pre-treatment and TLR4-deficiency led to a decreased infarct size. However, infarct area and MMP/TIMP ratio were not correlated. This means that in TLR4-deficient mice MMP/TIMP ratios are not determining the infarct size. Wildtype mice exhibited extended infarcts, although their MM TIMP ratio was comparable to that of TLR4-deficient hearts with smaller infarct areas. Wildtype mice with LPS pre-treatment developed small infarcts accompanied by high MMP/TIMP ratios. However, the stoichiometry of MMPs and TIMPs might in part mediate the cardioprotective effect of LPS.

A-247

Xenon induces late preconditioning in rat heart in vivo – involvement of COX-II

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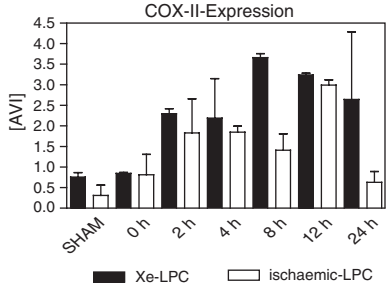
Background and Goal of Study: In myocardial preconditioning (PC) *early* and *late* PC (LPC) are distinguished. *Late* PC occurs 24 h after the stimulus and lasts for 2–3 days. One key step in signal transduction is increased expression of Cyclooxygenase-2 (COX-II). The anaesthetic gas Xenon (Xe) was shown to induce *early* PC (1), but is unknown whether Xe could also induce *late* PC and whether COX-II might be involved.
Materials and Methods: After approval by the local authorities, 44 male Wistar rats were chronically instrumented with a coronary artery occluder. After a recovery of 7 days, animals of the ischaemic LPC (i-LPC) group underwent 5 min of coronary occlusion to induce LPC (n = 4). The animals of the Xe-LPC (n = 4) group were treated with Xe inhalation (70 Vol% for 15 min). In the NS-398-Xe-LPC group animals were treated with the specific COX-II inhibitor NS-398 (5 mg/kg BW i.p. n = 4) prior to Xe-LPC. The animals of the controls (CON) were not further treated (n = 4). 24 h later all animals underwent 25 min of myocardial ischemia followed by 2 h of reperfusion under a-chloralose anaesthesia. Infarct size (IS) was assessed by TTC staining. To investigate COX-II expression by PCR LPC was induced by coronary occlusion or Xe-inhalation and hearts were excised at different time points (see results; each n = 2). Data are mean ± SD, Statistics: ANOVA and bonferroni's multiple comparision test as post-hoc test (IS measurements).
Results and Discussions: IS in CON was 67 ± 6%. Both, i-LPC and Xe-LPC reduced IS (31 ± 6% and 35 ± 10%, both $P < 0.001$ vs. CON). Treatment with NS-398 abolishes the cardioprotective effect of Xe-LPC (IS: 59 ± 7%, $P < 0.001$ vs. Xe-LPC). Two hours after either treatment, we could detect an increase in COX-II expression, which was higher in Xe treated animals (see Figure).



Conclusion(s): We could demonstrate for the first time that Xe induces LPC, and that an increased COX-II expression is an essential step in Xe induced LPC.
Reference:
1 Weber, NC; Br J Pharmacol 44(1):123–32.

A-248

Ischemic preconditioning, but not sevoflurane, reduces myocardial infarct size in a porcine closed-chest ischemia-reperfusion model

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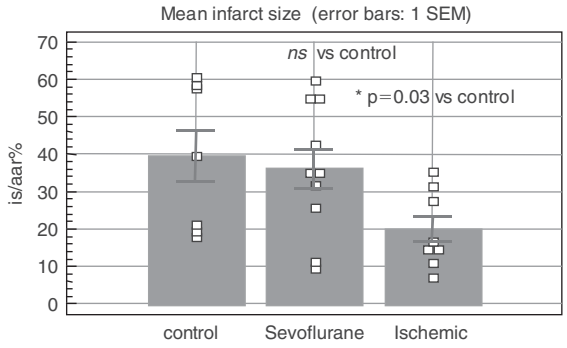
Background and Goal of Study: The endogenous cellular protection mechanism *preconditioning,* has chiefly been investigated in animals with collateral coronary flow. Preconditioning with either ischemia or sevoflurane was examined in a porcine experimental model featuring no or little collateral coronary flow.
Materials and Methods: Randomized, controlled, animal experimental trial. *N* = 25 20 kg pigs were subjected to 40 min ischemia of the distal LAD-region under pentobarbital anesthesia, followed by 2.5 hr reperfusion, risk area (**aar**)-staining, euthanasia and infarct-staining (**is**) by the tetrazolium method. Prior to ischemia pigs were randomized to 2 × 5 min pre-ischemia (n = 8), or 2 × 5 min 4% vol inhaled sevoflurane (n = 10), and n = 7 pigs acted as controls IS/AAR was compared between groups. Ventricular contractile performance was monitored using tissue Doppler echocardiography (peak systolic velocity) in the basal interventricular septum.
Results and Discussions: Preliminary results (n = 25) are depicted. IS/AAR is reduced by 50% by ischemia, but unchanged by sevoflurane. The porcine coronary anatomy may account for this, and because of *its* similarity to *human* coronary anatomy be implicated in negligible clinical results from sevoflurane preconditioning upon necrosis.



Conclusion(s): Histopathological and ventricular functional changes were observed following pharmacological intervention with inhaled sevoflurane in an *in vivo* experimental porcine ischemia-reperfusion model. The changes were smaller than expected, possibly explained by no coronary collaterals in this model.

A-249

Anesthesia and myocardial protection during coronary bypass surgery without cardiopulmonary bypass: comparison between propofol and isoflurane

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Background and Goal: To evaluate the possible protective effect of isoflurane and propofol on myocardium during off pump coronary artery bypass grafting (CABG) surgery.
Materials and Methods: Twenty-six patients undergoing elective off pump CABG were allocated into propofol group (n = 13) and isoflurane group (n = 13). Anesthesia was performed in propofol group with propofol plus fentanyl, while isoflurane and fentanyl were used in isoflurane group. Artery blood samples were collected before induction of anesthesia, and during and after the surgery. Plasma troponin I (cTnI), creatine kinase-MB (CK-MB), interleukin-6 (IL-6) and lactate concentrations were determined respectively.
Results and Discussions: At the 4 hours after operation, plasma level of cTnI was significantly increased in both groups, and no significant differences were found between them. Compared with baseline values, IL-6 in propofol group showed no significant changes at each endpoint. However, IL-6 values in isoflurane group were significantly higher than those in propofol group during and after surgeries ($P < 0.05$). In addition, lactate levels in propofol group showed statistically significant reduction, but not in isoflurane group. Both propofol and isoflurane have been showed to have efforts in attenuating myocardial ischemia-reperfusion injury (1, 2). In this study, the similar effect of them on preventing perioperative myocardial injury during off pump CABG were found, as shown by changes in levels of cTnI and CK-MB. However, propofol showed a more potent effect on reducing myocardial inflammatory response and improving myocardial metabolism perioperatively.
Conclusion: Compared with isoflurane, propofol is better in reducing myocardial inflammatory response as well as in improving myocardial metabolism perioperatively during off pump CABG surgery.

https://doi.org/10.1017/S0265021506000809 Published online by Cambridge University Press

References:
1 Ko SH, Yu CW, Lee SK, et al. Propofol attenuates ischemia-reperfusion injury in the isolated rat heart. Anesth Analg; 1997; 85:719–722.
2 Belhomme D, Peynet J, Louzy M, et al. Evidence for preconditioning by isoflurane in coronary artery bypass graft surgery. Circulation; 1999; 100[suppl II]:II-340–345.

A-250

Bacterial DNA reduces shortening of cardiac myocytes via Toll-like receptor 9

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Background and Goal of Study: Bacterial DNA is characterized by unmethylated Cytosin-Guanosin-dinucleotides (CpG-DNA), which interact with Toll-like receptor 9 (TLR9) (1). CpG-DNA as well as synthetic oligonucleotides containing a CpG motive have been shown to cause septic shock *in vivo* (2). However, it is not known whether TLR9 signalling in cardiac myocytes contributes to septic shock.
Materials and Methods: Therefore, we investigated sarcomere shortening of isolated cardiac myocytes of wild-type (WT, C57/BL6) and TLR9-deficient (TLR9-D) mice kept in a short-term culture (up to 6 h) with or without CpG-DNA (1 μM, oligonucleotide 1668). Sarcomere shortening was elicited externally (0.5–10 Hz) and recorded by a video imaging system.
Results and Discussions: Shortening frequency relation of murine cardiac myocytes is biphasic with a local minimum at 2 Hz. Sarcomere shortening amplitude did not significantly change after 6 h of culture in comparison to control conditions. However, application of CpG-DNA significantly reduced sarcomere shortening of WT cells after more than 3 h incubation time, whereas shortening of TLR9-D cells was insensitive to CpG-DNA. On average shortening of WT cells was depressed by about 38% after 5 h.
Conclusion: Thus, we could demonstrate that the influence of CpG-DNA leads to a depression of cardiac contractility. This effect seems to depend on TLR9. Since experiments were performed in pure myocyte culture, interaction with immune cells did not seem to be necessary to induce cardiac depression following application of CpG-DNA.
References:
1 Hemmi et al., *Nature* 2000;408:740–745.
2 Sparwasser et al., *Nature* 1997;386;336–337.

A-251

Preconditioning with bacterial DNA reduces the size of an ischemia/reperfusion injury in the heart

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Background and Goal of Study: Lipopolysaccharide (LPS) pre-treatment is known to reduce the size of an ischemia-reperfusion injury (1). LPS binds to Toll-like receptor 4 and CD14 thereby inducing a signalling cascade leading to the expression of inflammatory mediators and iNOS. This pre-conditioning seems to protect the tissue against ischemic injury. Bacterial DNA differs from eukaryotic DNA by the presence of CpG motives. CpG-DNA is specifically recognized by Toll-like receptor 9 (TLR9) leading to the activation of a signalling cascade followed by the induction of inflammatory mediators (2). Thus, we tested whether a specific CpG-oligonucleotide (1668-ODN) possesses pre-conditioning properties. 1668-ODN has been shown to induce sepsis in vivo earlier (3).
Material and Methods: In a first step, a thread was implanted around the LAD of C57BL/6 mice. Then, the animals were allowed to recover for 7 days. 16 h before constriction of the LAD (1 h) the animals were pretreated with D-Galactosamin and finally injected i.p. with PBS or CpG-ODN 1668 (1 nM, 5 nM, or 10 nM per animal). After 24 h of reperfusion the hearts were double stained with 5% Phthaloblue and 1.5% triphenyltetrazolium chloride to calculate area at risk (AAR) and infarct area (IA). In addition, the troponin T concentration in the blood plasma was measured using a Roche cardiac reader.
Results and Discussion: In control hearts IA was 21% of AAR (SEM ± 3; n = 15), in those pre-treated with 1 nM CpG IA was not changed (22%; ±7; n = 5). However, preteatment with 5 nM CpG significantly reduced IA by about 50% to 10% (±2.8; n = 9). Higher CpG concentrations were not suitable as the survival rate of the animals was reduced. The infarct area is correlated to the plasma troponin T concentration in control animals (6.645 ± 0.9645 ng/ml) versus 5 nM pre-treated animals (2.222 ± 0.5817 ng/ml).
Conclusion: Activation of the TLR9 signalling cascade initiated by bacterial DNA seems to induce protection against an ischemia-reperfusion injury in the heart.
References:
1 Oyama et al., *Circulation* 2004;109:784–9.
2 Hemmi et al., *Nature* 2000;408:740–745.
3 Sparwasser et al., *Nature* 1997;386;336–337.

Respiration

A-252

Why is accidental lung trauma possible during spontaneous ventilation?

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Background and Goal of Study: The adjustable pressure limiting (APL) valve protects against high airway pressures. At induction the fresh gas flow is set high and the APL valve is turned to maximum facilitating face mask ventilation. This manual mode becomes dangerous after connecting the ventilator to the endotracheal tube without changing the ventilation mode. All ventilators have an alarm when airway pressure exceeds a value, however without opening a valve. Airway pressure rises very fast and causes volutrauma if no immediate reaction occurs.
Materials and Methods: Goal of this study was to evaluate 8 ventilators (Excel 210 SE, Excel 410, Datex AS/3, Aestiva 5, Drager av1, Drager titus, Drager cato, Drager julian) in the manual ventilation mode without manual compression.

The airway pressure is measured and the time at which an alarm went off. A soft balloon of 2 litres is connected for the manual ventilation. Fresh gas flow is set at 15 litres per minute. The artificially lung consists of a Siemens test lung 190 with a balloon of 1 litre.

In the first mode the APL valve and the pressure alarm are set at 30 cm H_2O, in the second mode the alarm is set at 30 cm H_2O and the APL valve at its maximum level, in the third mode they are both set at the maximum level. At time zero the ventilator is switched to a manual ventilation mode without compression of the balloon. The airway pressure is monitored, and the times at which the alarms go off are noted by a high frequency pulse given on the pressure transducer. The recording is stopped when the airway pressure stabilizes or drops.

A ventilation mode is considered dangerous if the airway pressure stayed above 30 cm H_2O for more than 6 seconds and very dangerous if no alarm did go off in that time. A ventilator is considered to be dangerous if a dangerous ventilation mode exists.
Results and Discussion: Mode 1 was safe. Mode 2 was dangerous in most ventilators and mode 3 was very dangerous in all ventilators. All ventilators were considered as dangerous. Correct alarm setting and vigilance remains the cornerstone of safety. Technical improvement is possible to prevent these situation and would be ideal to protect every ventilator with a manual ventilation mode.

A-253

Improved ventilator safety valve tested in vitro

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Background and Goal of Study: Goal of the study was to measure first the characteristics of a new ventilator safety valve (VSV) when connected in a ventilator breathing circuit during the manual mode. Second goal was to search when interference with mechanical ventilation is possible.
Materials and Methods: The safety valve is inserted in the breathing circuit. A soft balloon of 2 liters is connected for the manual ventilation. An artificially lung, Siemens test lung 190 with a balloon of 1 liters is connected to the ventilator. During the first test the characteristics of the safety valve are analyzed. Fresh gas flow is set at 15 litres per minute.

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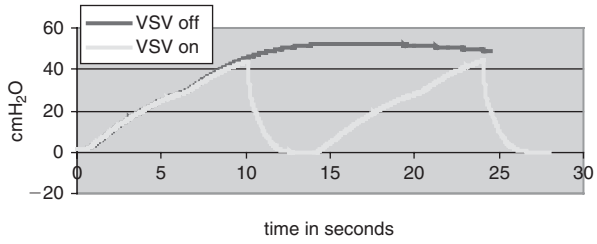
The airway alarm and the APL valve are set at their maximum level. At time zero the ventilator is switched to a manual ventilation mode without compression of the balloon. The airway pressure is monitored.

In a second test the ventilator is set to its lowest ventilation frequency and its largest I/E ratio in the controlled volume ventilation mode. Tidal volume is set at 750 ml. Failure of the device is stated as opening of the valve during ventilation.

Results and Discussions: Graph 1 shows the airway pressure of the first test. The device releases air and prevents a pressure of more than 22 cmH_2O to take place longer than 6 sec. In the second test the safety valve opened only when inspiratory-expiratory ratio was 1:1 or 2:1 and ventilation rate was less than 5 cycles per minute. The settings of long inspiratory periods for large tidal volumes in small lungs is never used.



Conclusion: The device does not disturb the ventilation when inserted into the breathing circuit.

A-254

Improved ventilator safety valve tested in vivo

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Background and Goal of Study: The characteristics of a new ventilator safety valve (VSV) are given in a previous abstract. Safety valve opens when pressure exceeds 20 cmH_2O for more 6 seconds. This new VSV protects against prolonged increases in airway pressure. However does it interfere with some manual ventilation modes where a need for prolonged increased airway pressures exists? Goal of the study was to use the safety valve during difficult manual facemask ventilation and during manual squeezing of the lungs after extra corporeal circulation (ECC) where prolonged airway increases are needed.

Materials and Methods: The safety valve is inserted in the breathing circuit. Fresh gas flow was set at 10 liters/min and the adjusted pressure limiting valve (APL) was turned to maximum during manual ventilation. Airway pressure and safety valve function were recorded during the measurements. A first group of ten male patients was chosen due to an expected difficulty for manual face mask ventilation based on an elevated BMI and having a beard. No clinical need for a rapid sequence induction existed. Muscle relaxation was achieved with cisatracurium 0.1 mg/kg given after loss of consciousness.

A second group of 10 patients needed an ECC and had during controlled mandatory ventilation peak airway pressures above 30 cm H_2O to obtain normal end-tidal CO_2. Manual squeezing was needed until total visual expansion of the lungs at the end of the ECC. Maximum time of airway pressures above 20 cmH_2O and opening of safety valve is noted during manual ventilation or squeezing. Approval from the hospital ethical committee was obtained for both groups.

Results and Discussions: The safety valve never opened in the first and second group of patients. The maximum time of airway pressures continuous above 20 cmH_2O was never longer than 3 seconds in both groups. (A mean of 0.6 seconds with a stdv of 1.2 in group 1 and a mean of 1.3 seconds with a stdv of 0.8 in group 2). The 6 seconds of the VSV was a lot longer than what is clinical necessarily in both groups.

Conclusion: The safety valve never interfered with manual ventilation during induction or during squeezing of the lungs.

A-255

Comparing the effectiveness of two different oxygen face masks

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Background and Goal of Study: Different oxygen face masks have a varying efficiency resulting in a different oxygen flow per minute to achieve similar oxygenation. The goal of this experimental trial was to compare an improved oxygen face mask model ($HiOx^{80}$, VIASYS Healthcare, Germany) to a standard oxygen mask (Intersurgical Ltd., UK) and to evaluate oxygen flow per minute required to prevent desaturation.

Materials and Methods: After approval of the local ethics committee and informed consent, volunteers were randomly assigned to two groups (Group S: standard mask; group H: $HiOx^{80}$ facemask). During a standardized climbing profile in an airplane (Pilatus PC-6) to an altitude of 22,500 ft (6,863 m), the oxygen flow was individually controlled to result in a mean oxygen saturation (SpO_2) of 95 to 97% as determined by pulse oximetry. Oxygen flow, oxygen saturation, and pulse rate were obtained every 1000 ft (305 m). Mann-Whitney-U-Test was used for statistical analysis, a $P < 0.05$ was considered significant.

Results and Discussions: 31 Volunteers (3 female, 28 male, mean age 38.9 ± 7.7 years) participated up to an altitude of 22,500 ft. Between group S (14 male, age 39.4 ± 8.4 years) and group H (3 female, 14 male, age 38.0 ± 6.4), the pre-trial parameters age, lung function indices, heart rate, and SpO_2 were comparable ($P > 0.05$). Mean in-flight SpO_2 between group S (95.3 ± 0.5%) and group H (96.2 ± 1.1%, $P = 0.78$) was comparable as well. Above 13,000 ft, group H required less oxygen flow compared to group S ($P < 0.05$), at 20,000 ft and 22,000 ft oxygen flow was comparable.

Conclusions: When using $HiOx^{80}$ facemasks, oxygen rate is reduced compared to a standard oxygen facemask. This effect is of importance at an altitude of 13,000 ft or above. Using a $HiOx^{80}$ facemask reduces the total oxygen consumption as well as costs and extends oxygen availability (e.g. with a oxygen pressure bottle) and may have importance for perioperative anesthesia, emergency medicine, and intensive care medicine as well.

A-256

In vitro evaluation of aerosol delivery by an ultrasonic nebulizer during mechanical ventilation with an endotracheal tube and a double lumen tube

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Background and Goal of Study: Administration of aerosol medication through a bypass system while mechanical ventilation is performed has become established at intensive care units. Modern anaesthetic machines do not include an aerosol therapy functionality. The aim of this study was to compare the output of an ultrasonic nebulizer in two different connecting settings using a standard endotracheal tube (ET) and a double lumen tube (DLT).

Materials and Methods: In set-up A, an ultrasonic nebulizer was connected directly to the endotracheal tube. In set-up B, the nebulizer was placed in line in the ventilation circuit in order to direct only the inhalation flow through the nebulizer device and to bypass the exhalation flow. A standard endotracheal tube (ET) and a double-lumen tube (DLT) with two different ventilatory protocolls were examined. 5 ml of a Tc-99m 0.9%-NaCl solution were filled into the nebulizer. After nebulization, the deposits accumulated in all parts of the system were measured using a gamma scintillation counter.

Results and Discussions: Set-up A, ventilated in volume controlled mode (VCV) with ET : Delivered dose (1.61 ± 0.41 ml), nebulization time 10.13 ± 1.71 min. Set-up A, Bi level ventilation, use of a DLT : Delivered dose (1.33 ± 0.88 ml), nebulization time 13.27 ± 2.58 min.

Set-up B, ventilated in volume controlled mode with ET : Delivered dose (1.82 ± 0.12 ml), nebulization time (27.1 ± 4.5 min). Set-up B, Bi level ventilation, use of a DLT : Delivered dose (1.3 ± 0.17), nebulization time (25.6 ± 4.0 min).

In set-up B, output was not significantly higher ($p < 0.05$), but nebulization time was significantly longer ($p < 0.05$) when compared to set up A.

Conclusion(s): In set-ups where the nebulizer is connected directly to an ET or DLT, a fairly acceptable level of total aerosol output within a short nebulization time was observed.

A-257

Comparative measurements of cough pressure in different anatomical locations at the thorax and abdomen. Preliminary results

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Background and Goal of Study: Cough is a physiological mechanism which can be weakened in the postoperative period because of surgery,

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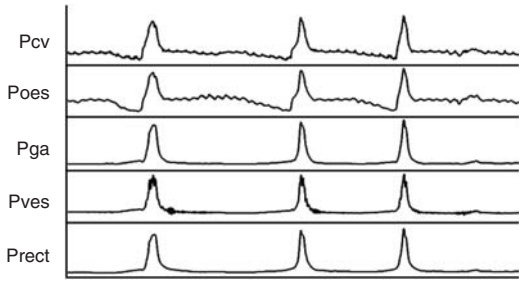
pain and/or anaesthetics. Pressure generated by cough (Pcough) can be measured with gastric and/or oesophageal balloons (1,2), but often these are not handy methods to assess expiratory muscle strength in the perioperative period. The goal of this study was to determine the validity of Pcough registered from different anatomical locations at the thorax and at the abdomen, as practical alternatives to gastric and oesophageal pressures.
Materials and Methods: Preoperatively, six patients scheduled for colon surgery were asked to perform a maximal single cough effort from Total Lung Capacity (TLC) in supine position. The manoeuvre was performed 3 times, always with the same command. Central venous (Pcv), oesophageal (Poes), gastric (Pga), vesical (Pves) and rectal (Prect) pressures were recorded. Mixture model analysis was chosen to compare Pcough measurements.
Results and Discussions: Maximal Pcough values were (mean ± SD, cmH_2O): Pcv 95 ± 14, Poes 93 ± 17, Pga 86 ± 13, Pves 95 ± 16 and Prect 93 ± 14. Pcough values were similar in all the sites, with very low intra-subject variability.

Figure shows an example of Pcough pattern recorded.



Conclusions: Pcough can equally be measured in superior cava, oesophagus, stomach, bladder or rectum, obtaining similar values in all theses sites. Additional patients have to be included to confirm these results.
References:
1 Gallart L et al. Anesthesiology 1995;83:48–55.
2 Man WD et al. AJRCCM 2003;168:714-7.

A-258

A simple modification of fiberoptic instruments for eligible suction or oxygen application

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Background and Goal of Study: Performing fiberoptic intubation, usually the working channel of the fiberoptic instrument is only used for suction of secretions. Insufflation of oxygen or capnography are also described and often helpful (1,2). There are no reports of eligible use of the channel for e.g. suction or insufflation of oxygen without changing the lines to the instrument. This is possible by fixing a modified three-way stopcock to the connector of the channel. We were interested if the suction capability of the instrument is compromised by this modification.
Materials and Methods: We used a 4.9 mm fiberoptic instrument with a 2.0 mm channel and a modified three-way stopcock, connected via an elastic tube to the channel of the instrument. We measured the suction rates for clear water and thicker secretions, simulated by baby-food. Suction was performed five times for each liquid with and without the valve between the suction line and the working channel of the instrument. Maximum intensity of the suction device was −0.7 bar. Times needed for suction of either 50 ml clear water or 15 ml baby-food were measured.
Results and Discussions: Time for suction of 50 ml water with or without the valve was 6.0 (±0.0) sec. (mean ± SD). Time for suction of the baby-food was 11.2 (±0.83) sec. with the valve and 11.6 (±0.89) sec. without the valve in line. There were no significant differences in the suction flow rates with or without the valve.
Conclusion(s): Performing fiberoptic intubation in critical situations, using this technique the provider can choose quickly between e.g. suction or oxygen insufflation. This may be necessary in cases of difficult and protracted visual identification of the trachea, if the tube can't be advanced at once or in severe respiratory compromised patients. In these situations it's helpful to choose quickly between e.g. suction and application of oxygen or capnography without interruption, a loss of time or disturbing manipulations caused by changing the lines to the channel. Suction flow rates are not diminished by the use of this technique.

References:
1 Laura H. Wolf et al., Anesth Analg 1997;85:701–3.
2 Schäuble J et al., EJA 2005;22:762–767.

A-259

Survey of anesthetic activity in non-cardiac thoracic surgery

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Goal of Study: To assess and describe the profile of anesthetic activity in non-cardiac thoracic surgery based on the ANESCAT survey carried out in Catalonia in 2003.
Methods: A prospective survey study was designed to gather information from anesthesiologists in all public and private hospitals (131) in Catalonia (6,704,146 inhabitants). All information was collected on 14 randomly chosen days in 2003. The data collection sheet included items asking about patients details, type of surgery, and anesthesia. The sample was representative of the target population of surgical patients. Data on anesthetic activity were extrapolated based on demographics and the distribution of anesthetic techniques, type of patient and intervention were calculated. We analyzed information on thoracic surgical procedures by calculating the percentage of each type in relation to all interventions. Results are expressed as medians (percentile 10–90).
Results: Of the estimated 603,189 anesthetic procedures performed on the 14 days studied, 4,458 (0.74%) were for thoracic surgery. Men accounted for 63% of the patients, patient age was 55 (23–73) yrs, and duration of anesthesia was 90 (45–228) min. Surgery was on the lung or bronchi in 90% of the cases. The intervention was performed on an outpatient basis in 9.4% of the cases; 65% of the patients were ASA ⩾ 3. Preoperative assessments took place in an outpatient office in 33% of the cases, in hospital in 45%, and in the waiting room of the operating theatre in 22%. General or combined anesthesia was used in 90%. When combined anesthesia was used, the most common technique was an epidural block (93.1%). The most frequent forms of general anesthesia were balanced (63%), intravenous (32.9%) and inhaled (4%). The patient was brought to a postoperative critical care unit in 45.6% of the cases and to a PACU in 54.4%. A special technique for postoperative analgesia was applied in 30%. Unanticipated difficult airway management was reported in 3%.
Conclusions: Our study shows a level of anesthetic activity that is very similar to that of other surveys. This survey addresses some issues should be improved such as to increase the rates of outpatient preoperative assessment and of application of special techniques for postoperative analgesia for non-cardiac thoracic surgery patients.
Reference:
Clergue F, et al. Anesthesiology 1999;91:1509.

A-260

The accuracy of a simple automated method for functional residual capacity assessment during spontaneous breathing

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Background and Goal of Study: Measurement of functional residual capacity (FRC) is of considerable interest for monitoring patients with lung injury [1,2]. The lack of instruments has so far impeded the routine application. Recently, a simple automated method for FRC assessment by oxygen washout has been introduced into clinical practice [3]. It was the aim of this study to evaluate the accuracy of an advancement of this oxygen washout technique.
Materials and Methods: The LUFU system (Draeger Medical, Luebeck, Germany) estimates FRC by oxygen washout, a variant of multiple breath nitrogen washout. The advancement of the technique uses a sidestream O_2-analyser, which calculates FRC from the end-inspired- and end-expired O_2 concentrations during fast changes of FiO_2. After approval by the local ethics committee FRC was measured in 25 healthy, spontaneous breathing volunteers in the sitting position using three techniques: 1. Helium dilution (FRC-He), 2. Body plethysmography (FRC-Bp), 3. Oxygen washout ($FRC\text{-}O_2$).
Results and Discussions: $FRC\text{-}O_2$ (Mean 4.3 ± 1.23 l, range 2.44–7.07 l) corresponds well with FRC-He (Pearson correlation coefficient: 0.914, $p < 0.0001$, mean 4.04 ± 1.02 l, range 2.37–6.15 l; bias of $FRC\text{-}O_2$:

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0.26 ± 0.51 l) and FRC-Bp (Pearson correlation coefficient 0.875, $p < 0.0001$, mean 4.36 ± 1.03 l, range 2.81–6.22 l; bias of FRC-O_2: −0.06 ± 0.6 l).

Conclusion(s): FRC estimation by oxygen washout using the further developed technique with a side stream O_2 analyser provides good agreement with general techniques for FRC assessment in spontanous breathing persons. Therefore this simple method could help monitor intensive care patients during controlled ventilation and moreover in the weaning period.

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A-261

The impact of different tracheo-bronchial suctioning methods on functional residual capacity

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Background and Goal of Study: The method of functional residual capacity (FRC) evaluation by oxygen washout is applicable routinely at bedside, in controlled ventilation and spontaneous breathing (1). We studied the impact of three different suctioning methods on FRC.

Materials and Methods: The LUFU system (Draeger Medical, Luebeck, Germany) estimates FRC by oxygen washout, a variant of multiple breath nitrogen washout. A sidestream O_2-analyser calculates FRC from the end-inspired- and end-expired O_2 concentrations during fast changes of FiO_2. After approval of the local ethics committee and written informed consent we measured FRC six times (measuring interval 4–6 min) in postoperative cardiac surgery patients during 6 hours after surgery; 3 times before (the mean is defined as basal value (pre)) and 3 times after (t4, t5, t6) a standard suctioning procedure (20 sec, 14 F catheter, 200 mmHg negative pressure). Patients were ventilated with PEEP = 10 mbar. The patients received three different suctioning methods in randomised order: Open suction, with disconnection from the ventilator during suctioning (OS); Closed suctioning during biphasic positive airway pressure ventilation (CS-BP); and closed suctiong during volume controlled intermittent positive pressure ventilation (CS-VC). During closed suction a closed-suctioning system (Kendall Comp., Mansfield, USA) was used to maintain positive airway pressure. After each period a standardized recruitment maneuver was applied to the patients lung (PEEP 15 mbar, PIP 35–40 mbar for 30 sec).

Results and Discussions: We present here preliminary results of the ongoing study; 8 patients were studied. FRC decreased after CS-BP (t4: 92.6 ± 6.6% of pre ($p = 0.015$)) and CS-VC (t4: 85.6 ± 15.9% of pre ($p = 0.037$)) and tended to decrease after OS (t4: 82.5 ± 30.5% of pre (n.s.)).

Conclusion(s): CS-BP and CS-VC reduces FRC immediately after suctioning. The reduction of FRC after OS did not reach significance in these preliminary results. The consequences of different suctioning procedures cannot be predicted because of strong inter- and intraindividual differences, so it might be of considerable interest to measure FRC in ventilated patients routinely.

Reference:

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A-263

Effects of modes of ventilation on respiratory mechanics during laparoscopic cholecystectomies

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Background: The effects of pneumoperitoneum on respiratory mechanics with the patient positioning have been previously reported (1). Volume controlled ventilation (IPPV) is the conventional method of ventilation under general anesthesia and pressure controlled ventilation (PCV) is an alternative mode which is used widely in respiratory failure. In this study we compared these two modes of ventilation regarding pneumoperitoneum and positional changes on the effects of respiratory mechanics and arterial oxygenation.

Materials and Methods: Following the ethical committee approval 30 patients scheduled for elective laparoscopic cholecystectomy were included. After standard monitorization and general anesthesia radial arterial cannulation was done for blood gases analysis. In IPPV group patients were ventilated mechanically with Drager Julian with the parameters of tidal volume:8 ml/kg, respiratory rate:10/min, inspiratory flow:30 lt/min, I.E ratio: 1:2 and PEEP: 5 cmH_2O and in PCV group for the optimal tidal volume to the patient Pmax: 15–20 cmH_2O, respiratory rate:10/min, inspiratory flow:30 lt/min and PEEP: 5 cmH_2O. All these parameters were set between these ranges to adjust $PetCO_2$ at 35 ± 5 mmHg before CO_2 insufflation which was kept constant at 12 mmHg. After ventilating the patients for at least 3 min at each position, measurements of PIP and plateau pressures, compliance (Cdyn) were done with Drager Julian and oxygenation was assessed by (A-a)DO_2. All these recordings were done at positions of supine (A), Trendelenburg (B) and Fowler (C) before (1) and after (2) CO_2 insufflation. Statistical analyses were done by Chi-square, Kruskal-Wallis and Student's-t tests.

Results: In PCV group PIP and plateau pressures were not affected by positional changes and pneumoperitoneum but in IPPV group both pressures increased after pneumoperitoneum. Whereas compliance decreased in both groups after pneumoperitoneum with positional changes but changes between groups were not statistically significant ($p > 0.05$). In IPPV group after pneumoperitoneum $PetCO_2$ was lower and PIP, plateau pressures were higher significantly compared to PCV group ($p < 0.05$).

Conclusion: During laparoscopic cholecystectomy PCV seems to maintain stability regarding respiratory mechanics, however has no advantage over IPPV regarding Pet CO_2 and oxygenation.

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A-264

Adaptive support ventilation in one-lung ventilation

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Background and Goals: During one lung ventilation (OLV) mechanical ventilation patterns must adapt to changes in mechanics (1). Adaptive Support Ventilation (ASV) is a mode designed to automatically adapt to changes in the mechanics. Objectives: (1) Changes in respiratory mechanics before, during and after OLV. (2) Adaptation of the pattern. (3) Accuracy of pattern.

Material and Methods: 20 patients for thoracic surgery (age 24–79). General anaesthesia, left mainstem double lumen tube. ASV was started using the ventilator Galileo™. Measurements at 4 different time points: (I) 5 min after induction, (II) 10 min after lateral decubitus, (III) 10 minutes after OLV started, (IV) 10 min after supine repositioning. Variables: VE, VT, RR; PaO_2, $PaCO_2$; Crs, inspiratory/expiratory resistances (Ri/Re), inspiratory /expiratory time constants (Tci/TCe), Inspiratory Pressure (Pi), I/E ratio, RR and PEEPi. Data analysis: linear model for repeated measures and Bonferroni test.

Results: Data (Mean ± SD) are shown in the table:

	I	II	III	IV
Re	12 ± 3	11 ± 3^{ns}	21 ± 6$^{\int}$	14 ± 4†
Ri	16 ± 6	13 ± 4†	28 ± 12$^{\int}$	19 ± 6‡
Csr	62 ± 18	50 ± 15^{ns}	45 ± 12$^{\int}$	54 ± 15^{ns}
CT	0.8 ± 0.2	0.7 ± 0.1‡	0.9 ± 0.2^{ns}	0.9 ± 0.3^{ns}
Vt	590 ± 143	548 ± 131†	533 ± 141^{ns}	559 ± 122^{ns}
RR	12 ± 1	13 ± 1^{ns}	13 ± 3^{ns}	13 ± 3^{ns}
I/E	1.9 ± 0.8	1.5 ± 0.5†	2.6 ± 0.5‡	2.2 ± 0.9^{ns}
PEEPi	0.6 ± 0.7	0.5 ± 0.8^{ns}	1.4 ± 1.0‡	0.8 ± 0.7^{ns}
Pi	14 ± 5	13 ± 3^{ns}	21 ± 6$^{\int}$	16 ± 4‡
$PaCO_2$	40 ± 5	39 ± 5^{ns}	42 ± 5^{ns}	42 ± 5^{ns}
PaO_2	432 ± 115	428 ± 143^{ns}	237 ± 128$^{\int}$	447 ± 108^{ns}

$^{\dagger}p < 0.05$; $^{\ddagger}p < 0.01$; $^{\int}p < 0.001$; ^{ns} no significancy. p refers to time point I.

Conclusions: ASV kept VT and RR unchanged; Pinsp and I/E ratio increased. Auto-PEEP levels were negligible and $PaCO_2$ remained normal.

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A-265

Ventilatory and oxygenation changes during laparoscopic radical prostatectomy

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Background and Goal of Study: Laparoscopic radical prostatectomy has become widespread in the last years (1). Carbon dioxide insufflation for many hours and Trendelenburg position affect cardiovascular and respiratory

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systems (2). The aim of the study was to evaluate ventilation-perfusion abnormalities during transperitoneal laparoscopic radical prostatectomy (TpLRP).
Materials and Methods: We prospectively studied 17 patients scheduled for TpLRP. Cardiovascular and ventilatory parameters were recorded after induction of anaesthesia and at 2, 4 and 5 hours of pneumoperitoneum (PNP). Dead space was measured using the Bohr equation (alveolar dead space, expressed as a fraction of alveolar tidal volume, VDalv/VTalv). Oxygenation was evaluated by oxygen tension-based indices [arterial oxygen pressure/inspired oxygen fraction (PaO_2/FiO_2) and arterial to alveolar oxygen pressures ratio ($PaO_2/PalvO_2$)]. Cardiovascular effects [heart rate (HR) and mean arterial pressure (MAP)] were also evaluated. Wilcoxon test was used for statistical analysis.
Results: Insufflation pressure was maintained stable at 12 cmH_2O. Ventilatory and haemodynamic values (mean ± SD) are shown in the table.

	Baseline	120 min	240 min	300 min
MV (L/min)	6.3 ± 1.2	7.7 ± 2	9.4 ± 2.5*	93 ± 3*
Paw (cm H_2O)	24 ± 1.5	35.3 ± 3.1*	35.7 ± 31*	31.7 ± 6.2*
$ETCO_2$(mmHg)	27.7 ± 2.5	34 ± 2.1*	32.3 ± 3.6*	34.5 ± 3.2*
$PaCO_2$(mmHg)	32.7 ± 1	44 ± 11.3*	41.4 ± 12*	54.8 ± 5.9*
MAP (mmHg)	81 ± 19.5	80.3 ± 12.4	75.7 ± 9.3	80.2 ± 6.2
HR (beats/min)	56.3 ± 7.0	58.8 ± 5.8	65.7 ± 7.3*	67.8 ± 7.6*
VDalv/Vtalv	0.15 ± 0.1	0.17 ± 0.1	0.22 ± 0.1*	0.4 ± 0.1*
PaO_2/FiO_2	335 ± 68	317 ± 92	265 ± 79	210 ± 107*
$PaO_2/PalvO_2$	0.53 ± 0.11	0.51 ± 0.15	0.42 ± 0.12	0.3 ± 0.16*

*$p < 0.05$ versus baseline.

Conclusion: Long lasting PNP induced significant ventilatory alteration, expressed as increase in dead space, and oxygenation impairment was also observed. Although mild tachycardia was observed, probably due to hipercarbia, MAP was maintained unchanged.
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A-267

Adaptive support ventilation for anaesthesia in gynaecological laparoscopy

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Background and Goal of Study: Adaptive Support Ventilation (ASV) is a ventilatory mode designed to automatically adjust the ventilatory setting to changes in the mechanics of the respiratory system (RS). Available studies on ASV are limited to critical care patients. This prospective study was aimed to evaluate whether ASV adapts to the respiratory mechanic variations that occur during gynecologic laparoscopy (GL) such as reduction of respiratory system compliance (Crs).
Materials and Methods: 17 patients (aged 30 ± 10 yrs), ASA I, undergoing GL were ventilated using ASV (Galileo™, Hamilton Medical, Switzerland) throughout all the surgical procedure. Exclusion criteria: Age <18. Setting parameters were: target ventilation volume (VE) of 110%, FiO_2 0.5, positive end-expiratory pressure (PEEP) of 5 cmH_2O. Arterial blood gases, mechanical properties of the RS and respiratory parameters adjusted by ASV were determined at 3 time points: (a) 5 min after induction (supine); (b) 15 min after pneumoperitoneum (PnP) and Trendelemburg (TL) were set up and (c) 10 min after PnP was removed (supine). Mann-Whitney U test was used for statistical analysis.
Results and Discussions: All data are given as Mean ± SD. PnP caused reduction of Crs (40.3 ± 7.0 ml/cmH_20 in time "b" vs 75.2 ± 15.3 in time "a"; $p < 0.0001$) and Time Constant ("b":0.67 ± 0.14 s; "a":0.98 ± 0.14; p = 001) and an increase in expiratory resistance ("b": 13.3 ± 2.8 $cmH_20\,L\,s^{-1}$; "a": 9.9 ± 1.9; p = 0.006). No differences were observed in PaO_2. VE was kept constant. Values of respiratory gases exchange and ventilatory settings are shown in the table. (Pinsp: cmH_20; RR: rpm).

	$PaCO_2$	Pinsp	I/E	RR
(a)	32.8 ± 5.4	17.1 ± 2.6	2.6 ± 0.6	12.6 ± 0.7
(b)	38.7 ± 9.1	20.6 ± 2.6	1.4 ± 0.4	14 ± 0.9
(c)	37 ± 7.5	17.5 ± 2.9	2.6 ± 0.7	13.8 ± 2
Sig b vs a	p = 0.09	p = 0.019	p = 0.001	p = 0.006
Sig c vs a	p = 0.26	p = 0.86	p = 0.80	p = 0.16

Conclusion(s): In patients under PnP and TL position for gynecologic laparoscopy, ASV automatically adapts the ventilatory settings providing an adequate respiratory gases exchange and avoiding the necessity of anaesthesiologist's interventions.

A-268

Volume controlled versus pressure controlled ventilation during one-lung ventilation

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Background and Goal of Study: There are significant changes of respiratory mechanics and arterial oxygenation during one-lung ventilation (OLV). The aim of the study was to determine whether pressure controlled ventilation (PCV) during OLV is superior then volume controlled ventilation (VCV).
Material and Methods: Sixty patients undergoing thoracotomy, after two-lung ventilation with VCV, were randomly allocated into two groups (N = 30 each). In Group A, patients were ventilated with VCV during OLV, and in Group B OLV was performed by using PCV.

During volume-controlled ventilation, patients' lungs were mechanically ventilated with same settings at two-lung and one-lung ventilation (FiO_2 = 0.5; Vt = 8 ml/kg; inspiratory : expiratory time = 1: 1; and, RR adjusted to maintain CO_2 approximately 40). Pressure controlled ventilation was maintained with selected pressure of 10–20 cm H_2O (adjusted as one half of peak airway pressure).

The following parameters were recorded: peak airway pressure, plateau pressure, estimated pulmonary shunt and arterial oxygen tension.

Statistical analysis were performed by using WinStat and statistical significance was set on $p < 0.05$.
Results and Discussion: The study showed that peak airway pressure ($p < 0.01$), plateau pressure ($p < 0.01$) and estimated pulmonary shunt ($p < 0.05$) were significantly higher during VCV, whereas arterial oxygen tension ($p < 0.05$) was significantly higher during PCV. The percentage reduction of peak airway pressure during PCV rated from 6 to 30%. The improvement in PaO_2 during PCV was inversely proportional with preoperative spirometry results.
Conclusion(s): Pressure controlled ventilation appeared to be an alternative to volume controlled ventilation in patients requiring one-lung anesthesia, and even superior in patients with respiratory disease.
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A-270

Time course of end-tidal CO_2 after Adjustment of ventilatory parameters during stable general anesthesia

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Background and Goal of Study: Ventilatory parameters resetting frequently occurs too early, before the end-tidal CO_2 ($E'CO_2$) reaches a steady state, leading to hyper- or hypoventilation. The time course of $E'CO_2$ to reach a steady-state, after tidal volume (Vt) changes during stable general anesthesia is not established.
Materials and Methods: After local Ethical Committee approval and informed consent, 144 ASA class 1–2 adult patients scheduled for elective non-laparoscopic and non-thoracic surgery were studied. A continuous infusion of NaCl 0.9% solution via a peripheral i.v. catheter was administered. Induction of general anesthesia was with propofol, fentanyl and monitored muscle relaxation with rocuronium, and its maintenance with sevoflurane. After intubation, mechanical ventilation was started with the following baseline settings: Vt: 10 $ml.kg^{-1}$, respiratory rate 10 bpm, inspiratory : expiratory time ratio 1:2. After induction and surgical incision, when a steady-state level of $E'CO_2$ was reached (constant values for at least 15 minutes), the patients were randomly allocated to Group 1 (the Vt was decreased to 8 ml kg^{-1}, n = 76) or group 2 (the Vt was increased to 12 ml kg^{-1}, n = 68). The value of the $E'CO_2$ was recorded every minute during a period of 30 minutes with a Datex capnometer. The t-test was used to compare the results. ($p < 0.05$; mean (SD)).
Results and Discussion: There were no baseline demographic, hemodynamic and $E'CO_2$ differences between the two groups. The $E'CO_2$ increased from 36.5 (4.1) to 39.1(3.7) mmHg ($p < 0.05$) in Group 1 and decreased from 37.6 (3.3) to 33.8(3.4) ($p < 0.05$) in Group 2. In Group 1, after 14 minutes and after 17 minutes, 50% ($P_{50,}$ in analogy with the MAC value for anesthetic gases) respectively 95% (P_{95}) of the patients reached a steady-state $E'CO_2$, while in Group 2 the values were respectively 12.5 and 17 minutes. No blood pressure, nor heart rate variations were noted in the two groups.

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Conclusions: After either increasing or decreasing by 20% the Vt during volume-controlled, mechanical ventilation and stable general anesthesia, 17 minutes are needed to reach a new steady-state level of $E'CO_2$ in 95 of the patients. A practical recommendation, in order to avoid hyper- or hypoventilation, is to adjust ventilatory settings only after $E'CO_2$ has reached a steady-state.

A-271

Pressure control ventilation restores lung mechanics during prone position

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Background and Goal: Lung mechanics can be deteriorated at prone position with volume control ventilation (VCV)[1]. The goal of the study is to evaluate the influence of pressure control ventilation (PCV) at pulmonary compliance, respiratory pressures and ventilation during prone position.

Materials and Methods: 20 patients ASA I–III, mean aged 58.9(13.4) years, undergoing lumbar spine surgery were studied. Patients were ventilated by a Julian-Drager anesthesia machine. During supine position patients had VCV at settings: $FI0_2 = 0.5\%$, tidal volume 8–10 ml/kg, time I:E = 1:2, PEEP = 5 and same settings during the first 20 min at prone position. After that the machine was switched at PCV adjusted to give ventilation as at VCV. PaO_2, $PaCO_2$ (mmHg), airway pressures (mbar), $ETCO_2$ (mbar) and pulmonary compliance (Compl-ml/mbar), were recorded at supine position, 20 min prone VCV, 20 and 40 min prone PCV. Data were analysed by SPSS 10.0 program using analysis of variance (ANOVA).

Results and Discussion: Data results (mean(SD)) are shown in the table:

	PaO_2	$PaCO_2$	Peak Pressure	Plateau Pressure	Compl
SUP-VC	255.3(87.5)	36.1(3.2)	19.9(5.0)	17.3(4.7)	46.4(10.9)
PR-VC20′	226.8(57.5)	33.8(2.9)	21.0(2.4)	18.4(2.3)	43.4(9.2)
PR-PC20′	242.7(63.6)	33.2(3.7)	19.1(2.2)	19.1(2.2)	43.6(7.7)
PR-PC40′	234.7(36.0)	33.6(2.9)	19.1(2.4)	19.1(2.4)	44.9(8.8)
p	0.66	0.93	0.30	0.38	0.78

There was no significant difference ($p > 0.05$) neither for displayed parameters nor for $ETCO_2$ ($p = 0.38$) at supine position and prone position using pressure control ventilation.

Conclusion: PCV can be used during prone position anesthesia preserving lung mechanics and oxygenation.

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A-272

Optimizing mechanical ventilation on palmar hyperhidrosis surgery

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Background and Goal of Study: Primary hyperhidrosis is a troublesome disorder of excessive perspiration. Sufferers are usually young and are often affected by professional, and psychological problems. Thoracoscopic interruption of the sympathetic chain requires general anesthesia and the alternative collapse of both lungs. Optimizing operative mechanical ventilation[1] remains a clinical challenge in this patients.

Materials and Methods: We study 20 patients underwent video-assisted bilateral thoracoscopic sympathectomy of the second and third ganglia to treat primary palmar hyperhidrosis. A double lumen endotracheal tube (ETT) was inserted, its correct positioning checked clinically and by fiberoptic.Ventilation Parameters and Blood Gases during One-lung Ventilation were measured.

Results and Discussions: During (OLV), arterial hypoxaemia ($SpO_2 < 90\%$) requiring a change in ventilation mode did not occur in any patient. The use of lower Fio_2 may not increase the risk of hypoxemia. . None of them developed it on OLV. OLV creates an obligatory right-to-left transpulmonary shunt but it had not repercussion in the patients of the study.

Conclusion(s): High oxygen concentration are not necessary in most of patients without pulmonary disease and has been associated with atelectasis formation. Incorrect positioning of the double lumen could have explained several clinical signs but fiberoptic bronchoscopy eliminated this diagnosis.

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A-273

Induction in anaesthesia in patients at risk of pulmonary aspiration

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Background and Goal of Study: Rapid Sequence Induction is the acknowledged standard of care for patients at risk of pulmonary aspiration of gastric contents. There is marked variation in opinion and practical conduct of this procedure. We carried out a study to determine local practice patterns for induction of anaesthesia in patients at high risk of pulmonary aspiration.

Materials and Methods: Retrospective chart review of consecutive patients undergoing appendicectomy during the period from Feb 2nd 2004 to Feb 2nd 2005. Patient records were examined for demographics, anaesthetic medication, and complications.

Results and Discussions: Over a 1 year period, 168 patients were anaesthetised for appendicectomies. Demographics: (Table 1) 86 (51.2%) of patients received i.v. fentanyl prior to induction. There was a wide range of doses of propofol and sodium thiopentone used. 50/70 (71.4%) patients received > 5 mg/kg of sodium thiopentone. 90/99 (90.1%) of patients received > 2 mg/kg of propofol. The dose of suxamethonium used at induction varied by 500%. A dose of 100 mg was administered to 64/91 (76%) of adults who received it. Anaesthesia related complications occurred in 4 patients: desaturation n = 2, acute lung injury n = 1 and difficult intubation n = 1. There were no mortalities.

Table 1. Patient Characteristics and Medication.

Age	21.2 ± 12.4
ASA I/II/III	131/37/1
Weight (kg)	60.9 ± 21.1
Male/Female	86/82
Subarachnoid Block n (%)	1 (0.6)
Propofol n (%)	98 (58.3)
Propofol (mg/kg)	2.9 ± 0.6 (1.4–4.4)
Sodium Thiopentone n (%)	68.0 (40.5)
Sodium Thiopentone (mg/kg)	5.76 ± 1.0 (3.1–8.8)
Suxamethonium n (%)	149 (88.6)
Suxamethonium (mg/kg)	1.4 ± 0.4 (0.6–3.0)
Non depolarizing muscle relaxant	17.0 (10.1)

Conclusion: There is wide variation of pharmacological practice in the conduction of anaesthesia in patients at risk of pulmonary aspiration. Drug dose variation suggests that dosing was not determined according to patient weight.

A-274

Differences in volume controlled ventilation with constant flow and volume controlled-pressure regulated compared to pressure controlled in a lung model

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Background and Goal of Study: The goal of this study was to determinate if pressure controlled ventilation (PCV) offers advantages in terms of pressure and alveolar distribution in a one and two compartment lung model, compared to a volume controlled- pressure regulated (VCVdual) and volume controlled ventilation with square waveform (VCVsquare).

Materials and Methods: We studied 30 situations using a TEMEL Supra–GA respirator connected to a lung model with compliance of $25\,ml \cdot cmH_2O^{-1}$ in the one lung model and $50\,ml \cdot cmH_2O^{-1}$ in the two lung model. Resistance was 5 and $20\,l \cdot seg^{-1} \cdot cmH_2O^{\cdot 2}$.

Three ventilatory modes were used: **I** VCV square, **II** VCV dual, **III** PCV. Respirator setting was: Tidal volume of 600 cc, I/E relation 1:2 and varying respiratory frequency from 10 or 15 breaths $\cdot$ min^{-1}. The flow in the VCVsquare was 30 l/min. For each of the situations we programmed in the monoalveolar

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simulation: **1** (C = 50; R = 5), **2** (C = 25; R = 5) , **3** (C = 50; R = 20), **4** (C = 25; R = 20). In the bialveolar simulation (C = 25; R = 5 − C = 25; R = 20).
Results: Data (Mean ± SD) are shown in table:

	VCV square	VCV dual	VCP
Paw mean (cmH_2O)	6.7 ± 2	6.9 ± 2	6.9 ± 2
Paw peak (cmH_2O)	24 ± 9	23 ± 7	20 ± 6[a]
Paw plateau (cmH_2O)	16 ± 5	16 ± 5	20 ± 7[b]
Paw peak – Paw plateau (cmH_2O)	8 ± 2	7 ± 2	0 ± 1[b]
P alveolar (cmH_2O)	16 ± 5	16 ± 5	16 ± 5
P plateau – Palveolar (cmH_20)	0 ± 0	0 ± 0	3.5 ± 3.5[b]
t Ppeak(seg)	0.9 ± 0.0	0.6 ± 0.2	1.4 ± 0.4[c]
t P1 (seg)	0.16 ± 0.2	0.14 ± 0.1	0.04 ± 0.1[b]
t P plateau (seg)	0.6 ± 0.3	0.6 ± 0.3	0.3 ± 0.4[c]
t flow = 0 (seg)	0.7 ± 0.3	0.7 ± 0.3	0.3 ± 0.4[b]
t mouth flow (seg)	1 ± 0.04	1 ± 0.2	1.4 ± 0.3
IPF l/seg	0.6 ± 0.02	0.8 ± 0.03	0.7 ± 0.02

[a] $p < 0.1$ compared to VCVsquare group, [b] $p < 0.05$ compared to the other groups, [c] $p < 0.1$ compared to the other groups.

Conclusion(s): PCV does not offer advantages in terms of alveolar pressure, obtaining worse results in the redistribution parameters.. The VCVdual guarantees a tidal volume with the lower pressure and with good redistribution parameters.

A-275

S100b protein may be increased in severe obstructive sleep apnoea

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Background and Goals: In obstructive sleep apnoea [OSA] repeated apnoea/hypopnea [AH] events and desaturations potentially result in cerebral hypoxia. S100B, a mainly astroglial protein, is a sensitive indicator of even minor cerebral damage. In OSA subjects we seek correlation of serum S100B with polysomnography parameters.
Material and Methods: We divided OSA subjects undergoing overnight polysomnography study in mild/moderate OSA AHI [AH index] 6–40, 52 ± 12 yrs and severe OSA [AHI ⩽ 40], 49 ± 11 yrs. We measured venous blood S100B at awakening (upper normal limit of 12 $ng.ml^{-1)}$. Spearman correlation, regression analysis and Mann Whitney test were used for statistical analysis.
Results: Only AH events independently related to S100B. S100B levels were higher in severe compared to moderate OSA but did not differ significantly. In three subjects suffering of numerous AH events S100B far exceeded normal values.

	AH < 40 N = 21	p <	AHI > 40 N = 20	p <
BMI	32 ± 8 [23–55]	nss	36 ± 9 [27–61]	nss
AHI	16.6 ± 8 [6–30]	nss	75 ± 25.5 [42–125]	0.05
AH events	78 ± 45 [17–100]	nss	356 ± 136 [223–664]	0.01
O_2 Desatur events	76 ± 47 [14–182]	nss	319 ± 158 [67–653]	0.05
Average Desatur	5.4 ± 1.2 [2–7.5]	nss	9.7 ± 4.3 [4.9–19]	nss
Lowest SpO_2	81.5 ± 7.4 [63–90]	nss	71 ± 12 [50–89]	nss
Serum S100B	0.07 ± 0.026 [0.03–0.12]		0.15 ± 0.24 [0.02–1.1]	

BMI:body mass index. P refers to the correlation of S100B with each parameter. Desatur: Desaturation.
Conclusions: In severe OSA serum S100B may be increased and correlates with AH events.We hypothesize that normal serum S100B does not exclude astroglial distress as blood brain barrier integrity determines S100B leakage from cerebrospinal fluid into the bloodstream.
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A-276

The contribution of pulmonary microvasculature pressure to the lung derecruitment and opening

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Background and Goal of Study: Both high and low pulmonary capillary pressure (Pc) have been shown to compromise the lung function but, the effects of altered Pc on the degree of airway closures during mechanical ventilation (MV) have not been investigated. We characterized the alterations in lung mechanics during MV at different PEEP levels while Pc was varied.
Materials and Methods: Perfusion of isolated rat lungs was established with physiological haemodynamic conditions. At steady state, pressure-volume curve was recorded and pulmonary input impedance (ZL) was measured at PEEP of 2.5 cmH_2O. MV was then maintained for 10 min. at a PEEP level of 2.5 cmH_2O and ZL recordings were followed by P-V curves. After inflating the lung to 30 cmH_2O, another set of ZL was measured in order to evaluate the degree of recruitment. The PEEP was then decreased to 0.5 cmH_2O and this sequence was repeated. Measurements were performed at both PEEP levels while Pc was randomly varied from 0, 5, 10 and 15 mmHg. Airway resistance (Raw), parenchymal damping (G) and elastance (H) were estimated from ZL by model fitting. We determined from the P-V curves, the quasi-static elastance (E) and the volume difference between the inflation and deflation parts at a pressure level of 15 cmH_2O (V_{15}) as a derecruitment indices.
Results and Discussions: MV at both PEEP levels primarily resulted in elevations in G and H with the greatest increases at Pc = 0 mmHg (elastance changes of 27.8 ± 4.2% and 61.3 ± 3.7% PEEP of 2.5 and 0.5 cmH_2O, respectively). Maintaining physiological Pc (10 mmHg) led to significantly lower changes in H (11.6 ± 1.5% vs. 31.4 ± 3.6%). The beneficial effects of the pressurized capillaries on the lung mechanics were also reflected in the shape of the P-V curves with a significant decreases in E (1245 ± 98 vs. 993 ± 117 cmH_2O/l at Pc of 0 and 10 mmHg, respectively; $p < 0.05$) and in V_{15} (3.6 ± 0.35 vs. 2.2 ± 0.23 ml, $p < 0.05$) at the higher PEEP.
Conclusion(s): Physiological pressure in the pulmonary capillaries is an important factor in the maintenance of the stability of the alveolar architecture during positive pressure MV. This stabilization role of the pulmonary capillaries should therefore be taken into account in situations where impairment in pulmonary capillary perfusion may occur (e.g. in hypovolemia or embolism).

A-277

Extravascular lung water after pneumonectomy followed by ventilator-induced lung injury

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Background and Goal of Study: Postpneumonectomy pulmonary oedema (PPO) is a dangerous complication of lung reduction surgery. The exact mechanisms of PPO are still unsettled [1]. Ventilator-induced lung injury (VILI) is suspected to contribute to the PPO phenomenon. Single transpulmonary thermodilution (STD) might be of value in these clinical scenarios [2]. Thus, our goal was to validate extravascular lung water index determined by STD ($EVLWI_{STD}$) in pneumonectomy (PE) followed by VILI in sheep, using both thermo-dye dilution ($EVLWI_{TDD}$) and postmortem gravimetry ($EVLWI_G$) as reference methods.
Materials and Methods: Twenty-six sheep were anesthetized and assigned to sham (n = 5), left (n = 7, LPE), and right (n = 14, RPE) pneumonectomy groups. Seven RPE animals (VILI group) were exposed to tidal volume of 12 ml/kg and zero PEEP for 3 hrs. $EVLWI_{STD}$ and $EVLWI_{TDD}$ (PiCCO*plus* and COLD-Z021, Pulsion, Germany), and pulmonary hemodynamics were measured before and after PE followed by VILI. Lungs were harvested separately for $EVLWI_G$. To validate *in vivo* EVLWI vs. $EVLWI_G$, we used linear regression and Bland-Altman analysis. $p < 0.05$ was regarded as statistically significant.
Results and Discussions: After PE, $EVLWI_{STD}$ and $EVLWI_{TDD}$ decreased by 30% and 33% in the LPE group and by 42% and 56% in the RPE group, respectively ($p < 0.01$). At 3 hrs, the VILI group demonstrated manifesting PPO paralleled by the increase in $EVLWI_{STD}$ and $EVLW_{TDD}$ by 36% and 49%, as compared to the PE stage ($p < 0.01$). Final values of $EVLWI_{STD}$ and $EVLWI_{TDD}$ correlated significantly with $EVLWI_G$ ($r^2 = 0.67$ and $r^2 = 0.81$, respectively). The biases ± 2SD compared with $EVLWI_G$ were 2.9 ± 2.5 ml/kg for $EVLWI_{STD}$ and 0.2 ± 2.1 ml/kg for $EVLWI_{TDD}$, respectively ($p < 0.01$).

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Conclusions: Among other factors, VILI may play an important role in PPO. After PE and VILI, $EVLWI_{STD}$ and $EVLWI_{TDD}$ correlated closely with $EVLWI_G$. Thus, despite moderate overestimation, both methods are acceptably accurate for estimation of lung fluid balance.

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A-278

3D-Imaging of alveoli during mechanical ventilation

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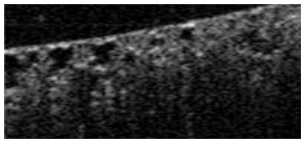
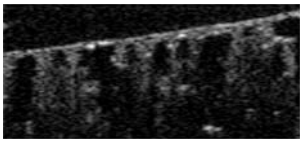
Background and Goal of Study: The development of ventilator induced lung injury (VILI) is strongly related to the mechanical shear stress and tension on the alveolar walls. The understanding of VILI requires a proper description of the three dimensional structure and deforming of lung parenchyma throughout tidal ventilation (1). The aim of our study is to proof the feasibility of optical coherence tomography (OCT) (2) for imaging alveoli under different ventilator settings in the blood-free perfused and ventilated isolated rabbit lung.

Materials and Methods: A Fourier-Domain-OCT (3) was used to image the lung with a contact-free scanner head. Cross sectional images of the alveolar structures were taken during different modes of ventilation to capture the dynamical changes. Synchronously the real-time pressure data were recorded.

Results and Discussions: The cross sectional OCT images reveal differences between endinspiratory and endexpiratory phase (Fig 1), recruitment/derecruitment of alveoli and show the influence of PEEP. The 3D OCT model of the fixated lung is comparable to images taken with scanning electron microscopy and confocal microscopy. The analysis of the OCT images allows quantitative measurements of the alveolar volume change during ventilation.



(a) End-expiratory



(b) End-inspiratory

Figure 1.

OCT images of ventilated lung with VT = 15 ml/kg and PEEP = 0 cm H_2O (size: 1 mm × 0.5 mm)

Conclusion(s): OCT cross-sectional images provide a data base for the quantitative analysis of lung mechanics on the alveolar scale. In contrast to conventional microscopy OCT gives full 3D information of the alveolar structure and dynamic behavior during ventilation.

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A-279

Morphometrical measurements in experimental lung Injury

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Background and Goal of Study: In the present study we compared the new, more objective morphometrical measurement of lung structures with the traditional quantification of diffuse alveolar damage (DAD) in a porcine model of oleic acid induced lung injury.

Materials and Methods: In total, 480 light-microscopical photomicrographs from 30 animals were investigated. DAD was quantified by means of a recently published scoring system[1]. Morphometrical analysis included manual and computerized measurements.

Results and Discussions: All morphometrical measurements in aerated areas, but only few in non-aerated areas, were highly correlated with DAD characteristics. Particularly, median chord length in air, area in air and intra-alveolar wall thickness proved highly predictive for DAD characteristics.

Conclusion(s): Our findings suggest that objective morphometrical measurements may be as useful as traditional histo-pathological analysis for evaluating diffuse alveolar damage.

Reference:

1 Gama de Abreu et al.: Comparative Effects of Vaporized Perfluorohexane and Partial Liquid Ventilation in Oleic Acid-induced Lung Injury. Anesthesiology 2006, in press.

A-280

Comparison between these 3 following humidifiers when non-invasive ventilation is used: an heat and moisture exchanger booster (HMEB), an hot water humidifier (HWH) and an Hygroscopic condenser humidifier (HCH)

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Background and Goal of Study: Humidification and heating of inspired gases is debatable when non-invasive ventilation (NIV) is used because the upper airways are not bypassed. However high inspired fresh gas flows are dry and cold. Without a heat and moisture device on NIV several adverse effects occur: dry mucous membrane, bronchial obstruction, epistaxis and patient discomfort (1). So 3 humidifiers were tested on 10 volunteers non-invasively ventilated.

Materials and Methods: Volunteers without any history of respiratory disease, non smokers of 232 y.o were ventilated, without air leakage, with a Bipap BREAS PV 102 (positive pressure exp. and insp. of respectively 5 and max 11 cm H_2O) and 3 following humidifiers: HMEB (active microhumidifier) (2), HWH Fisher et Paykel MR 850 (gas T° in this one heated to 31°C) and HCH (filter Medisize Hygrovent Gold). They were also tested with dry air (DA). Each volunteer had breathed through the 4 "devices". The 3 humidifiers were compared between themselves and in comparison with air. We have recorded during 1 minute (capacitance = 1200 values) minimal absolute humidity (mAH, mg H_2O/L), minimal temperature (mT°, °C), tidal volume (V_t), respiratory rate (RR), breathing difficulties (BD) and subjective dryness (SD) of inspired air. Statistical analysis used was the Hoteling test, the Bonferroni methods modified according to Holm and the Friedman test. $P < 0.05$ significant.

Results and Discussions: Mean values ± SD of:

	HMEB	HWH	HCH	DA
mAH	36.43 ± 0.50	35.61 ± 0.58	32.75 ± 0.30	15.73 ± 0.54
mT°	33.12 ± 0.14	31.48 ± 0.22	31.43 ± 0.20	26.20 ± 0.28

There was no statistically significant difference for V_t, RR, BD and SD between the 4 "devices" themselves.

There were statistically significant differences between 4 "devices" for mAH and for mT°. With regards to the mAH and the mT°, the 3 humidifiers proved to be better than air. HMEB was equivalent to HWH and better than HCH in relation to mAH. HMEB was the best one with regards to mT°.

Conclusion(s): During NIV, HMEB is the best one with regards to mAH and mT°.

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A-281

A comparison of double-lumen endotracheal tube and Arndt bronchial blocker in right and left thoracic surgery

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Goal of Study: To compare the effectiveness and the time required for the positioning of two lung isolation techniques: double-lumen endotracheal tube (DLT) and Arndt bronchial blocker (ABB) in right and left thoracic surgery.

Materials and Methods: Forty patients scheduled for thoracic surgery were included. Patients were distributed into two groups depending on the side of surgery. For right surgery, a right ABB or a left DLT a was randomly placed. For left surgery, a left ABB or a right DLT was also randomly placed. DLTs were introduced into the glottis via direct laryngoscopy and then guided into the left or right mainstem bronchus using a fiberoptic bronchoscope. ABBs were introduced according to manufacturer recommendations. All devices were introduced by senior residents. The variables recorded were: time to position the device, frequency of malpositions and adequacy of lung

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collapse. Statistical analyses were performed with ANOVA and X^2 test. Results were considered to be statistically significant when *P* value was less than 0.05.

Results: All the groups were similar with regard to sex, age, weight, height, ASA, Mallampati and Cormack-Lehane. Times for positioning in minutes are shown as mean ± SD.

	Right surgery		Left surgery	
	Right ABB n = 10	Left DLT n = 10	Left ABB n = 10	Right DLT n = 10
Time	4.12 ± 0.97	4.10 ± 2.7	7.92* ± 4.3	3.7 ± 1.8

* $p < 0.015$ compared with all other devices.

There were no significant differences in the number of malpositionings. The quality of lung deflation was excellent in 89.5% of the cases. Three cases were judged as being fair (right ABB) and only in one case collapse was considered poor (left ABB).

Conclusion(s): In hands of inexperienced anaesthesiologists in thoracic surgery the left ABB was the device that needed the longest time for initial positioning. All devices presented similar frequency of malpositions. The quality of lung collapse was excellent for the majority of patients independently of the side of surgery and the device used.

A-282

Effects of inspiratory oxygen fraction and endotracheal intubation on endtidal carbon monoxide and carboxyhaemoglobin concentration

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Background and Goal of Study: Increased exhaled carbon monoxide (CO) and arterial carboxyhaemoglobin (HbCO) levels have been suggested to indicate inflammation [1,2]. In this context we studied the effects of inspiratory oxygen fraction and endotracheal intubation during induction of general anaesthesia on endtidal CO and arterial HbCO concentrations.

Materials and Methods: We measured simultaneously endtidal CO concentrations (MicroPac, Dräger, Germany) as well as arterial blood HbCO (ABL 725, Radiometer, Denmark) concentrations in patients undergoing general anaesthesia (n = 20, 3 female, 17 male, age 69.6 ± 7.4 years, height 172.1 ± 8.7 cm, weight 83.8 ± 12.5 kg, mean ± SD, ANOVA ± Bonferroni).

Results and Discussions: During breathing of oxygen (FiO_2 1.0) endtidal CO concentrations increased from 8.2 ± 5.2 to 16.6 ± 9.1 ppm, $p < 0.01$. Subsequent endotracheal intubation increased CO concentration to 29.4 ± 14.1 ppm, $p < 0.001$. At the same time arterial HbCO concentration decreased from 1.1 ± 0.4 to 0.9 ± 0.3%, $p < 0.001$ (FiO_2 1.0) and to 0.8 ± 0.3%, $p < 0.001$ after endotracheal intubation.

Conclusions: Endtidal CO and arterial HbCO concentrations are influenced in diverse directions with increased inspiratory oxygen fraction and endotracheal intubation. This observation is likely explained by a displacement of CO from its haemoglobin bond during the lung passage.

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A-283

Role of the aquaporin channels 1 and 5 on the ventilator-induced lung injury

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Background and Goal of Study: The lung damage induced by the mechanical ventilation (MV) plays a key role in the evolution of patients with ARDS(1). The aquaporins (AQPs) allow selective and rapid bi-directional movement of water(2). There are at least ten types of AQPs of which the lung is known to have four(3). The AQPs 1 and 5 are inhibited by chloride of mercury ($HgCl_2$). This effect is reversed by equimolar concentrations of cysteine.

Materials and Methods: Wistar rats (250–400 g) were anesthetized with 100 mg/kg ketamine i.p. Five rats were then sacrificed as controls (*Group 1*). Eighteen rats were orotracheally intubated and ventilated for 2 hours. This specimens were classified under the following groups: Ventilated with TV of 7 ml/Kg (*Group 2*), TV of 20 ml/Kg (*Group 3*), TV of 20 ml/Kg and $HgCl_2$ (6 mg/Kg) administered through a tail vein (*Group 4*) and TV of 20 ml/Kg, $HgCl_2$ and cysteine iv on equimolar concentration (*Group 5*). After the 2 hours, the animals were sacrificed with penthotal (100 mg/kg iv). The lungs were weighed at this time and after 96 hours in a stove at 80°C.

Results and Discussions: Results are presented in table 1.

Table 1

	n	Lung WET/DRY weight ratio
Group 1	5	4.68 ± 0.08
Group 2	4	4.88 ± 0.07
Group 3	5	5.52 ± 0.32*
Group 4	5	8.67 ± 0.32#
Group 5	4	5.50 ± 0.31*

Values are expressed as mean ± S.D.
*$P < 0.05$ from TV of 7 ml (Group 2). #$P < 0.05$ from TV of 20 ml (Group 3).

Conclusion: The MV with high tidal volumes (20 ml/kg) caused acute lung injury and increment of the lung wet/dry weight ratio. The blockade of the AQPs 1 and 5 with $HgCl_2$ worsened the lung edema. This blockade is reversed with equimolar concentrations of cysteine. The AQPs have a protector role relating to the damage induced by mechanical ventilation.

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A-284

Effects of halothane on electrogenic ion transport and transepithelial potential difference in airway epithelium

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Background and Goal: The airway epithelium (AE) is lined with a thin layer of fluid called airway surface liquid-ASL. Bidirectional transport of Na^+ and Cl^- by the AE that controls production and composition of ASL is responsible for airway transepithelial potential difference-PD and in this way influences on mucociliary transport. Volatile anaesthetics are suggested to elicit depression of airway clearance and ion transport and can affect on postoperative pulmonary complications. The goal: to reveal possible influence of halothane on electrogenic ion transport in AE.

Material and Methods: The study were performed on trachea excised from rabbits killed by CO_2 asphyxiation. The trachea was cut along the membranous part and divided into pieces of about 2 cm^2. Then it was mounted in the Using chamber filled with Ringer solution and equipped with nozzle connected to a peristaltic pump. The jet flux of stimulation fluid (volume 1.8 ml, for 15 sec) from the nozzle washed the mucosal surface of the tissue. Stimulation fluids were: Ringer solution with amiloride (AMI)-blocker of Na^+ transport (control conditions) and aqueous solutions of Halothane in concentrations (mmol/l) as follow: 0.3; 0.6; 1.5; which is relevant with partial pressures (MAC vol%):1, 2, 5 (experimental conditions). The EVC 4000 voltage/current clamp apparatus (WPI, USA) connected to chart recorder was used to measure voltage and resistance.

Results: Data (Mean ± SD) are shown in the table.

AMI	n = 16	dPD-0.44 ± 0.08	PD-7.30 ± 0.50	R308 ± 72
H1.0	n = 13	dPD-0.43 ± 0.09	PD-7.50 ± 0.29	R296 ± 63
AMI	n = 21	dPD-0.34 ± 0.07	PD-5.37 ± 0.68	R297 ± 94
H2.0	n = 14	dPD-0.27 ± 0.02	PD-5.20 ± 0.61	R272 ± 76
AMI	n = 20	dPD-0.26 ± 0.03	PD-5.36 ± 0.34	R271 ± 77
H5.0	n = 8	dPD-0.20 ± 0.06*	PD-5.04 ± 0.79	R272 ± 85

n–number of experiments; PD–baseline (mV); dPD-stimulus -evoked changes in PD (mV); R-transepithelial electrical resistance ($\Omega \cdot cm^2$). Mann-Whithney's *U*-test *$p < 0.05$.

Conclusions:

1. Stimulation (gentle rinsing) of mucosa by AMI causes transient hyperpolarization.
2. 15 sec jet flux of 1.5 mmol/l halothane (5 MAC) induced depolarization.
3. In 19% of cases depolarization was seen in 0.3 and 0.6 mmol/l (1 and 2 MAC).
4. These changes are related to the compromised Cl^- transport.
5. Longer lasting stimulation (minutes) of mucosal surface is being performed.

Reference:

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A-285

Haemodynamics, gas exchange and surgical conditions during bilateral high frequency jet ventilation in lung surgery

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Background and Goal: Bilateral high frequency jet ventilation (HFJV) applied to conventional endotracheal tube may be an attractive alternative to the usage of double lumen endotracheal tube and one lung ventilation (OLV) for major thoracic procedure. The aim of present study was to compare haemodynamics, oxygenation and surgical conditions during bilateral HFJV and OLV during anaesthesia for lung surgery.

Material and Method: 56 patients were randomly allocated to receive either HFJV ($n = 28$) or OLV ($n = 28$) during major thoracic procedures. All patients were anaesthetized with TCI propofol. Muscle relaxation was achieved with rocuronium and analgesia was provided with continuous epidural infusion of 0.5% ropivacaine with fentanyl. Transoesophageal probe for non-invasive cardiac output measurements was inserted after induction of anaesthesia. Arterial and central venous blood samples for gas analysis were taken before induction of anaesthesia (0), prior to the start of the studied mode of ventilation (I), and then every 30 min during HFJV or OLV. Haemodynamic parameters were recorded at baseline (I) and every 15 min during HFJV or OLV. Measurements were taken for 120 minutes. ANOVA or Mann-Whitney tests were used when appropriate and $p < 0.05$ was considered significant.

Results: Patients in study groups were comparable. Arterial oxygen saturation and systemic vascular resistance values were significantly higher in HFJV group. Peak inspiratory pressures and shunt fraction were significantly higher in OLV group. No differences in blood pressure, heart rate, stroke volume, cardiac index and $PaCO_2$ values were recorded. Surgeons have found comparable and satisfactory operational conditions in both groups.

Conclusions: Bilateral HFJV is superior to OLV regarding both gas exchange and ventilation-perfusion ratio. This mode of ventilation may be an attractive alternative to OLV for major thoracic procedures.

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A-286

Positive end-expiratory pressure (PEEP) impairs intestinal microcirculatory oxygenation and perfusion, and increases trans-intestinal oxygen shunting in pigs

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Background and Goal of Study: Mechanical ventilation with positive end-expiratory pressure (PEEP) remains the basic concept for respiratory support in critically ill patients. However, PEEP depresses systemic hemodynamics, e.g. cardiac output, but microcirculatory effects of PEEP remain unclear. Since impaired intestinal micro-circulatory perfusion and oxygenation may promote sepsis and multiple organ failure, we studied the *per se* effects of PEEP on intestinal microcirculation. Herein, impairment of the intestinal microcirculation could result from reduced mesenteric blood flow and/or increased trans-intestinal oxygen shunting.

Materials and Methods: Pigs (27–33 kg bodyweight, $n = 6$) were anesthetized, intubated and mechanically ventilated. The animals were instrumented for determination of cardiac output and superior mesenteric artery blood flow, and the following intestinal microcirculatory measurements: At the ileum mucosa and serosa, we simultaneously measured microvascular PO_2 (μPO_2, Pd-porphyrin phosphorescence quenching), microvascular HbO_2-saturation (μHbO_2, reflectance spectrophotometry) and microcirculatory perfusion (laser Doppler). To quantify trans-intestinal oxygen shunting, we determined the gradient between microcirculatory tissue oxygenation (mucosal + serosal μPO_2) and corresponding mesenteric venous PO_2 (PO_2-gap). After baseline measurements, PEEP was increased from 0 to 15, 20 and 25 mbar. Statistics: Steady state data, mean ± SEM, Fisher PLSD, $p < 0.05$.

Results and Discussions: PEEP pressure-dependently reduced microcirculatory mucosal μPO_2 from 18 ± 2 (baseline) to 10 ± 1 (PEEP 25 mbar), and serosal μPO_2 from 32 ± 2 to 20 ± 2 mmHg. Correspondingly, PEEP also reduced mucosal μHbO_2 from 49 ± 10% to 33 ± 5% and serosal μHbO_2 from 62 ± 6 to 49 ± 3%. Furthermore, PEEP impaired microcirculatory perfusion of the mucosa (from 1.8 ± 0.3 to 1.1 ± 0.2 units) and serosa (from 5.0 ± 0.7 to 3.7 ± 0.6 units). The O_2-gap started positive at baseline (+8.2 mmHg), zeroed at PEEP 15 mbar (+0.5 mmHg) and turned negative during higher PEEP-levels (−10.8 mmHg at PEEP 25 mbar).

Conclusion(s): In summary, PEEP depressed all measures of intestinal microcirculatory oxygenation and perfusion, both of the mucosa and the serosa. Furthermore, our data suggest that – beside reduction of mesenteric blood flow – an increase in trans-intestinal oxygen shunting contributes herein.

A-287

Effect of an endothelin-receptor antagonist on redistribution of pulmonary blood flow induced by inhaled NO (iNO) in an animal model of lung injury

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Background and Goal of Study: Inhaled NO (iNO) as a selective vasodilator in the lung vasculature is widely explored in many different clinical settings of pulmonary compromise [1]. The exact mechanism of iNO on the pulmonary blood flow remains not completely understood. We hypothesized that the net effect of iNO on distribution of blood flow is composed of two mechanisms: One is the well described vasodilation in ventilated areas; the second is vasoconstriction in poorly or non-ventilated lung units, induced by endothelin-1 (ET-1) [2]. The recently developed dual endothelin receptor antagonist Tezosentan selectively acts on Endothelin A and B receptors and antagonises the response to ET-1. This allows for a more detailed evaluation of mechanisms of blood flow redistribution, induced by iNO.

Materials and Methods: We studied pulmonary blood flow distribution using single photon emission computed tomography (SPECT) in 14 pigs (20–30 kg) with an endotoxin induced lung injury. In 7 animals Tezosentan was continuously infused for 3 hours, further 7 animals served as controls. Both groups were exposed to iNO (40 ppm, last 30 minutes of the 3-hour period).

Results and Discussions: In controls, a marked change in perfusion distribution is recorded (SPECT) with iNO, as previously observed [3]. This perfusion redistribution was abolished in animals treated with Tezosentan. As a result, PaO_2 increased by 38.5 ± 40.2% in the controls, while it remained unchanged (−4.3 ± 6.0%) in the Tezosentan group ($p = 0.07$).

Conclusions: Our data suggest that the redistribution of pulmonary blood flow induced by iNO is mediated by vasodilation in ventilated lung units and, in addition, by vasoconstriction in poorly or non-ventilated lung units, mediated by ET-1. Accordingly, the Endothelin mechanism may be substantially involved in response and NON-response to iNO.

References:

1 Kaisers U, et al. Crit Care Med 2003, 31(4 Suppl): S337–42.
2 Hambraeus-Jonzon K, et al. Anaesthesiology 2001, 95(1): 102–12.
3 GUST R, et al. Am J Respir Crit Care Med 1999, 159(2): 563–570.

A-288

The respiratory phenotype of the adenosine A1 receptor knockout mouse

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Background and Goal of Study: The nucleoside adenosine has been implicated in the regulation of respiration especially in during hypoxia (1). However, it is still a matter of debate which of the subtypes of adenosine receptors is mediating the respiratory depression during hypoxia (1). This study aimed at investigating the role of adenosine A1 receptors during hypoxia *in vivo*. We used the adenosine A1 receptor knockout mouse ($A_1R^{-/-}$) as a tool to investigate the importance of the A1 receptor in respiration and to evaluate the potential of specific A1 blockade as therapeutical strategy.

Materials and Methods: Respiration of unrestrained $A_1R^{-/-}$ and wildtype mice ($A_1R^{+/+}$) was measured using a plethysmographic device. The effects of hypoxia in the absence and presence of theophylline have been tested.

Results and Discussions: Under normoxia and mild hypoxia no difference in respiration patterns was observed between $A_1R^{+/+}$ and $A_1R^{-/-}$ mice. However, in more severe hypoxia $A_1R^{+/+}$ mice exhibited after a transient increase of respiration a decrease of the minute volume (MV). In contrast to this, the MV of $A_1R^{-/-}$ mice was strongly increased under these conditions. Interestingly, the difference in hypoxia-induced breathing patterns between the genotypes could be abolished by theophylline (50 μg/g i.p.): Under hypoxic conditions, theophylline specifically increased the MV in wildtype mice but had virtually no effect in $A_1R^{-/-}$ mice.

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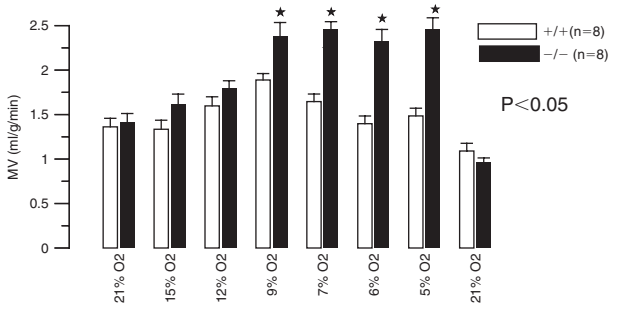

Conclusion: This is the first *in vivo* study clearly demonstrating that the adenosine A1 receptor is a critical determinant of the down-regulation of respiration under hypoxic conditions in mice.

Reference:

1 Barros RCH. *Neuroreport* 11:193–197, 2000.

A-289

Pulmonary immune effects of One-lung ventilation in a pig model of thoracic surgery

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Background and Goal of Study: One-lung ventilation (OLV) with normal tidal volume (10 ml/kg) induces an inflammation in the ventilated lung, characterized by release of cytokines, leukocyte recruitment and neutrophil dependent tissue destruction. In this prospective study, pulmonary immunological parameters were analyzed from the ventilated and non-ventilated lung, prior to and after OLV in a pig model of thoracic surgery.

Materials and Methods: 12 Yorkshire/Swedish land pigs were used in the study. After tracheotomy, the pigs were mechanically ventilated (V_T = 10 ml/kg, FIO_2 = 0.40 in air and PEEP = 5 cm H_2O). After insertion of a left sided bronchusblocker, OLV was started with V_T = 10 ml/kg, FiO_2 = 0.40, PEEP = 5 cm H_2O) and a typical left-sided thoracotomy was performed. Fiberoptic, bronchoalveolar lavage (BAL) of both lungs was achieved before (t1), 20 min after OLV (t2) and 1 hour after OLV (t3). In the BAL fluid, numbers of cells, protein concentrations, pro-inflammatory (TNFα, IL8) and anti-inflammatory cytokines (IL10) were determined. Data were analyzed by Friedman and post-hoc Wilcoxon test.

Results and Discussions: In the ventilated lung [R] protein, intraalveolar cell numbers and proinflammatory cytokines (IL8, TNFα) were significantly increased. Likewise an inflammation response was detected the non-ventilated lung [L] almost in the same extend.

Table (mean ± SD, * = p < 0.05)

	t1 L	t2 L	t3 L	t1 R	t2 R	t3 R
Protein [μg/ml]	234 ± 118	271 ± 99	251 ± 73	246 ± 202	220 ± 50	255 ± 50
IL8 [pg/ml]	199 ± 278	407 ± 211*	605 ± 281*	120 ± 50	276 ± 253*	377 ± 288*
TNFα [pg/ml]	92.4 ± 80	156.8 ± 52*	201 ± 103*	95 ± 27	117 ± 27	229 ± 178*
Cells [Mio]	137 ± 34	187 ± 55	224 ± 44*	156 ± 57	154 ± 53	222 ± 49*

Conclusion(s): Our results indicate that OLV using a tidal volume of 10 ml/kg initiates an epithelial damage and proinflammatory response in the alveolar compartment of the dependent lung. Lung protective ventilation approaches are needed to reduce lung damage during OLV in thoracic surgery.

Reference:

1 Schilling, et al. Anesth Analg 2005;101:957–65.

A-290

Time-dependent modulation of hypoxic pulmonary vasoconstriction in experimental sepsis by thoracic epidural anaesthesia

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Background and Goal of Study: Acute lung injury in experimental sepsis induced by cecal ligation and perforation (CLP) is linked to elevated pulmonary NO-Synthase activity which in turn alters hypoxic pulmonary vasoconstriction (1). Thoracic epidural anaesthesia (TEA) has been shown to improve intestinal mucosal blood flow and barrier function (2). We hypothesized that TEA during sepsis attenuates pulmonary vascular dysfunction in isolated perfused rat lungs by affecting pulmonary NO-Synthase activity.

Materials and Methods: We studied 24 Sprague-Dawley rats in 5 groups: I SHAM; II early sepsis (CLP 6 h); III early sepsis and continuous TEA (CLP 6 h + TEA); IV late sepsis (CLP 24 h); V late sepsis and continuous TEA (CLP 24 h + TEA). TEA was induced by epidural infusion of bupivacaine 0.5% (15 μl/h). After anaesthesia and tracheostomy exhaled NO (exNO) from rat's lungs was measured followed by isolation and perfusion of the pulmonary circuit. Angiotensin II (AT II) was injected into the circuit to test vasoreactivity. Lungs were then ventilated with hypoxic mixture (HPV 3% O_2). Changes in perfusion pressure were measured.

Results and Discussions: Results were analysed with t-test. Values (mean ± SEM) are shown in the table.

	SHAM	CLP 6 h	CLP 6 h + TEA	CLP 24 h	CLP 24 h + TEA
exNO (ppb)	2.2 ± 0.2	7.6 ± 0.9#	4.8 ± 0.5*	10.6 ± 0.8#§	4.8 ± 0.8*
Δp ATII (mmHg)	2.5 ± 0.2	1.75 ± 0.25	1.75 ± 0.25	2.2 ± 0.3	2.0 ± 0.3
Δp HPV (mmHg)	9.1 ± 0.9	8.0 ± 0.4	5.0 ± 0.4*	1.0 ± 0.3§	4.8 ± 0.4*

#p < 0.05 vs SHAM, *p < 0.05 vs untreated animals same point of time, §p < 0.05 vs CLP 6 h.

Conclusion(s): TEA suppressed NO-Synthase activity in early and late sepsis. TEA reduced HPV in early sepsis and partly restored diminished HPV in late sepsis. We conclude, that modulation of HPV by TEA in septic conditions is time-dependent and not related to NO-Synthase activity.

References:

1 Fischer LG, Freise H, Hilpert JH, et al. *Intensive Care Med* 2004; 30(9): 1821–8.
2 Sielenkamper AW, Van Aken H. *Anesthesiology* 2003; 99(3): 523–525.

A-291

Pressure support ventilation reduce ventilator-induced diaphragmatic dysfunction

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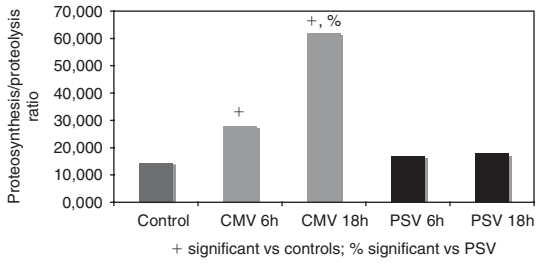
Background and Goal of Study: Prolonged controlled mechanical ventilation (CMV), result in diaphragmatic dysfunction (VIDD) with a decrement in diaphragm force and muscle atrophy. We tested the hypothesis that pressure support ventilation, because of diaphragmatic contraction, could reduce VIDD.

Materials and Methods: Mechanically ventilated animals were anaesthetized, tracheostomized, and ventilated with 21% O_2 for 18 hours of CMV (n = 7) or PSV (n = 7), or 6 hours of CMV (n = 7) or PSV (n = 7). Controls were dissected after anaesthesia. After ventilation procedure, both costal part of the diaphragm were dissected. The first were quickly frozen at −80°C for further analysis of chymotrypsine like 20S proteasome activity, the second was incubated in a C14* KREBS solution for 1 hour and then frozen at −80°C. Statistical analysis was performed using a one way anova with post-hoc test.

Results and Discussions: After 6 hours of CMV, proteosynthesis was significantly decrease *vs* PSV (p = .0117) without changes in proteolysis. 18 hours of CMV resulted in a dramatic increase in proteolysis and decrease in proteosynthesis *vs* PSV (p = .0023 and .0103 respectively).



Conclusion(s): Controlled mechanical ventilation dramaticaly decrease protein balance. Probably due to diaphramagatic work, PSV reduce ventilator-induced proteolysis without decrease in proteosynthesis.

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A-292

Ventilator-induced diaphragmatic dysfunction: is protein oxidation still a real trigger?

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Background and Goal of Study: Because of respiratory muscle weakness, Controlled Mechanical Ventilation (CMV) results in severe alterations of diaphragmatic protein metabolism and atrophy (1, 2). Furthermore, CMV is associated with oxidative damage of myofibrillar diaphragmatic protein (1, 3). We hypothesized that in maintaining respiratory muscle activity, Pressure Support Ventilation (PSV) will reduce diaphragmatic oxidative and protein metabolism alterations.

Materials and Methods: 55 adult Sprague-Dawley rats were anaesthetized, tracheostomized and assigned to one of two groups: 6 or 18 hours of PSV and 6 or 18 hours of CMV (VT 10 ml.kg^{-1}, RR 80/min, PEP = 0, FiO_2 0.21). Protein synthesis and proteolysis were analysed on costal diaphragm sample. Myofibrillar oxidation (protein carbonyls content) was measured on controlateral diaphragm.

Results and Discussions: 6 hours of CMV results in a 38% reduction of protein synthesis (−60% after 18 h, $p = 0.016$). While it increases in CMV (+33%, $p = 0.0002$), proteolysis is stable in PSV. Moreover, Proteolysis/Protein synthesis ratio is increased in CMV, not in PSV. Compared with control, both 18 hours of PSV and CMV are associated with increased in myofibrillar protein carbonyl levels ($p = 0.0009$ in CMV, $p = 0.0002$ in PSV).

Conclusion(s): Despite reduction in proteolysis and maintained protein synthesis, PSV is associated with oxidative damage in the diaphragm. Oxidative signal is probably not the trigger of ventilator induced-diaphragmatic protein metabolism alterations. Other mechanisms like apoptosis are probably involved in such modifications.

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1 Shanely RA, et al. *Am J Respir Crit Care Med* 2002; 166:1369–1374.
2 Shanely RA, et al. *Am J Respir Crit Care Med* 2004; 170:994–999.
3 Zergeroglu MA, et al. *J Appl Physiol* 2003; 95:1116–1124.

A-293

Hypoxia attenuates neutrophil-induced alveolar epithelial cell killing

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Background and Goal of Study: The mechanisms by which different cells respond to acute changes in oxygen tension are not well described. Leukocyte infiltration is known to play an important role in hypoxia-induced tissue damage. Although numerous studies on hypoxia have been performed, only a paucity of information is available about hypoxia and the interaction of effector cells such as neutrophils with target cells (alveolar epithelial cells, AEC). Goal of this study was to analyze how hypoxia influences neutrophil adherence to AEC previously exposed to hypoxia. The research hypothesis was that increased adherence would lead to enhanced target cell killing.

Materials and Methods: L2 cells, a cell line of rat AEC were exposed to 5% oxygen for 2, 4, and 6 h, while control cells remained in an incubator with 21% oxygen. Neutrophils were incubated with control- and hypoxia-exposed cells for 30 min and non-adherent cells were carefully washed away. Remaining cells were counted. For cytotoxicity assays, neutrophils were added to AEC and both cell types were incubated together in hypoxia or normoxia. Cytotoxicity was determined measuring lactate dehydrogenase release into supernatant, which was confirmed with chromium experiments.

Results and Discussions: Exposure of cells to hypoxia resulted in an increase of adherent cells of 150% after 2 h, 200% after 4 h, and 327% after 6 h compared to control cells ($p < 0.0005$). Death rate of hypoxia-exposed AEC decreased by 54% after 2 h, by 56% after 4 h, and by 60% after 6 h in comparison to control cells ($p < 0.05$).

Conclusion(s): This study shows for the first time that AEC are more resistant to effector cells under hypoxia suggesting hypoxia-induced cell protection. An underlying mechanism will have to be elucidated.

Reference:

1 Beck-Schimmer B, et al. Am J Respir Cell Mol Biol 2001; 25:7.

Transfusion and haemostasis

A-294

A total balanced volume replacement strategy using a new balanced hydroxyethyl starch preparation in patients undergoing major abdominal surgery

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Background and Goal of Study: The kind of fluid for correcting hypovolemia is a focus of debate (1). In a prospective, randomized, controlled, and double-blind study in patients undergoing major abdominal surgery a total balanced volume replacement strategy including a new balanced hydroxyethyl starch solution (HES) was compared with a non-balanced fluid regimen.

Materials and Methods: In group A (n = 15) a new balanced 6% HES 130/0.42 was given along with a balanced crystalloid solution; in group B (n = 15) an unbalanced conventional HES 130/0.42 plus an unbalanced crystalloid (saline solution) were administered. Volume was given when mean arterial blood pressure (MAP) was < 65 mmHg and central venous pressure (CVP) minus PEEP level was < 10 mmHg. Haemodynamics, acid-base status, coagulation (thrombelastography [TEG]), and kidney function (including kidney specific proteins N-acetyl-beta-D-glucosaminidase and alpha-1-micro-globulin) were measured after induction of anaesthesia, at the end of surgery, 5 hrs and 24 hrs after surgery.

Results and Discussions: Group A received 3533 ± 1302 ml of HES and 5333 ± 1063 ml of crystalloids, in group B 3866 ± 1674 ml of HES and 5966 ± 1202 ml of crystalloids were given. Haemodynamics, laboratory data, TEG data, and kidney function were without significant differences between the groups. In group B, Cl^- concentration and base excess (−5 ± 2.4 mmol/l vs 0.4 ± 2.4 mmol/l) were significantly higher than in group A and exceeded normal values.

Conclusion(s): A complete balanced volume replacement strategy incuding a new balanced HES preparation resulted in significantly less derangement in acid-base status compared with a nonbalanced volume replacement regimen. The new HES preparation showed no negative effects on coagulation and kidney function.

Reference:

1 Mythen MG. *Intensive Care Med* 1994; 20: 99–104.

A-295

The Hemostatic profile of blood type O and non O patients after acute normovolemic hemodilution with hydroxyethyl starch

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Background and Goal of Study: Excessive administration of hydroxyethyl starch (HES) may induce dilutional or HES related coagulopathy. And there are a few reports that blood type O has a tendency of low factor VIII and vWF level. In this case, blood type O patients might be especially vulnerable to coagulopathy during acute normovolemic hemodilution (ANH) with HES. Therefore, we tried to find out coagulation profile of blood type O patients undergoing ANH with HES in comparison with other blood types.

Materials and Methods: Twenty nine patients and 14 patients, all ASA 1 or 2, undergoing a spine surgery of more than 2 spinal levels were assigned to the non-O and O group, respectively. After anesthesia induction, 30% of estimated blood volume was procured and the same volume of 6% HES (130/0.4) was infused simultaneously. Coagulation profiles were measured before ANH (T_0) and 30 min after (T_{30}).

Results and Discussions: Both before and after ANH, factor VIII activity, vWF:ag and VWF:RC of were lower in the O group than in the Non-O group. After ANH, all factors decreased in both groups and fell below normal range in the O group. LY30 and LY60 of TEG profile were higher in the O group before and after ANH. After ANH, MA and CI decreased in both groups and fell below normal range in the O group.

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Conclusions: In the case of blood type O patients, ANH with HES should be carefully performed with coagulation monitoring.

Reference:

1 Huraux C, Ankri AA, Eyraud D, Sevin O, Menegaux F, Coriat P, Samama CM. Hemostatic changes in patients receiving hydroxyethyl starch: the influence of ABO blood group. Anesth Analg. 2001; 92: 396–401.

A-296

Magnesium attenuates in vivo haemodilution induced hypercoagulation

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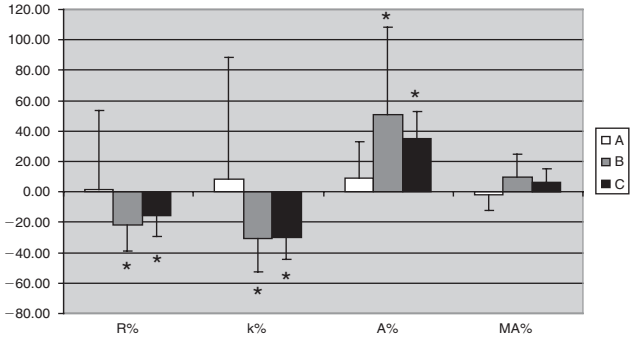
Background and Goal of Study: Rapid infusion of crystalloids generates enhanced coagulation[1]. Serum magnesium (Mg) levels may play a role in attenuating this effect (unpublished data). This study determines the coagulation effect of rapid *in vivo* crystalloid dilution if Mg levels are decreased, maintained or partly increased.

Materials and Methods: The University Ethics Committee approved the study. 20 healthy, consenting volunteers, on no aspirin, non-steroidal medication, or any other anti-coagulants during the preceding week were included. All volunteers received a rapid infusion (14 ml/kg in 20 min) of 0.9% saline, Balsol® (Mg 1.5 g/l) or Balsol® + additional Mg (3.0 g/l) on three separate occasions. The order of administration was randomised for each volunteer and investigators were blinded to the identity of the solutions marked A, B, or C. Blood was tested pre and post infusion for Haemoglobin (Hb), serum Mg and thrombelastogram (TEG). Values are compared to control.

Results and Discussions: The solutions were identified post-hoc as: A = Balsol + Mg; B = 0.9% saline & C = Balsol. Haemodilution resulting in identical dilution in all groups (drop in Hb of 10.0, 10.3 & 10.8% in A, B & C respectively). Mg remained in the normal range in all 3 groups, but there was a 8.5% decrease with saline, no change with Balsol and a 17.8% increase with Balsol + Mg. Coagulation remained normal post-dilution in Balsol + Mg, but not in the other 2 groups (TEG post-dilutional % change represented in the figure below. *$p < 0.05$).



Conclusion: If rapid haemodilution produces slightly increased plasma Mg, enhanced coagulation is attenuated.

Reference:

1 Ruttman T. *Br J Anaesth* 2002; 88: 470–472.

A-297

6% HES 130/0.4 (Voluven) vs. 4% modified fluid gelatin (Gelofusine) for plasma volume substitution at acute normovolemic haemodilution and intraoperative blood loss: efficacy and safety during supratentorial brain tumor surgery

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Background and Goal of Study: Adverse effects of artificial colloids have been reported in neurosurgical patients. The goal of this study is to compare 6% HES 130/0.4 (Voluven) and 4% modified fluid gelatin (Gelofusine) to standard 6% HES 200/0.5 (Haes-steril) regarding effectiveness of plasma volume substitution and safety at acute normovolemic haemodilution (ANH) and intraoperative blood loss in neurosurgical patients.

Materials and Methods: 33 patients undergoing supratentorial brain tumor surgery were selected for randomized, controlled, prospective study. Exclusion criteria were anemia, severe hepatic and renal diseases, coagulopathy. We used for ANH (1500 ml) and intraoperative blood volume substitution three types of infusion solutions: Haes-steril in 10 patients (control group – C), Voluven in 12 patients (V), and Gelofusine in 11 patients (GE). Efficacy was calculated by comparing the amount of total colloid infused, invasive haemodynamics, oxygen transport, rSO_2. Safety end points were blood loss, the use of allogenic blood products, coagulation variables, ICP, and adverse effects. All data were obtained at baseline, after ANH, after tumor removal, and at the end of surgery. Data were analyzed by ANOVA.

Results and Discussions: All data were normally distributed (Kolgomorov-Smirnov test). Total volume of infused colloids was similar between groups (1300 ± 349 ml in C vs. 1604 ± 376 ml in V ($p = 0.07$) and 1400 ± 394 ml in GE ($p = 0.55$)). No differences were found in haemodynamics, oxygen transport, and rSO_2. Blood loss was 3460 ± 2750 ml in C, 2667 ± 1073 ml in V ($p = 0.68$), 2220 ± 2050 ml in GE ($p = 0.16$). Coagulation abnormalities were developed after tumor removal: aPTT was 45 ± 15 s. in C, 50 ± 18 s. in V ($p = 0.50$) and 33 ± 10 s. in GE ($p = 0.04$); prothrombin index was 63 ± 9% in C, 59 ± 4.4% in V ($p = 0.19$) and 53 ± 2.6% in GE ($p = 0.00$). No difference was found in use of allogenic blood products and in ICP data. There was one case of anaphylactic/anaphylactoid reaction in GE.

Conclusions: 6% HES 130/0.4 and 4% modified gelatin are effective plasma volume expanders in neurosurgery. 6% HES 130/0.4 and 4% modified fluid gelatin interfere with intrinsic and extrinsic coagulation systems, respectively.

A-298

Volume substitution with 6% HES 130/0.4 in a balanced electrolyte solution in cardiac surgery

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Background and Goal of Study: HES containing infusion solutions are used to maintain circulating blood volume or to treat hypovolaemia in various medical fields. The exclusive use of normal saline based fluids may be associated with the development of hyperchloraemic metabolic acidosis. The goal of this study was to prove equivalence of 6% HES 130/0.4 in balanced electrolyte solution (HES balanced) with 6% HES 130/0.4 in saline solution (HES saline) regarding colloid volume requirements in cardiac surgery. Superiority of HES130 balanced regarding acid-base status parameters was also to be proven.

Materials and Methods: Prospective, randomised, double-blind, parallel-group, multicentre, clinical phase III study. Up to 50 mL/kg of study drug could be infused per day. 43 patients were treated with HES balanced and 38 patients were treated with HES saline. Volume of study drug needed for adequate volume therapy, serum chloride levels, arterial pH, base excess (BE) were investigated. ANOVA/ANCOVA were done as appropriate.

Results and Discussions: In the intent-to-treat analysis of the primary efficacy parameter, mean volumes of HES were 2391 mL in HES balanced or 2241 mL in HES saline, and equivalence [−500 mL; 500 mL] was proven (95% CI: −77 mL; 377 mL). Serum chloride levels were significantly lower after infusion of HES balanced.

	HES balanced*	HES saline*	p value
Cl^- (mmol/L)	110.0 ± 0.58	111.8 ± 0.61	0.0171
Arterial pH	7.378 ± 0.006	7.365 ± 0.007	0.0793

*(Least Squares Mean ± SEM)

Mean BE was at all time points less negative in the HES balanced group. At the end of surgery the contrast of BE (HES balanced minus HES saline) was 1.17 ± 0.42 mmol/L (95% CI: 0.34; 2.00, $p = 0.0032$).

Conclusions: Volumes of HES needed were equivalent between treatment groups. Significant lower serum chloride levels after infusion of HES balanced reflect the lower chloride load of similar infusion volumes. Lower serum chloride values were accompanied by significant less acidosis, as indicated by less negative BE values, and a trend towards a higher arterial pH.

A-299

Hydroxyethylstarch 130/0.4 in liver transplantation – evaluation of the effects on graft function and post-operative course

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Background and Goal of Study: The choice of fluids for Liver Transplantation (LT) is a matter of controversy (1). As far we know, possible effects of hydroxyethylstarch (HES) on the graft were not previously studied. The aim of this blind, controlled, not randomised, comparative study was to evaluate the effect of this drug on the graft function and postoperative course.

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Materials and Methods: All patients from 2001 to 2003, that received 25 ml/kg or more of corn 130/0.4 HES during LT surgery were selected to this study (group I – HES). One author that did not participate in subsequent collection of data, choose for each HES patient a control patient (matched to pathology, sex and age) from the pool of patients transplanted from 1997 to 1999, that did not receive any kind of HES or other synthetic expander (group II – control). Two other different authors evaluated in a blind way the graft function and 7 days post-operative evolution and another fourth author (pathologist doctor) blindly evaluated liver biopsies. Statistics were done with Mann-Whitney test. Data as mean ± SD or median and inter-quartile range, depending of sample Normality.
Results and Discussions: Group I included 17 patients, aged 35.4 ± 12.2 years that received 34.8 ± 7.4 ml/kg of HES, 4 (0.5–8) units of RBC and 4 Units of FFP (0–8). Group II included 17 patients, aged 36.9 ± 11.9 years that received 4 (2–7) units of RBC ($p = 0.79$) and 11 (6.5–16.5) units of FFP ($p = 0.01$) and did not receive synthetic expanders. Control group, during the 7 first post-operative days, presented significantly higher haemoglobin, albumin and lower prothrombin time. Concerning graft function, groups did not differ in post-operative bilirrubin, AST, ALT and LDH. Pre-operative creatinin was slightly higher in group II ($p = 0.03$) but not different in post-operative period. Blind evaluation of post-operative graft biopsies, searching for lesions previous reported to high molecular-weight HES, did not find group differences.
Conclusions: In our practice, the infusion of large amounts of HES 130/0.4 during liver transplantation was included in an overall policy to decrease consumption of blood products (RBC, FFP and albumin). Graft function and post-operative course were similar.
Reference:
1 Juttner B, Kuse ER, Elsner HA, et al. Eur J Anaesthesiol 2004; 21: 309–313.

A-300

6% HES 130/0.4 versus 4% albumin for volume replacement in paediatric cardiac surgery: cyanotic congenital disease

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Background and Goal of Study: Despite a lack of evidence of its superiority over synthetic colloids, human albumin is still widely used in paediatric cardiac surgery. This prospective randomised study compared 6% HES 130/0.4 (Voluven®) to 4% human albumin in terms of calculated blood loss and fluid requirements in cyanotic children undergoing elective cardiac surgery.
Materials and Methods: After approval by the Ethic committee and parental informed consent, 44 cyanotic children (1–132 months) were randomised to receive up to 50 ml/kg either HES 130/0.4 (HES) or 4% albumin (Alb) for per-operative volume replacement including priming for the cardiopulmonary bypass circuit. Lactate ringer's was used for further per-operative volume needs. In the postoperative period (up to 24 h), albumin was the only colloid used to reach routine haemodynamic goals. Per and post-operative blood losses were measured but also calculated from estimated blood volume, pre and postoperative haematocrit and volume of red blood cell transfused (1). Efficacy was evaluated by the amount of fluid infused at the end of the surgery and after 24 h. Data (mean ± SD) were compared between the two groups with unpaired Student t-test. Significance was accepted at $p < 0.05$*.
Results and Discussions: Demographic data were similar in both groups.

(ml/kg)	Alb (N = 20)	HES (N = 24)
Perop colloid	49 ± 5	47 ± 8
Postop colloid	19 ± 16	24 ± 22
Perop crystalloid	89 ± 53	59 ± 40*
Perop measured blood loss	21 ± 13	21 ± 12
Postop measured blood loss	45 ± 38	41 ± 30
Calculated blood loss	30 ± 22	24 ± 16

Conclusions: In the conditions of our study, the use of 6% HES 130/0.4 appeared comparable to 4% albumin in terms of blood losses. Moreover its use was associated with a reduced need for peroperative crystalloids.
Reference:
1 Van der Linden et al. *Anesth Analg* 2005; 101:629–34.

A-301

6% HES 130/0.4 versus 4% albumin for volume replacement in paediatric cardiac surgery: non-cyanotic congenital diseases

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Background and Goal of Study: Despite a lack of evidence of its superiority over synthetic colloids, human albumin is still widely used in paediatric cardiac surgery. This prospective randomised study compared 6% HES 130/0.4 (Voluven®) to 4% human albumin in terms of calculated blood loss and fluid requirements in non-cyanotic children undergoing elective cardiac surgery.
Materials and Methods: After approval by the Ethic committee and parental informed consent, 67 non cyanotic children (1–162 months) were randomised to receive up to 50 ml/kg of either HES 130/0.4 (HES group) or 4% albumin (Alb group) for per-operative volume replacement including priming for the cardiopulmonary bypass circuit. Lactate ringer's was used for further per-operative volume needs. In the postoperative period (up to 24 h), albumin was the only colloid used to reach routine haemodynamic goals. Per and post-operative blood losses were measured but also calculated from estimated blood volume, pre and postoperative haematocrit and volume of red blood cell transfused (1). Efficacy was evaluated by the amount of fluid infused at the end of the surgery and after 24 h. Data (mean ± SD) were compared between the two groups with unpaired Student t-test. Significance was accepted at $p < 0.05$*.
Results and Discussions: Demographic data were similar in both groups.

(ml/kg)	Alb (N = 35)	HES (N = 32)
Perop colloid	45 ± 10	44 ± 15
Postop colloid	9 ± 9	11 ± 10
Perop crystalloid	63 ± 36	59 ± 31
Perop measured blood loss	17 ± 7	15 ± 7
Postop measured blood loss	38 ± 24	49 ± 60
Calculated blood loss	23 ± 11	20 ± 13

Conclusions: In the conditions of our study, the use of 6% HES 130/0.4 appeared comparable to 4% albumin in terms of blood losses and need for peroperative crystalloids.
Reference:
1 Van der Linden, et al. *Anesth Analg* 2005; 101:629–34.

A-302

Magnesium attenuates the enhanced coagulation brought on by 20% saline dilution

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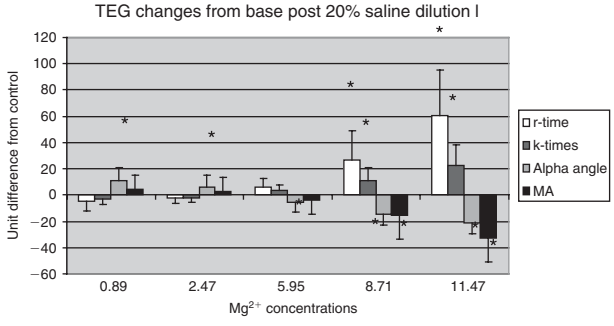
Background and Goal of Study: Rapid saline haemodilution enhances coagulation[1]. This *in vitro* study investigated whether magnesium (Mg^{2+}) attenuates this.
Materials and Methods: The University Ethics Committee approved the study. Blood samples from 21 healthy, consenting volunteers were divided into 6 aliquots; one was kept as an undiluted control, the others were all diluted in a 4:1 ratio with saline containing increasing $MgSO_4$ levels as shown below. Samples were analyzed for pre- and post-dilution magnesium concentrations as well as coagulation using the thrombelastograph (TEG).
Results and Discussions: Pre-dilution Mg^{2+} levels were within normal range and the post dilution Mg^{2+} levels in the five groups are reflected below:

Diluent Mg^{2+}	0.95 mmol/l	5.52 mmol/l	15.20 mmol/l	24.18 mmol/l	32.40 mmol/l
Actual post-dil Mg^{2+}	0.89 mmol/l	2.47 mmol/l	5.95 mmol/l	8.71 mmol/l	11.47 mmol/l

The TEG r- and k-times and maximum amplitude (MA) remained unchanged from control in spite of dilution until measured Mg^{2+} levels were at 5.95 mmol.l^{-1} after which all coagulation parameters demonstrated inhibition. α-angles were significantly different from control at all points, with a small increase until Mg^{2+} of 5.95 mmol.l^{-1} after which coagulation was inhibited. (TEG post-dilution % change represented in the Figure below. *$p < 0.05$)



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Conclusions: Haemodilution enhanced coagulation is attenuated when Mg^{2+} remains constant.

Reference:

1 Ruttman T. *Br J Anaesth* 2002; 88: 470–472.

A-303

Comparison of methods of warming intraoperatively infused fluids in regard to their effectiveness in maintaining temperature homeostasis and reducing postoperative shivering

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Background and Goal of Study: This study compares intraoperative changes in body temperature and the intensity of postoperative shivering when infusing fluids through a warming device, pre-warmed or at room temperature.

Materials and Methods: 77 ASA I–III patients undergoing abdominal operations under combined anaesthesia, randomized in three groups to receive all fluids (incl. blood and blood components): in group A (25 subjects) prewarmed at 38°C, in group B (26 patients) through a warming device at constant 41°C and in group C (22 patients) at room temperature (24°C). Temperature was recorded q15 min using oesophageal and skin thermometers. Temperature against time and infused volume was recorded. Postoperative shivering was graded 0 to 3 (0 none, 1 mild, 2 moderate and 3 severe). Aggressive warming was established, should oesophageal temperature fall below 35°C.

Results and Discussions: All groups had equal anthropometric and demographic data and similar anaesthetic and surgical management and environmental conditions. There was no difference in the rate of mean temperature change during the first 30 minutes [mean rate of 3 groups = −0.00069°C/ml]. *Thereafter*: In group A, mean temperature kept decreasing by about half rate. In group B, mean temperature fall ceased over the next 15 minutes, it remained almost constant until 100 minutes and then started increasing. In group C temperature kept falling and aggressive warming had to be established by mean 105 min (CI: 91–119, $p < 0.05$), as it reached 35°C. Mean temperature difference was significant 60 min after induction (B = 35.9 vs. A = 35.5 and C = 35.4°C, $p < 0.05$) and kept increasing. Postoperative shivering was least in group B [median = mode = 0 in16/26 patients, max = 2 in 5/26] and most in group C [median = mode = 2 in 10/22, min = 0 in 2/22 and max = 3 in 8/22; 18/22 with shivering 2 or 3]. In group A: median = 1, mode = 0 in 8/25, max = 3 in 7/25; 12/25 with shivering grade 2 or 3.

Conclusion(s): When anaesthesia lasts longer that 60 min, continuous warming of infused fluids at a constant temperature maintains temperature better and results in less postoperative shivering. Infusing fluids at room temperature was not tolerable after 105 min.

A-304

Intraoperative fluid restriction improves outcome after elective colonic resection comparison of two intraoperative fluid regimens

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Background and Goals: There is continuing debate regarding the quantity and the type of fluid resuscitation during elective major surgery[1]. The aim of our study was to compare the effect of a restrictive perioperative fluids regimen to a standard regimen on postoperative recovery after colorectal resection.

Materials and Methods: This is a randomized, double-blinded trial which included 37 patients ASA I–II scheduled to undergo conventional open surgery for neoplastic colonic resection. Surgery was performed under general anaesthesia combined with lumbar epidural anaesthesia. The patients received either standard fluid therapy (Group A 8 ml/kg/h for the first hour and 6 ml/kg/h for the second and third hour) or restricted fluid therapy (Group B 4–5 ml/kg/h). Patients in both groups received vasoactive drugs when needed to achieve a mean arterial blood pressure of more than 60 mmHg. Blood was transfused if the haemoglobin values were less than 8.5 g/dl. Intraoperative monitoring included invasive blood pressure, heart rate, electrocardiography, central venous pressure and urinary output. We recorded the times until eye opening, respiration, tracheal extubation, ability to cough, response to verbal orders and orientation. The time to recovery from anaesthesia and to achieve satisfactory Aldrete score was also noted. Other variables measured in hospital included pain visual analogue scale, return of bowel function, mobilization, complications, and length of hospital stay. The data were analysed by Student t test, χ^2, Mann-Whitney U test as appropriate.

Results: The intraoperative fluid administration in the Group A was 3150 (sd) 855 ml versus 1250 (sd) 430 ml ($p < 0.05$). Group B experienced faster recovery and less frequent incidence of postoperative nausea and vomiting. Time from postanesthesia care unit arrival to discharge was 23.8 (sd) 6.2 min in the group B versus 45.1 (sd) 17.8 min ($p < 0.05$). Group B had shorter hospital stays than Group A 8 (sd) 4 days versus 12 (sd) 2 days).

Conclusions: In patients undergoing elective colorectal surgery, intraoperative use of restrictive fluid management may be advantageous in terms of postoperative recovery and hospital stay.

Reference:

1 Joshi GP. Anesth. Analg. 2005; 101(2):601–5.

A-305

Paradoxical procoagulant effect of FVII/VII monoclonal antibody (MAb) on in vitro coagulation

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Background and Goal of Study: While studying the effect of extrinsic pathway inhibition on whole blood coagulation using the thromboelastogram (TEG®), we observed a paradoxical procoagulant action of FVII/VIIa MAb. We present results and discuss findings.

Materials and Methods: Following institutional approval and volunteer consent, varying concentrations of murine MAb against human FVII/VIIa were added to blood obtained from 4 volunteers. Specimens were assayed and TEG® variables (r, k, MA and α-angle) were compared using ANOVA with Dunnett's *post hoc* analysis (GraphPad® InStat).

Results and Discussions: Results are presented as mean (± standard deviation).

	Control	1:1000	1:100	1:10
k-time (mins)	11.4 (1.2)	8.2 (2.6)	6.0 (1.9)	3.0 (0.9)
r-time (mins)	24.9 (1.8)	20.4 (2.8)	17.1 (1.8)	8.9 (1.4)
α-angle (°)	18.0 (2.1)	26.6 (8.7)	33.9 (8.6)	51.4 (9.8)
MA (mm)	43 (2.2)	52.5 (5.9)	57.4 (5.3)	61.8 (6.0)

Normally, FVII/ VIIa MAb inhibits coagulation (1) by blocking the assembly of TF-VIIa complex (product information sheet). Thus, the procoagulant effect we observed is surprising. Most of FVII is in the inactive single chain zymogen form. Only 1% is in the 2-chain active form, FVIIa (2), which can initiate clotting after binding TF. Physiologic levels of FVII inhibit thrombin generation by competing with FVIIa for TF binding sites (3). Presumably, the addition of MAb inactivates FVII > FVIIa, since FVII is more abundant. Decreases in FVII remove this inhibition and encourage the assembly of FVIIa-TF and the acceleration of coagulation.

Conclusion(s): The MAb against FVII/FVIIa demonstrates procoagulant properties when added to whole blood during TEG®.

References:

1 Thromb. Haemost. 73, 223–230 (1995).
2 Blood 95, 1330–1335 (2000).
3 Blood 95, 1330–1335 (2000).

A-306

The use of tranexamic acid reduces transfusion requirements and efficacy of postoperative re-infusion drains in total knee arthroplasty

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Background and Goal of Study: Total knee replacement surgery frequently requires allogenic and/or autologous transfusion. Potentially useful strategies to reduce bleeding and transfusions include perioperative tranexamic acid administration and re-infusion of postoperative drained blood (1)(2). The aim of our study was to evaluate the effect of TA on transfusion requirements and the efficacy of postoperative re-infusion devices.

Materials and Methods: In a double blind prospective study patients scheduled for TKA were randomly assigned into two groups. In the group TA, TA (10 mg/kg ev bolus followed by 1 mg/kg/h perfusion) was administered, while

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in the control group, saline was given matching the protocol. Blood was re-infused if the amount drained was greater than 300 ml and the patient hemoglobin was below 13 gr/dl. Blood drained, calculated blood loss, autologous and allogenic transfusion and percentage of patients re-infused were evaluated. T-test was used for quantitative variables and Chi-square test for qualitative variables.

Results and Discussions: 81 patients were included (TA group: 38, control group: 43). Demographics, preoperative hemoglobin, coagulation parameters, fluid administration, tourniquet and surgery duration were similar between groups. Results expressed as mean (SD) are summarized below. *P $<$ 0.05.

	Control (n = 43)	TA group (n = 38)
Blood drained (ml) first 6 hrs	535 (370)	163 (103)*
Calculated blood loss (ml)	1756 (530)	1380 (553)*
Autologous transfusion (U)	2	0*
Allogenic transfusion (U)	7	1*
Patients re-infused (%)	67	6*

Conclusions: Perioperative TA administration reduces drained blood loss, postoperative calculated bleeding, transfusion requirements and it question the usefulness of the postoperative re-infusion drains.

References:

1 Tanaka N et al. J Bone Joint Surg Br 2001; 83:702–5.
2 Friederichs MG. J Arthroplasty 2002; 17(3):298–303.

A-307

Effects of the direct thrombin inhibitor melagatran in rats with endotoxin-induced sepsis

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Background and Goal of Study: Sepsis is associated with activation of inflammation, coagulation and increased thrombin generation (1). The aim of the study was to examine the effects of melagatran, a direct thrombin inhibitor (DTI), in a rat model of endotoxin-induced sepsis.

Materials and Methods: Lipopolysaccharide (LPS; E. Coli O127:B8; intravenous bolus of 6 mg/kg), or isotonic saline, was administered in thiobutabarbital anaesthetised Sprague-Dawley rats weighing 250 g. The three study groups (sham-saline, n = 10; LPS-saline, n = 11; and LPS-melagatran, n = 12), were given melagatran, or isotonic saline, intravenously immediately before (0.75 μmol/kg) and during 4 h after (0.75 μmol/kg/h) LPS, and mean arterial pressure (MAP), and glomerular filtration rate (GFR) were followed. At 4 h after LPS, plasma levels of aspartate aminotransferase (ASAT), alanine aminotransferase (ALAT), bilirubin and tumour necrosis factor α (TNFα) were analysed. Statistical testing was by a one-way ANOVA.

Results and Discussions:

	Sham-Saline (n = 10)	LPS-Saline (n = 11)	LPS-Melagatran (n = 12)
MAP (mmHg)	130 ± 3	116 ± 4*	106 ± 2*
GFR (mL/min/g KW)	1.2 ± 0.01	0.7 ± 0.1*	0.7 ± 0.1*
P-ASAT (μkat/L)	3.1 ± 0.5	5.7 ± 1.0*	3.9 ± 0.4*†
P-ALAT (μkat/L)	1.2 ± 0.1	1.5 ± 0.1*	1.3 ± 0.1*†
P-bilirubin (μmol/L)	10.1 ± 0.4	19.5 ± 2.4*	11.1 ± 0.6†
P-TNFα(pg/mL)	67 ± 10	476 ± 59*	325 ± 50*†

Data are at 4 h after LPS. KW denotes kidney weight. Values are mean ± SEM. *p $<$ 0.05 versus sham. †p $<$ 0.05 between LPS-groups.

Conclusion(s): The DTI melagatran ameliorated liver dysfunction and decreased systemic levels of the pro-inflammatory cytokine TNFα, in rats with endotoxaemia. Thrombin inhibition seems to have beneficial effects in sepsis.

Reference:

1 Pawlinski R, Mackman N. *Crit Care Med* 2004;32:S293–297.

A-308

Recombinant activated factor VII and hypothermia (rFVIIa) in an experimental model of bleeding and arterial thrombosis: a double-blind study

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Background and Goal of Study: Recombinant activated factor VII (rFVIIa) is increasingly used to secure haemostasis in haemorrhagic situations in trauma and surgical patients. Hypothermia is often observed in these clinical settings. We have compared the effects of hypothermia on rFVIIa efficacy in an experimental model of bleeding and arterial thrombosis.

Materials and Methods: 69 New-Zealand rabbits were anaesthetised, ventilated and monitored for blood pressure, temperature and carotid flow. The Folts model was used: sequentially an injury and a stenosis were carried out on the carotid artery, inducing thrombosis with cyclic flow reductions (CFR) recorded over a 20-min period. Afterwards, animals were randomised into 4 groups: the first 2 groups received placebo, one group was normothermic (control group, n = 18), the other one hypothermic (34°C, n = 16). The 2 other groups received 150 μg/kg of rFVIIa, one was normothermic (n = 18), the last one hypothermic (34°C, n = 18). Then CFR were recorded. At the end of the experiment, an hepato-splenic section was done and the amount of wound bleeding (WB) was recorded. After each period, blood samples (Haemoglobin, platelet count, aPTT, PT, fibrinogen) and ear immersion bleeding time (BT) were performed.

Results and Discussion: Hypothermia increased blood loss (WB) and BT. In hypothermic animals, rFVIIa decreased WB (p = 0.0001), and shortened the prolonged BT (p = 0.0031). In normothermic rabbits, rFVIIa shortened BT but did not modify hepato-splenic bleeding as compared with the control group. Blood loss was not different between the rFVIIa treated groups whatever the temperature. rFVIIa decreased PT and aPTT (p $<$ 0.0001), without modifying platelet count nor fibrinogen. CFR were more frequent in rFVIIa treated groups than in placebo treated groups, whatever the temperature (hypothermia p = 0.0002; normothermia p = 0.035).

Conclusion: Hemostatic efficacy of rFVIIa was maintained, and even increased in hypothermia in this rabbit model. However, rFVIIa use was associated with more thrombotic events.

A-309

Introduction of tranexamic acid in a blood conservation strategy developed for cardiac surgery: economic impact

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Background and Goal of Study: Application of a standardized multidisciplinary transfusion strategy reduced the need for blood transfusion in cardiac surgery patients (1). In this strategy, aprotinin (AP) was used as the antifibrinolytic agent. Tranexamic acid (TA) has few side effects and is less expensive than AP. Therefore use of TA as the antifibrinolytic agent might improve the cost-effectiveness of this multimodal blood conservation strategy.

Materials and Methods: After local ethics committee approval and written informed consent, patients undergoing non-emergent coronary artery bypass or single valve surgery from April 2000 to March 2002 were included. During the first year (April 2000–March 2001), high dose AP (full Hammersmith regimen) was used (control group). During the second year (April 2001–March 2002), TA (10 mg/kg + 1 mg/kg.h) was used as the first choice antifibrinolytic (study group), AP being reserved for very specific indications. Net red blood cell loss was calculated from estimated blood volume and pre and post-operative haematocrit (2). Costs for the different blood sparing techniques and allogeneic blood products were recorded. Data in both groups were compared using unpaired Student t test or Chi-square test where applicable. A p $<$ 0.05 was considered significant (*).

Results and Discussions: (mean ± SD)

	Control group (N = 247)	Study group (N = 190)
Age (years)	65 ± 10	65 ± 11
Sex (M/F (%))	77/23	75/25
Surgical time (min)	233 ± 46	232 ± 47
Aortic clamp (min)	87 ± 20	86 ± 19
Calculated RBC loss (ml)	496 ± 366	532 ± 409
Allogeneic RBC exposure	13.4%	17.9%
Costs for blood sparing techniques (€)	279 ± 310	71 ± 209*
Total costs for blood strategy (€)	330 ± 409	227 ± 293*

Conclusion: In the conditions of our study, the use of TA in the blood conservation strategy was cost-effective.

References:

1 Van der Linden P, et al. *Can J Anesth* 2001; 48:894–901.
2 Samama CM, et al. *Anesth Analg* 2002; 95:287–293.

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A-310

Tranexamic acid reduces blood loss in total knee arthroplasty. A double blind study

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Background and Goal of Study: Total knee arthroplasty (TKA) is a procedure associated with important blood loss. Avoiding blood transfusion and derivates must be a goal in our actual and future practice. The aim of our study was to reduce in 50% postoperative blood loss by the administration of Tranexamic Acid (TA) (1) associated to postoperative blood cell saver.

Materials and Methods: Forty consecutive patients scheduled for unilateral cemented TKA under spinal anesthesia with the use of a tourniquet were double blind randomized to TA or placebo. TA 10 mg/kg was given thirty minutes before tourniquet release and three hours later in the postoperative period, versus equal volume of saline (100 ml) in the control group. At the end of surgery intraarticular drainage for autologous retransfusion was connected. Collected volume was registered until drains were removed 48 h later. Haematologic, haemostatic and creatinine values were recorded preoperatively and 1, 3 hours, 1, 3 and 5 days in the postoperative period. Blood transfusional trigger was 8.5 g/dl. All the patients were operated by the same anesthetic and orthopedic team. Allogenic blood transfusion and adverse effects were also recorded.

Results and Discussions: Groups were comparable in demographic data, preoperative analitics, type of prosthesis and surgery. Total blood loss was significantly lower in the TA group ($n = 20$) compared to control group ($n = 20$) (531.50 $\pm$ 325.38 ml vs. 966 $\pm$ 524.82 ml; $p < 0.003$). In TA group Hb remains stable between days 1–3 (10.08 $\pm$ 1.3 vs 10.3 $\pm$ 1.2 g/dl) (NS) but in control group Hb day 3 is lower than day 1 (10.2 $\pm$ 1.3 vs 9.5 $\pm$ 1.2 g/dl) ($p = 0.004$). 5 patients in control group (25%) and 2 in TA group (10%) had allogenic transfusion (NS). There were no differences in haemostatic parameters. No adverse effects were recorded.

Conclusion(s): TA reduces near 50% total blood loss after TKA. The association with postoperative blood salvage systems may be useful to reduce the need of autologous transfusion.

Reference:

1 Cid J and Lozano M. Transfusion 2005;45:1302–1307.

A-311

The administration of tranexamic acid before and after extracorporeal circulation reduces postoperative bleeding

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Background and Goal of Study: Disorder of the fibrinolytic system is involved in the pathogenesis of excessive? bleeding after heart surgery with extracorporeal circulation (ECC)[1,2]. Our aim was to evaluate the protective effect of tranexamic acid (TA) on postoperative bleeding and transfusion requirements.

Materials and Methods: We performed a randomized, double-blind, placebo-controlled study of 50 patients (27 men 23 women aged 64.5 $\pm$ 1.4 years) admitted to our 24-bed ICU, tertiary university hospital. We performed an intention-to-treat analysis, comparing the TA (2 gr iv pre and post ECC) and control group with respect to 24 hour bleeding, transfusion requirements and the evolution of clinical and biochemical parameters. Statistical analysis was performed using Pearson's χ^2 and Fisher exact test. Student t test was used for independent groups, and the Mann-Whitney test for non-parametric variables. MANOVA was used to study sequential changes and intergroup differences.

Results and Discussions: TA patients had significantly less bleeding (492 $\pm$ 387 ml vs. 1036 $\pm$ 147 ml; p 0.001) and transfusion requirements of RBCs (475 $\pm$ 146 ml vs. 962 $\pm$ 165 ml; p 0.021) and fresh frozen plasma (33 $\pm$ 33 ml vs. 409 $\pm$ 144 ml; p 0.012). The use of TA was associated with lower plasma levels of CPK-NAC (p 0.004), CPK-MB (p 0.039) and D-Dimer ($p < 0.0005$) on ICU admission as well as lower levels of CPK-MB (p 0.042) and D-Dimer ($p < 0.0005$) at 4 hours after ICU admission.

Conclusion(s): The use of TA in heart surgery patients under ECC reduces postoperative bleeding and hospital costs associated with transfusion requirements, morbidity and mechanical ventilation time.

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A-312

Tranexamic acid reduces inflammatory response to extracorporeal circulation

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Background and Goal of Study: In a previous prospective cohort study we found that tranexamic acid (TA), used to control bleeding, significantly reduced the incidence and complications of SIRS post-ECC. Our aim was to confirm the protective role of TA in this inflammatory syndrome.

Materials and Methods: Fifty patients (27 men 23 women) undergoing elective heart surgery were randomized to receive 2 g of TA or saline before and after extracorporeal circulation. We performed an intention-to-treat analysis, comparing the incidence of SIRS in the TA and control group. Statistical analysis was performed using Pearson's χ^2 and Fisher exact test for categorical variables and Student t test for independent groups. MANOVA was used to study sequential changes over time.

Results and Discussions: The incidence of SIRS post-ECC was 17% in TA patients vs 42% in the placebo group (p 0.048). SIRS was associated with vasodilatory shock (53% in patients with SIRS vs. 0% in those without; $p < 0.0005$) and greater transfusion of RBCs (p 0.013). Similarly, SIRS was associated with greater requirement of fresh-frozen plasma (p 0.014) in the first 4 hours post-intervention. We found an association between SIRS and lactic acid levels on terminating ECC (p 0.028) as well as IL-6 levels at 4 hours after intervention (p 0.059).

Conclusion(s): The use of TA in heart surgery with ECC may protect against SIRS. Patients with SIRS presented greater morbidity, transfusion requirements and vasoactive drugs.

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A-313

The effect of low molecular weight heparin (Clexane®) on crystalloid haemodilution induced enhanced coagulation

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Background and Goal of Study: Crystalloid haemodilution enhances coagulation[1]. This was not confirmed in a study using prophylactic low molecular weight heparin (LMWH)[2]. Does pre-operative prophylactic LMWH (Clexane®) abolish or attenuate crystalloid induced hypercoagulation?

Materials and Methods: After Ethics approval and informed consent, 20 young, healthy male volunteers, on no medication affecting coagulation, received either Clexane 40mg or the equivalent volume of Saline subcutaneously on two separate occasions one week apart. The order of the injections was randomized and the investigator was blinded as to which injection had been given. Twelve hours later a blood sample was taken for thromelastography (TEG) analysis and haematocrit. Saline (14 ml/kg) was then infused over thirty minutes whereafter another sample was taken for TEG analysis and haematocrit measurement.

Results and Discussion: There was a significant post-dilutional difference in the alpha angle ($p = 0.002$) and k time ($p = 0.001$) between the two groups. There was a trend towards less shortening of r time in the Clexane group compared to the Saline control ($p = 0.18$). There was no difference in clot strength (MA). The findings suggest that Clexane diminished acceleration of clot formation due to haemodilution. This result strengthens the argument for prophylactic anticoagulation in trauma and other surgical patients where large volumes of crystalloids may be used. (TEG post-dilution between group differences are represented in the table below. *$p < 0.05$.)

		r-time		k-time		a-angle		MA	
Group	Sample	Means	(SD)	Means	(SD)	Means	(SD)	Means	(SD)
Clexane	Pre-dilution	21.06	3.97	12.08	3.18	18.67	4.72	43.01	6.70
	Post-dilution	16.44	4.33	9.84*	2.89	23.07*	9.06	44.69	6.83
Saline	Pre-dilution	19.84	3.51	9.80	1.52	22.17	3.12	44.63	5.57
	Post-dilution	14.74	4.08	7.08*	2.55	30.52*	10.55	48.03	6.50

Conclusion(s): Clexane attenuates crystalloid haemodilution induced hypercoagulation.

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A-314

Antifibrinolytic therapy reduces blood loss and transfusion requirements in total knee arthroplasty

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Background and Goal of Study: Determine if the intraoperative administration of epsilon aminocaproic acid (EACA) contribute to decrease perioperative blood loss and need for blood replacement associated to total knee replacement.
Materials and Methods: 41 patients were enrolled in this randomized, prospective and double-blind study to received EACA or saline solution intraoperative. Blood loss during surgery and in the reanimation unit was recorded, together with the number of units of blood thansfused in hospital. In all patients, a bilateral lower limb Echo Doppler was performed in the day 4–6 of postoperative.
Results and Discussions: The patients in both groups were similar. Mean blood loss for patients receiving EACA was 700 ± 231 significantly less than in patients receiving placebo (1058 ± 380), a 33% reduction. During the hospital stay the treatment group received 0.83 ± 0.98 units of packed red blood cells, significantly less, compared with 1.65 ± 1.02 in placebo group. No abnormal Echo Doppler studies were reported.
Conclusion(s): The intraoperative use of EACA is helpful in decreasing significantly blood loss and transfusion requirements in total knee arthroplasty with no detectable morbidity.
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A-315

Activation markers of haemostasis in patients undergoing radical urogenital surgery

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Background and Goal of Study: Aim of this study is to evaluate variations in coagulative parameters in patients scheduled for radical urological surgery and correlation with postoperative complications and survival prognosis.
Materials and Methods: In forty six urologic cancer patients submitted for radical surgery blood cell, hemoglobin, hematocrit, platelet count, thrombotic molecular markers (antithrombin III, protein C, D-dimer) and coagulation exploring tests (prothrombin time, activated partial thromboplastin time) were determinated at baseline conditions preoperatively, and correlated with occurrence of complications.
Results and Discussions: Preoperative values of fibrinogen and D-dimer were elevated over normal range of 125 mcg/l in 66.7% patients with bladder cancer, in 58.8% of patients with renal cell carcinoma, and in 53.8% of patients submitted for radical prostatectomy. Significant increase of molecular markers was observed in first postoperative day, with most substantial changes of PTT, protein C, AT III. Up to fifth postoperative day elevated activation markers decreased, with exception of postoperatively septic patients (3/45, 6%) in whom D/dimer level ranged from 590–4271 mcg/l, protein C was elevated up to 326 mg/l. Postoperative mortality (3/45, 6%) was associated with advanced tumor stage in bladder cancer patients and occurrence of severe sepsis. Non-survivors had significantly elevated levels of activation markers at baseline.
Conclusion(s): Elevated preoperative values of haemostatic markers demonstrate prothrombotic state in patients with urologic malignancy, and there was correlation of fibrinolytic markers elevation and advanced tumor stage. Further elevation of D-dimer in postoperatively complicated course indicate enhanced activation of coagulation and fibrinolysis. Preoperative significant elevation of thrombotic marker D-dimer could be associated with poor prognosis in urologic cancer patients.

A-316

Management of clopidogrel or ticlopidine drugs in elderly patients with hip fractures: a French survey

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Background and Goal of Study: The number of elderly patients treated with clopidogrel or ticlopidine agents and undergoing a hip surgical procedure increases regularly. The goal of the study was to evaluate the management of such a population among French anaesthetists.
Materials and Methods: Over a 4-month period, a website survey was conducted on hip fracture management for patients treated with antiplatelet drugs amongst anaesthetists in France.
Results and Discussions: There were 213 replies. Anaesthetists worked in private, general, university, or other hospitals in 24%, 53%, 18%, and 5% of cases, respectively. The response given was consensual in 53% of cases. Clopidogrel or ticlopidine was stopped before surgery in 85% of cases, compared to 45% of cases for aspirin. Time between the stop of both antiplatelet drugs and the surgery varied largely (figure 1). During this time, a relay was given in 95% of cases: prophylactic or curative low-molecular-weight heparin (LMWH: 63% and 12%, respectively), flurbiprofen (18%) or other (2%). For the surgery, general and regional anaesthesia were performed in 64% and 36% of cases, respectively. Postoperatively, antiplatelet drugs were reintroduced at day-1 (4%), day-3 (37%), when patient left the hospital (32%) or when LMWH was stopped (27%).
Conclusion(s): This survey highlights the inhomogeneous practice of French anaesthetists concerning the management of elderly patients treated with antiplatelet agents and undergoing hip surgical fracture. A harmonization of our practice is mandatory. Thus, guidelines from our societies become urgent.

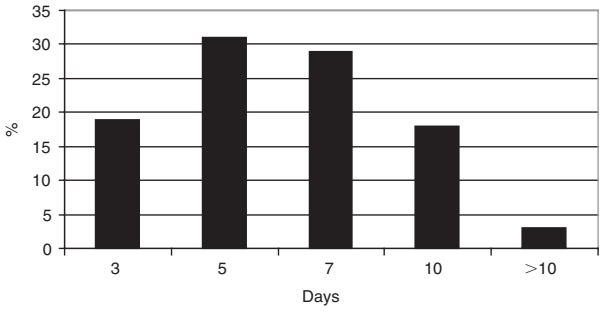

Figure 1. Time in days between antiplatelet stop and surgery.

A-317

Experience with on-site ROTEM® thromboelastometry monitoring of coagulation during liver transplantation

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Introduction: Haemostasis was monitored using the ROTEM® coagulation analyser (a modified thrombo-elastography device) during 20 liver transplants (LT) to study the usefulness of this new coagulation monitor.
Methods: Arterial blood samples were collected at incision, 15 min after graft revascularisation, and at any time if clinically indicated. For each sample, usual laboratory tests and 2 ROTEM® analysis were performed, one in the operating room (OR) and one in the central haematology laboratory. The assessment between the 2 ROTEM® devices was based on the intraclass correlation coefficient (ICC) and his 95% CI. ROTEM® values were compared with laboratory tests (PT, aPTT, fibrinogen and platelet count) results. The sensitivity and specificity of ROTEM® results to predict conventional laboratory values indicating therapy in case of coagulopathic bleeding were calculated.
Results: 30 OR and lab ROTEM values were compared and concordance between the 2 ROTEM® analyser was satisfactory with all ICCs > 0.80. 72 simultaneous ROTEM and laboratory data were obtained in 20 LT cases. Significant correlations were found between A15-FIBTEM and fibrinogen, CFT-EXTEM and PT, and A15-INTEM and platelet count (figures). The sensitivity and specificity of ROTEM® values to predict conventional laboratory values indicating therapy in case of coagulopathic bleeding are shown on the table.

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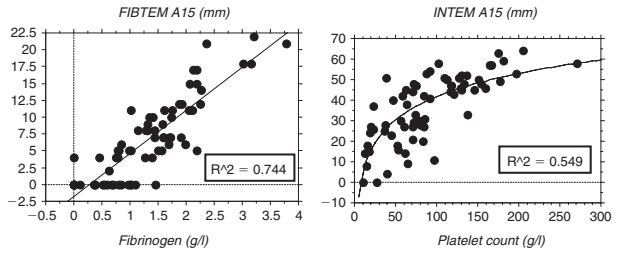

	Sensitivity	Specificity
CFT EXTEM > 159 sec/PT ratio > 1.8	0.87	0.79
A15 INTEM < 40 mm/Platelet count < 50 g/l	0.94	0.70
A15 FIBTEM < 7 mm/Fibrinogen < 1 g/l	1	0.72

Conclusion: In this series of 20 LT with severe coagulopathy, the ROTEM® analyser provided rapid informations which are closely related to conventional laboratory tests.

A-318

Oxygenation parameters during moderate and severe acute normovolemic hemodilution

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Background and Goal of Study: To investigate changes in oxygenation parameters during moderate and severe acute normovolemic hemodilution (ANH) during general anesthesia.

Materials and Methods: Fifty patients scheduled for OPCAB were randomized in two equal groups after anesthesia induction. In moderate group ANH was performed up to hemoglobin (HGB) values of 95–105 g/l and in severe group up to HGB values of 75–85 g/l. Oxygenation parameters were measured with thermodilution method before and after ANH.

Results and Discussions: In moderate group ANH significantly increased oxygen delivery (DO_2) (from 326 ± 87 to 391 ± 132 ml min^{-1} m^{-2}, $p < 0.05$), while in severe group ANH significantly decreased DO_2 (from 322 ± 92 to 286 ± 118 ml min^{-1} m^{-2}, $p < 0.05$). After ANH, moderate group had significantly higher DO_2 and mixed venous saturation than severe one (391 ± 132 vs. 286 ± 118 ml min^{-1} m^{-2}, $p < 0.05$ and 81.1 ± 6.2 vs. 71 ± 2%, $p < 0.05$; respectively). Oxygen extraction ratio was significantly higher in severe then in moderate group (29.1 ± 7.1 vs. 21 ± 4%, $p < 0.05$). In comparison with first measurement, there was no statistically difference in the value of oxygen consumption in either, nor between the groups.

Conclusion(s): While moderate ANH during general anesthesia had favorable effect on the oxygenation, severe ANH showed negative effect on oxygen balance.

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A-319

Coagulopathies in patients after open prostatectomy: epidural versus general anesthesia measured by haemoviscoelastography

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Background and Goal of Study: Anesthetic techniques may affect blood coagulability and the subsequent incidence of thromboembolic events or bleedings. This study evaluated the effects of epidural versus general anesthesia on perioperative blood loss and the development of postoperative venous thrombosis in 119 patients undergoing open prostatectomy.

Materials and Methods: In the epidural anaesthesia group (n = 68), haemoviscoelastography (HVG) was performed after crystalloid preloading and during the immediate postanaesthesia course. In the general anaesthesia group (n = 51) HVG was performed before induction and during the immediate postanaesthesia course. HVG were repeated postoperatively at 1.6 and 24 h.

Results and Discussions: Values for all HVG variables (platelet aggregation [Ar], reaction time [r], thrombin formation time [k], maximum amplitude [AM], total clot formation time [T], summary fibrinolytic activity [F] and coagulation index [Kk] in the preanaesthesia period were similar in both groups. Intraoperative blood loss was not significantly different between the epidural and general anesthesia groups. There was no significant difference in measured coagulation variables between both groups, but there were significant differences in postoperative r, T and F variables ($p < 0.05$). In the postanaesthesia period r and T significantly decreased ($p < 0.001$), and Ar and F increased ($p < 0.001$) in general anaesthesia group. The total blood loss after open prostatectomy was correlated ($r = 0.72$; $p < 0.001$) with the prostatic tissue weight. When the tissue weight resected exceeded 35 g, blood loss was in excess of the linear correlation shown with the weight of resected prostatic tissue. 19 (15.9%) patients has significantly increased F (activity) 1 and 6 h postoperatively.

Conclusion: The use of general anaesthesia for open prostatectomy is associated with accelerated hypercoagulability when compared with epidural anaesthesia. Perioperative blood loss in patients undergoing open prostatectomy is not affected by the anaesthetic technique and correlate with mass of resected prostate tissue.

A-320

Validity of activated clotting time (ACT) in vascular surgery

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Background and Goal of Study: After vascular surgery, thrombotic risk is increased [1]. However, regardless of bleeding risk, there is no consensus for anticoagulation in post-operative time. ACT is measured bedside using portable devices with results available within a few minutes; this allows quick adjustments to maintain anticoagulation. The purpose of this study was to evaluate ACT validity in comparison with activated partial thromboplastin time (aPTT).

Materials and Methods: After informed consent, patients who should benefit of heparinization (50 UI/kg) during vascular surgery were included. Patients with coagulation disease were excluded. ACT measurements were performed bedside with Hemochron® Junior Signature system (Gamida), with low range cartridge. aPTT was determined in the hospital laboratory on the same samples Two measure were performed before heparinization (t0) and at the end of surgery in the recovery room (t1). ΔACT (ACTt1 − ACTt0) was evaluated as diagnosis test for excessive anticoagulation, defined by aPTT > 2 times control. ROC curve was performed in order to define the optimal threshold for ΔACT.

Results and Discussion: 103 patients (aged: 66 ± 11 yrs) were included from May 2004 to February 2005. Mean ACT at t0 was 137 ± 30 s and at t1 176 ± 32 s. ROC curve allows to determine a threshold at 34 s. At this point, sensibility was 87% [CI95: 79%–95%], specificity 85% [IC95: 75%–96%], positive predictive value 90% [CI95: 82%–98%] and negative predictive value 81% [CI95: 70%–93%].

Conclusion: ACT measure in vascular surgery appears as a valuable test to detect excessive anticoagulation. It allows a faster management of haemorrhagic or thrombotic risk in post-operative period. The clinical interest of ACT should be now assessed.

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A-321

ROTEM-based algorithm for management of acute haemorrhage and coagulation disorders in trauma patients

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Background: Treatment of bleeding in trauma patients is based on classical coagulation tests and on empiric rules. ROTEM, a modified thrombelastogram, allows rapid detection of hyperfibrinolysis, fibrinogen deficiency, and stability of the clot.

Goal of the Study: Establishing an algorithm using ROTEM parameters to target therapy with specific blood products or antifibrinolytic drugs to respond to causes of bleeding, which cannot be detected with classical coagulation tests.

Methods: From 2000 to 2005, 20,000 ROTEM measurements (trauma and non-trauma patients) were analyzed. Reference values of publications were also screened.

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Results: Prophylactic aprotinin/tranexamic acid administration is indicated if Maximum Clot Firmness (MCF) of EXTEM (ex) < 35 mm on admission. Aprotinin/tranexamic acid is indicated if: Maximum Lysis (ML) > 10% at 30 minutes or > 15% at 60 minutes or if the ratio of Coagulation Time (CT) of APTEM (ap) to EXTEM < 0.75 and if the ratio of the Amplitude at 15 min (A15) is A15-ap/A15-ex > 1.25. The cut-off point for fibrinogen administration is: MCF-ex < 50 mm with a MCF of FIBTEM (fib) < 12 mm. Platelet transfusion is indicated if MCF-ex < 50 mm and MCF-fib > 12 mm. Fresh frozen plasma or cryoprecipitates are given if CT-ex > 80 s or CT of INTEM (in) > 240 s and if CT of HEPTEM (hep) equals CT-in. Protamine is administered if CT-in > 240 s and CT-hep/CT-in < 0.66. Following parameters are needed to indicate treatment with rFVIIa: CT-ex, CT-in, CT-hep, MCF-ex, MCF-fib, ML (30 min), fibrinogen concentration, platelet count, pH.
Discussion: In bleeding trauma patients ROTEM allows the diagnosis of hyperfibrinolysis and a more targeted use of expensive blood products. ROTEM gives additional information to eliminate non-hematological causes for haemorrhage. The algorithm is a step to improve management of bleeding in trauma and needs to be validated by multicenter studies.
Conclusion: Diagnosis and treatment of haemorrhage in trauma, classical coagulation tests should be complemented with the ROTEM-analysis.

A-322

ROTEM-based management for diagnosis and treatment of acute haemorrhage during liver transplantation

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Background and Goal: Bleeding disorders during liver transplantation are diagnosed with coagulation tests and treated on empiric rules. ROTEM, a modified thrombelastogram, allows detection of hyperfibrinolysis, fibrinogen deficiency, and stability of the clot. We established guidelines for targeted treatment of bleeding disorders during liver transplantation.
Methods: From 2000 to 2005, ROTEM measurements (EXTEM = ex, INTEM = in, FIBTEM = fib, APTEM = ap, HEPTEM = hep) of 600 liver transplantations were analyzed on induction, preanhepatic phase, anhepatic phase, immediately and after reperfusion, prior and at the end of surgery and after administration of platelets or factor concentrates. Factor VIIa, VIII and XIII were used in ROTEM-analysis for in vitro testing to predict their clinical effectiveness.
Results and Discussion: Prophylactic administration of aprotinin/tranexamic acid is indicated in case of fulminant liver failure and if MCFex (Maximum Clot Firmness of ex) ⩽ 35 mm at the start of surgery. Antifibrinolytic drugs are indicated in fulminant hyperfibrinolysis with a Clot Lysis Index at 30 min (CLI30) < 50%. Hyperfibrinolysis after reperfusion is self-limiting in 20% of the patients and requires close meshed controls. Administration of fibrinogen in case of diffuse bleeding if: MCFex < 45 mm and MCFfib (Maximum Clot Firmness of fib) < 8 mm and without diffuse bleeding if: MCFex < 35 mm with MCFfib < 8 mm. Transfusion of platelet concentrates if: diffuse bleeding, MCFex < 45 mm with a MCFfib > 8 mm and without diffuse bleeding, if MCFex < 35 mm and MCFfib > 8 mm. Administration of fibrinogen, platelets, prothrombin complex concentrates/fresh frozen plasma if: MCFex < 25 mm and massive diffuse bleeding. Fibrinogen concentrates are given in persistent bleeding with MCFex ⩾ 50 mm and MCFfib ⩾ 12 mm (treat to target: MCFex ≈ 55–60 mm and MCFfib ≈ 16–20 mm). In contrast to the ROTEM, classical coagulation tests do not diagnose hyperfibrinolysis.
Conclusion: During liver transplantation differential diagnosis of bleeding and indications for administration of fibrinogen, platelets, prothrombin complex concentrates and fresh frozen plasma are more precise with the ROTEM.

A-323

Difference between MCF-ExTEM and MCF-FibTEM (ROTEM) and platelet activity after cardiopulmonary bypass

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Background: Cardiopulmonary bypass (CPB) modifies platelets in the postbypass period. ROTEM, a modified thromboelastogram is not routinely used to measure platelet activity after CPB.
Goal of the Study: To investigate if there is a difference between MCF-ExTEM (MCFex) and MCF-FibTEM (MCFfib) and whether there is a relation to platelet counts after CPB.
Methods: 22 patients for CPB surgery were enrolled in this prospective study. 11 patients (group 1) had received > 500 ml of cell saver blood and 10 patients (group 2) had < 500 ml of cell saver blood retransfused. On induction and in the postbypass period after administration of protamin we measured: ExTEM and FibTEM parameters with the ROTEM and blood count. Data were analysed with ANOVA.
Results: One patient was excluded because of haemodynamic instability. We obtained 21 sets of measurements. Analysis of ExTEM (ex) parameters (Clot Formation Time CFT, alpha angle and Maximum Clot Firmness MCF) showed a significant difference ($p < 0.01$) between groups after CPB but no difference was observed with: FibTEM (fib), CTex (Coagulation Time of ExTEM). By calculating [MCFex – MCFfib] a significant difference (40 mm vs 45 mm; $p = 0.008$) was found between groups after CPB and also observed between platelet counts in both groups (blood loss > 500 ml: $75 \times 10^3/\mu L$ vs blood loss < 500 ml: $135 \times 10^3/\mu L$; $p = 0.007$). Platelet counts correlated highly with [MCFex – MCFfib] ($r = 0.721$; $p < 0.001$).
Discussion: After CPB, fibrinogen activity of MCFex is the same as in MCFfib and the difference [MCFex – MCFfib] relates to the platelet count and blood loss. Currently platelet transfusion after bypass is based on empiric rules. However, [MCFex – MCFfib] could be used to determine the transfusion threshold for platelets after CPB.
Conclusion: [MCFex – MCFfib] after CPB is in relation to blood loss into the cell saver and to platelet count after CPB.

A-324

Prevalence and perioperative management of knee arthroplasty patients taking aspirin

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Background and Goal of Study: The use of aspirin (A) in primary health care is increasing. Cardiovascular (CV), cerebrovascular (CBV) and diabetic (DM) patients are recognised antiplatelets indications. We aimed to assess the preoperative prevalence and perioperative management and complications associated with the use of A.
Materials and Methods: 444 patients undergoing knee arthroplasty were prospectively studied. Prevalence, indications, discontinuation, timing of discontinuation, anaesthetic events and drainage blood were recorded. Anova (Bonferroni) test was applied.
Results: There were 340 (76.6%) women and 104 (23.4%) men. Age 72.4 ± 7.1 years. The ASA status was 2 in 348 (78.3%) and 3 in 96 (21.7%). All patients had regional anaesthesia. Prevalence of aspirin intake was 66 (14.9%). Indications were: CV disease: 28 (42.4%), CBV disease: 12 (18.2%), DM: 4 (6.1%), Others: 22 (33.3%). Discontinuation of A was indicated in 41 (62.1%) patients (timing of discontinuation 5.6 ± 2.02 days). The reasons for no discontinuation were: CV disease: 12 (48%), CBV disease: 4 (16 %) and others 9 (36%). Neither anaesthetic technique modification nor significant complications were recorded. Drainage blood and Haemoglobin (Hb) figures are shown below.

	Drainage blood	Basal Hb	Week Hb
Not taking A	607 ± 331 ml	13.5 ± 1.1	9.7 ± 1.1
A disc > 7 d	750 ± 331 ml	13.9 ± 1.0	9.6 ± 0.8
A disc < 7 d	511 ± 188 ml	13.5 ± 1.1	8.7 ± 0.9*
No A disc	402 ± 243 ml	13.4 ± 1.3	10.3 ± 0.8*

*p < 0.05 disc = discontinuation.

Conclusions: 1) 14.9% of our patients were taking aspirin, but 33,3% of its indications were not evidence-based. 2) In our cases without aspirin discontinuation, regional anesthesia was safe. 3) Paradoxically, patients with no aspirin discontinuation had less bleeding than those with <7 days discontinuation; further studies are needed to clarify these findings.

A-325

How do we transfuse nonagenarians and centenarians with a hip fracture?

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Background and Goal of Study: We present a descriptive, observational and retrospective study to asses our transfusion practise in nonagenarians and centenarians with hip fractures.

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Materials and Methods: The charts of all patients older than 90 years admitted with a hip fracture between January 2001 and December 2004 were reviewed.

We recorded demographic data; comorbid conditions; baseline, preoperative, trigger, postoperative and discharge haemoglobin (Hb) and hematocrite (Htc) levels; delay to surgery; complications; use of red cells and hospital length of stay. A descriptive and a multivariate statistical analyse were performed.

Results and Discussions: 91 patients were included, 72.5% females, 53.8% ASA III and 60.4% with a pertrochanteric fracture. 73.63% had to be transfused about 2.79 units of blood. When comparing the transfused with the non-transfused patients we evidenced significantly lower levels of Hb and Htc on admission, pre-surgery and post-surgery within the first group, whereas similar values were found upon discharge. The prevalence of CHF was significantly higher within the transfused group. The morbidity and mortality rates as well as the hospital length of stay were similar in both groups. Of the 67 transfused patients 69.85% were anaemic on admission, furthermore anaemic patients were transfused a higher number of blood units, and there was a negative linear correlation between the admission Hb and the number of blood units transfused. In the multivariable analyses pre-surgery and post-surgery Htc values along with osteosynthesis by proximal femoral nail were the main variables predictive of transfusion.

Conclusion(s): In view of the high transfusion risk within this sample and the improved functional outcomes associated with higher Hb levels;[1] strategies to raise its values might be promising. Furthermore our findings may provide a rationale for testing alternatives to transfusions within this population.[2] However, a major concern has risen lately about the ethics of applying expensive blood-sparing techniques in a population whose life expectancy is lower than 10 years.[3]

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A-326

Does acute normovolaemic haemodilution reduce red blood cell loss in cardiac surgery patients?

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Background and Goal of Study: Efficacy of acute normovolemic haemodilution (ANH) as a blood conservation technique is related to the reduction of the net red blood cells (RBC) lost during surgery. It remains controversial. This prospective randomized study assessed the effects of profound ANH on the RBC mass lost during cardiac surgery with cardiopulmonary bypass (CPB).

Materials and Methods: After approval by the Ethic committee and informed consent, 40 patients undergoing coronary artery bypass surgery were randomly allocated to a control group or an ANH group. ANH was performed in two steps. First, haemodilution was performed before surgical incision to a target haemoglobin concentration of 10 g/dl. Then, haemodilution was completed at CPB initiation to a target haemoglobin concentration of 7 g/dl. During both steps, 3% modified fluid gelatin was used to maintain normovolaemia. Anaesthesia, surgical techniques and cardioprotective strategies were standardized. The ANH blood stored at room temperature was re-transfused in the inverse order of collection after heparin reversal. In the postoperative period, a strict transfusion strategy was applied (1). Per and postoperative blood losses were measured but also calculated, taking into account the estimated blood volume and the pre and the post-operative haematocrit (2). Data (mean ± SD) were compared between the two groups using an unpaired Student t test and Chi-square, as appropriate. A $p < 0.05$ was considered significant (*).

Results and Discussions: Demographic and surgical variables were not different between groups.

	Control (N = 20)	ANH (N = 20)
Preop Hb (g/dl)	14.2 ± 1.5	14.7 ± 0.8
Postop Hb (g/dl)	9.7 ± 1.2	10.5 ± 1.3
ANH volume (ml)	0	2554 ± 387*
Per-op blood loss (ml)	302 ± 108	344 ± 138
Post-op blood loss (ml)	1040 ± 438	1256 ± 391
Calculated blood loss (ml)	659 ± 207	655 ± 211
Patients transfused	2	1

Conclusion: ANH did not reduce calculated blood loss in patients undergoing cardiac surgery.

Reference:

1 Van der Linden P et al. *Can J Anesth* 2001; 48:894–901.

A-327

Blood management observation in oncology surgical treatment in The Netherlands, a preliminary analysis

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Background and Goal of Study: In cancer patients (pts), surgery is scheduled as soon as possible after diagnosis. Pre-operative (pre-op) optimization of pts can be important because oncological surgery (OS) often results in large blood losses requiring blood transfusions (BTx).

Materials and Methods: Preliminary analysis on first 200 pts (101 male/99 female; age = 66.0 ± 11.3 yrs), from 9 Dutch hospitals, in a prospective, cross-sectional study on blood management in OS.

Results: 21.9 ± 16.8 days (mean ± SD) between decision and day of operation (88.4% ≥ 10 days). Methods used to save blood were hypervolemic hemodilution (HH) (n = 171), erythropoietin treatment (epo) (n = 17), iron treatment (n = 14), per-operative cell saving (n = 13) and stopping anti-coagulation treatment (n = 12). For 23 pts no methods were used to save blood and for 134 pts HH was used only. Pre-op Hb (i.e., within 7 days before operation) was 13.0 ± 1.8 g/dl (n = 133), for pts receiving epo (n = 14) it was 12.2 ± 1.3 g/dl (range 10.3–14.5 g/dl) and for pts without epo (n = 119) it was 13.0 ± 1.8 g/dl (range 8.1–16.5 g/dl). There were no significant differences in pre-op Hb for pts without any blood saving techniques [n = 16; 13.4 ± 2.1 g/dl (range 8.9–16.5)] compared to pts receiving HH only [n = 82; 13.0 ± 1.7 g/dl (range 8.1–16.1); p = 0.264]. Also no significant difference in number of pts transfused < 24 hrs post-op between these two groups (p = 0.471).

In total 60 pts received allogenic BTx. Pre-op Hb for transfused pts was 12.1 ± 1.9 g/dl (n = 39), which was significantly lower than pre-op Hb (13.2 ± 1.6 g/dl) for non-transfused pts (n = 90; p = 0.001).

Conclusion(s): On basis of this preliminary analysis, implementation of blood saving techniques in OS seems to be limited. A higher pre-op Hb seems to result in less allogenic BTx. There is enough time for pre-op Hb-optimilization with epo. HH-alone does not seem to yield significant blood saving. More patient data are needed to conclusively demonstrate a possible advantage of HH and/or epo in OS.

A-328

Influence of genetic factors on postoperative bleeding in heart surgery patients

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Background and Goal of Study: Excesssive postoperative bleeding (>1 L/24 h) and transfusion requirements vary between 10% and 70%. Etiopathology remains unclear, with numerous possible factors involved. We studied the role of certain gene polymorphisms associated with coagulation, fibrinolysis and inflammation.

Materials and Methods: We studied 50 patients (27 men and 23 women, aged 64.5 years, SD 1.4) undergoing elective heart surgery with extracorporeal circulation. Aortocoronary bypass was performed in 25, valve replacement in 17 and both procedures in 6 patients. Data were recorded at baseline, on admission to ICU, at 4 and 24 hours post-intervention. We studied the following gene polymorphisms: insertion/deletion (I/D) at intron 16 of the angiotensin converting enzyme (ACE), G1691A of factor V Leiden; G20210A of factor II; 4G/5G of the plasminogen activating inhibitor (PAI-1); Alu-repeat insertion/deletion (I/D) of the tissular plasminogen activator (tPA) and the first intron of the beta tumoral necrosis factor (TNFβ + 250).

Statistical analysis was performed using Pearson's χ^2, Fisher exact test, univariate analysis of variance, and the Mann-Whitney or Kruskal-Wallis tests for non-parametric variables as appropriate.

Results and Discussions: ACE (p 0.010), TNFβ + 250 (p 0.039) and PAI-1 (p 0.037) were associated with greater bleeding. Homozygous GG (TNFβ + 250) presented higher basal plasmatic levels of IL-6 (p 0.01), greater bleeding at 4 hours post-intervention (p 0.035) and greater plasma requirements (p 0.027). PAI-1 Homozygous 5.5 were associated with lower baseline levels of:- C1-inhibitor (p 0.038), of C7 (p 0.016) and of leptin (p 0.019) on admission to ICU (p 0.000), at 4 (p 0.000) and 24 hours post-intervention (p 0.013). Likewise, on admission to ICU they presented longer TP (p 0.019), lower fibrinogen (p 0.027) and PAI-1 levels (p 0.019) and greater bleeding at 4 (p 0.002) and 24 hours (p 0.016) after intervention.

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Conclusion(s): Excessive bleeding after heart surgery was associated with polymorphism of the ACE, TNFβ + 250 and PAI-1 genes, which may contribute to understanding its pathogenesis.

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A-329

Effect of leukocyte depletion of whole blood on monocytic and lymphocytic cytokine response

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Background and Goal of Study: A variety of studies have suggested that allogenic blood transfusions can induce clinically significant immunosuppression (TRIM) followed by worse postoperative clinical outcome. Leukocyte depletion seems to be an useful approach to prevent TRIM (1). We investigated the influence of leukocyte depleted in contrast to undepleted stored blood on the immune system.

Materials and Methods: Blood samples from five healthy volunteers were mixed with 26 days stored undepleted or leukocyte depleted whole blood in a 1 to 1 mixture ratio and were cultured in the absence or presence of lipopolysaccharide (LPS) or phytohaemagglutinine (PHA). After 24 h of incubation at 37°C and 5% CO_2 atmosphere, supernatants were collected and PHA-stimulated Interleukin-(IL)-2 and gamma-(g)-IFN and LPS-stimulated TNF-(a)-alpha and IL-10 release were measured by means of ELISA.

Results and Discussions: Stored whole blood resulted in a significant TNF-a depression (−61%) and IL-10 induction (+221%) after LPS-stimulation. In the PHA-stimulated samples, g-IFN release was significantly reduced by undepleted whole blood (−100%), while IL-2 (−4%) was not influenced. Transfusion-associated changes of TNF-a and increased IL-10 cytokine release were diminished but not prevented by prestorage leukocyte depletion (IL-2 + 20%, TNF-a − 42%, IL-10 + 110%). Only the suppression of g-IFN release (−50%) was significantly reduced by leukocyte depletion.

Conclusion(s): Stored whole blood has an immunosuppressive effect on LPS- and PHA-stimulated cytokine release. These changes can be diminished but not prevented by leukocyte depletion. T-lymphocytic immune response seems to be more affected by donor leukocytes than monocytic immune response. Therefore we assume that leukocytes can not be the main factor in mediating TRIM.

Reference:

1 Blajchman, et al. Hematology 2005; 10:208–14.

A-330

Is red-blood cell transfusion an usual practice in major surgery? Spanish current practice in blood management

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Background and Goal of Study: To determine the prevalence of anaemia, estimate perioperative blood loss, and investigate transfusion practice and blood-sparing techniques in major elective surgery in Spain.

Materials and Methods: Prospective, observational study conducted in patients scheduled for different elective major surgical procedures in 20 Spanish centres. Enrolment used a randomised system: four patients per day were selected in each centre over a 5-week period. Study variables included: baseline and postoperative (5th day) haemoglobin value, blood losses (assessed by external losses and mathematical calculation from preoperative to postoperative hematocrit) red cell transfusion, and blood-sparing techniques used.

Results and Discussion: Number of patients enrolled: 359. Demographic data (mean ± SD): age 64 ± 14 yrs, BMI 28 ± 5 Kg/m^2, ratio men/women 53/47. Estimated blood losses: 914 ± 532 mL. Mathematically calculated blood losses: 1907 ± 836 mL. Baseline Hb: 13.7 ± 1.6 g/dL; postoperative Hb (5th day): 10.5 ± 1.4 g/dL. Baseline Hb was less than 13 g/dL in 29% of patients. Allogenic blood transfusion was performed in 34.8% of patients. Transfusion trigger was 8.3 ± 1.4 g/dL Hb. Mean blood bag administration was 2.2 ± 1.3. Blood-sparing techniques used included postoperative reinfusion: 12% of patients (most with total knee replacement), autologous blood donation (11%), controlled hypotension (9%), intraoperative collection (8%), preoperative erythropoietin-iron treatment (7.8%), pharmacological agents (7%) and normovolemic haemodilution in 2.8%.

Conclusions: Allogenic blood transfusion is still widely used in elective major surgeries. Preoperative anaemia (Hb < 13 g/dL) was present in 30% of patients. There was a large difference between estimated and calculated blood loss in all surgeries. Blood management methods were widely used in orthopaedic surgery, but less in other types of procedures.

Reference:

Rosencher N et al. *Transfusion.* 2003;43:459–69.

A-331

Preoperative erythropoiesis stimulation in anaemic colorectal cancer patients. Which patients do not respond?

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Background and Goal of Study: Anaemia is a common complication of colorectal cancer patients that increases the risk for transfusion. We have performed a study to determine the effectiveness of preoperative erythropoiesis stimulation in these patients and to determine which patients do not respond (basal Hb level increase < 1 g/dl) to treatment.

Materials and Methods: Descriptive, prospective study. 40 consecutive anaemic patients scheduled for elective colorectal surgery were enrolled in the study. Patients received iron saccharate intravenously 100–200 mg three times a week plus r-HuEPO subcutaneously (600 U/Kg) twice a week for 21 days or until surgery.

Results:

	Responder (n = 26) (Mean ± Std)	Non responder (n = 14) (Mean ± Std)
Age (years)	73.3 ± 12.55	70.3 ± 13.6
Iron serum (mcg/dL)	45.4 ± 13.3	44.23 ± 14.8
Ferritin (ng/mL)	54.2 ± 122.05	84.5 ± 81.67
STS (%)	12.4 ± 10.7	11.5 ± 9.4
Albumin (g/dL)	3.21 ± 0.15	3.00 ± 0.70
Preoperative Hb (g/dL)	9.80 ± 1.05	10.01 ± 1.09
Post-treatment max. Hb (g/dL)	**12.30 ± 1.5***	10.02 ± 1.29*
Treatment duration (days)	11.3 ± 4.7	11.2 ± 2.0
Tumor stage (0–4)	1.87 ± 0.8*	**3.62 ± 0.5***

*$p < 0.05$.

Conclusions: Preoperative erythropoiesis stimulation increases basal Hb in anaemic colorectal cancer patients (65%). Patients presenting high stage tumors do not respond to treatment (35%).

References:

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A-332

Preoperative identification of patients with primary hemostasis deficiencies scheduled for major surgery

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Background and Goal of Study: Routine preoperative coagulation tests fail to accurately identify primary hemostasis deficiencies. Our study aims to develop a cost-effective method that improves preoperative identification of patients with a deficiency in homeostasis that could further require preoperative corrective therapy, in order to minimize intra-and postoperative blood loss and related morbidity, mortality and costs.

Materials and Methods: We conducted over 1 year a prospective, observational study on patients scheduled for major abdominal, orthopedic and neurosurgical surgery. All patients fulfilled preoperatively a "Standard Bleeding Assessment" questionnaire (SBA)[1] and patients with abnormal routine coagulation tests (total platelet count, APTT, PT and INR) were excluded from the study. Patients with positive SBA further underwent platelet function analysis (PFA) with PFA-100® Col/Epi. Intra- and first 24 postoperative hours transfusion requirements were monitored in all patients. Student's t-test was used for statistical analysis and $p < 0.05$ was considered significant.

Results and Discussions: 621 patients were included in the study. 85 (13.68%) patients had positive SBA of which 43 (50.58%) had abnormal PFA test. Transfusion requirements (number of packed red blood cells units) were significantly higher in the latter group of patients (6.45 ± 2.36 U of PRBC, $p = 0.000$) than both the group of patients with normal SBA (2.55 ± 1.01 U)

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and the remaining group of patients with abnormal SBA but normal PFA (2.89 ± 1.22 U). No differences were seen between these two latter groups.

Conclusion(s): Our study shows that patients with normal routine coagulation tests, but increased risk of bleeding can be identified by combining SBA questionnaire with PFA laboratory test. Further studies are needed to evaluate the impact of preoperative corrective therapy on postoperative morbidity, mortality and costs in this group of patients.

Reference:

1 Koscielny J, et al. Clin Appl Thromb Hemost 2004; 10(3): 195–204.

A-333

Effect of blood leukocyte-depletion on postoperative infections after colorectal surgery

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Background and Goal of Study: Several studies suggest that allogenic blood transfusion (ABT) is a major independent risk factor for postoperative infections (PI) and prolonged hospital stay after elective colorectal cancer surgery (1). This effect seems due to the immunomodulation effect of leukocytes (2). Some studies have shown that leukocyte-depletion of erythrocyte may abolish this effect (3). Universal leukocyte-depletion was implemented in our hospital in January 2003. The aim of our study was to compare PI and length of hospital stay after leukocyte-depleted (LD) or non-leukocyte-depleted (nLD) red blood cells (RBC) transfusion.

Materials and Methods: We underwent a retrospective study of patients scheduled for elective colorectal cancer surgery during a four year's period. We divided patients in Group I: patients operated before leukocyte-depletion (2001–2002) and Group II: after leukocyte-depletion implementation (2003–2004). We compared the incidence of PI and length of hospital stay in both groups. Pearson's χ^2 and the Student T test were used for statistical analysis.

Results and Discussion: A total of 1125 patients were studied (group I n = 551 and group II n = 571). Both groups were similar in age and stage of tumoral disease. The global incidence of ABT was of 29.6%. No significant differences in transfusion rates were found between both groups. Table shows the incidence of PI and the length of hospital stay without significant differences between groups.

	Incidence of PI	Hospital stay in days (95%CI)
Group I	78 (14.2%)	17.1 (16–18)
Group II	83 (14.5%)	14.9 (14.4–15.4)

Conclusion: We did not find a reduction in postoperative infections neither in hospital stay in patients undergoing elective colorectal cancer surgery after implementing universal leukocyte-depletion.

References:

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2 Oubiers JGH. Transfusion 1997; 37:126–34.
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A-334

Transfusion requirements and practices in Austrian hospitals: consequences of preoperative anemia

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Background and Goal of Study: Pre-existing anemia may increase not only the risk of anemia but also the need for allogeneic red blood cell (RBC) transfusions (1). The goal of this study was – using the data of the Austrian Benchmark study – to evaluate the incidence of preexisting anemia and RBC transfusions in patients scheduled for elective standard operations in Austria.

Materials and Methods: We selected 18 Austrian hospitals by stratified randomization and investigated four standard surgical procedures: CABG, hemicolectomy (HECO) primary non-cemented total hip replacement (THR) and primary total knee replacement (TKR). Recruiting started in April 2004 and reached a rate of 550 cases per month after a 2-month run-in phase. As of January 2005 3622 consecutive cases were completed. Anemic patients were defined using the cut-off values given by the WHO (♀ 120 g/L; ♂ 130 g/L) (2). Fisher's exact test was performed for statistical analysis.

Results and Discussion: Incidence of preoperative anemia and percentage of transfused anemic patients compared to non-anemic patients is summarized in the table. No appropriate preoperative treatment was performed in patients with anemia (mostly borderline) although scheduled for elective surgery.

	N pts.	Anemic pts.	I	II	p-value
CABG	777	24%	48%	76%	<0.001
HECO	148	30%	11%	58%	<0.001
THR	1401	16%	28%	54%	<0.001
TKR	1296	18%	28%	60%	<0.001
Total	3622	19%	32%	62%	<0.001

I = % of non-anemic pts. transfused with allogeneic RBCs.
II = % of anemic pts. transfused with allogeneic RBCs.

Conclusion: Patients with preoperative anemia (WHO cut-off values) are likely to receive allogenic RBCs transfusions.

Although scheduled for elective surgery those pts. are not adequately treated.

Preoperative treatment of anemia would lead to an almost 50% reduction of allogeneic RBC transfusions.

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A-335

Perioperative coagulation changes following hepatic resection surgery and consequent thoracic epidural risk

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Background and Goals: Thoracic epidurals have been shown to have outcome benefits in major abdominal surgery (1), however concerns regarding perioperative coagulation disturbances following hepatic resection may still limit the use of thoracic epidurals as a form of analgesia in this type of surgery (2). The study aim was to investigate the changes in coagulation variables that occur following hepatic resection in order to characterize coagulation abnormalities that may affect the risks associated with thoracic epidurals in this setting.

Materials and Methods: We studied 21 patients undergoing hepatic resection surgery for isolated hepatic metastases. Platelet counts, International Normalized Ratio (INR) and Activated Partial Thromboplastin Time Ratios (APTT) were measured in all patients preoperatively and up to 10 days postoperatively. Intraoperative reduction of hepatic venous pressure during hepatic resection was carried out. Vitamin K (10 mg) was given to all patients during the operation, and daily after the operation if INR > 1.5.

Results and Discussion: Blood loss in all patients was in the range 100–600 mls. Platelet count remained above 150×10^{-9}/L in all patients perioperatively.

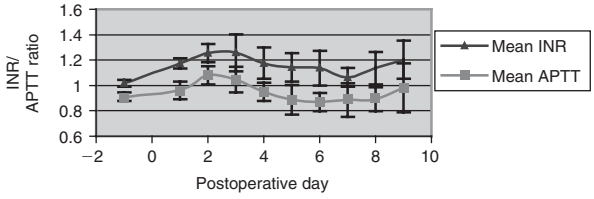

Figure 1. Mean INR and APTT ratio changes after hepatic resection (95% CI also shown).

Conclusion: Thoracic epidural placement for hepatic resection surgery does not appear to be contraindicated on the basis of potential perioperative coagulation changes alone.

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A-336

Efficacy and safety of using automated blood cells salvage in neurooncology

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Background: Cell saving may result in: a) a development of hypocoagulation which may be corrected by transfusion of donor or autologous fresh frozen

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plasma (FFP); b) a tumor cells contamination of reinfusate which may be solved by no using cell saver during tumor excision [1] or by X-ray irradiation of reinfusate [2] or by using leukodepletion filters. We studied this latter method.
Materials and Methods: Automated cell saving during removal of brain and spinal tumors was the main component of transfusion in 218 patients (225 operations) who developed massive blood loss of 0.5–5 TCB. Reinfusion device C.A.T.S 2-02 (Fresenius) was used. Parameters of hemostasis, blood cells count and the problem of tumor contamination of reinfusate were studied. This latter problem was solved by using the leukodepletion filter RC-400 Klev (Pall, Germany).
Results and Discussions: The average intraoperative blood loss was 5.1 l (1.5–19.5 l). The amount of autologous blood transfused was 635 ± 570 ml (180–3500 ml). Data are shown in the table:

Parameters	Bef. oper	Bef. reinf.	After oper	1d. aft. op.
Hb (g/l)	128.5 ± 18	75 ± 21	103.6 ± 19	98.8 ± 18
Ht (%)	35.2 ± 4	22.9 ± 6	29.4 ± 6	30.5 ± 5
RBC ($\times 10^{12}$/l)	4.1 ± 0.5	2.42 ± 0.7	3.3 ± 0.7	3.3 ± 0.51
Plts ($\times 10^{9}$/l)	222.6 ± 68	164.9 ± 57	142.0 ± 54	152.5 ± 53
??	7.4 ± 0.05	7.4 ± 0.07	7.4 ± 0.08	7.4 ± 0.06
PI (%)	86.2 ± 13	60.6 ± 16	69.7 ± 13	77.3 ± 13
PTT (s)	32.8 ± 5.4	39.0 ± 9.7	39.3 ± 8.1	31.3 ± 5.8
Fib-gen. (g/l)	2.9 ± 0.7	2.5 ± 1.0	2.3 ± 0.9	2.5 ± 0.5

Tumor cells were detected in all prefiltration samples, but none were found in postfiltration ones. Intraoperative autotransfusion (IAT) effectively compensated massive intraoperative blood loss on condition of correction of hemostasis disorders by FFP and filtration of reinfusate through leukodepletion filters.
Conclusions: IAT was proved to be safe in patients undergoing neurosurgery and obligatory in case of massive hemorrhage. IAT during neurosurgery may be used alone in the patients requiring transfusions and decrease the need of allogenic blood.
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A-337

Perioperative von Willebrand factor and factor VIII plasma levels in chronic alcoholics

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Background and Goal of Study: Chronic alcoholic patients have an increased risk of postoperative bleeding complications (1). Alcohol intake decreased von Willebrand factor (vWF) levels, whereas alcohol consumption did not show association with factor VIII (FVIII) (2). Our study aimed at examination of perioperative levels of the mentioned parameters in chronic alcoholics undergoing surgery.
Materials and Methods: We studied 27 consecutive patients scheduled for hip or knee replacement (14 chronic alcoholics, 13 non-alcoholics). Blood samples were collected before, immediately after, 2, 4 and 24 hours after surgery. We measured vWF:Ristocetin Cofactor (vWF:RCof) and FVIII using a commercial kit by agglutination-related changes in optical density, and vWF:Collagen Binding Activity (vWF:CBA) using an ELISA-kit. Statistics: Mann-Whitney-U test.
Results: Patients did not differ in basic characteristics. Data (median, 25.–75. quartiles) are shown in table:

	Chronic alcoholics	Non-alcoholics	P
FVIII [U/ml]	2.1 (1.7–2.4)	2.1 (1.5–2.3)	0.74
Change 2 h [%]	4 (−10–24)	54 (20–76)	**0.04**
Change 4 h [%]	20 (−1–38)	38 (−1–91)	0.26
Change 24 h [%]	40 (6–62)	31 (28–98)	0.97
vWF:RCof [U/ml]	1.1 (0.9–2.4)	1.2 (0.9–1.9)	0.52
Change 2 h [%]	24 (−6–59)	100 (10–155)	0.26
Change 4 h [%]	68 (−12–86)	111 (35–154)	0.13
Change 24 h [%]	115 (15–161)	143 (111–267)	0.11
vWF:CBA [U/ml]	1.3 (1.2–2.6)	1.2 (1.0–1.6)	0.21
Change 2 h [%]	0 (−56–38)	54 (3–88)	**0.03**
Change 4 h [%]	9 (−17–70)	44 (−12–70)	0.57
Change 24 h [%]	54 (2–78)	79 (61–129)	0.12

Preoperative values of FVIII, vWF:RCof and vWF:CBA; change from baseline 2, 4 and 24 hours postoperatively.

Conclusion(s): Patients with chronic alcohol misuse did not differ in preoperative values of FVIII, vWF:RCof and vWF:CBA. They have a diminished increase of FVIII and vWF:CBA 2 hours postoperatively, which might account for increased bleeding complications after surgery.
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A-339

Central venous oxygen saturation as a complementary parameter in the decision to transfuse?

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Goal of Study: French Guidelines (FG) for blood transfusion (BT) have been recently proposed by our Intensive Care Societies. They are based on haemoglobin value (Hb) and on clinical state. Apart cardiac and septic patients, the Hb threshold value for BT is 7 g/dL. This study was conducted to evaluate whether a central venous oxygen saturation ($ScvO_2$) < 70% would help as a complementary parameter in the decision to transfuse, as recently suggested by Rivers et al. (N Engl J Med 2001).
Materials and Methods: After general and urologic surgery, 60 hemodynamically stable patients with central venous line, in whom BT was discussed, were included. $ScvO_2$ (%) and Hb (g/dL) were measured before and after BT. Anaesthesiologists were free to transfuse according to FG for BT and/or $ScvO_2$ < 70%. Patients were retrospectively divided into 4 groups according to: 1) $ScvO_2$ < or ⩾70% before BT; and 2) the respect or not to the FG for BT (FG+ or FG−). Statistical analysis was performed by non parametric tests to compare values before and after BT (*: $p < 0.05$). Data are presented as median [CI 95%].
Results and Discussion: Among 60 patients, 7 patients with $ScvO_2$ > 70% were not transfused.

	$ScvO_2$ < 70% (n = 26)		$ScvO_2$ ⩾ 70% (n = 27)	
FG	+ (n = 14)	− (n = 12)	+ (n = 13)	− (n = 14)
Blood units	2 [1.8–2.7]	2 [1.7–2.1]	2 [1.6–2.2]	2 [1.8–2.7]
$ScvO_2$ before BT	58.6 [52.2–62.3]	56.5 [49.0–62.9]	75.3 [68.0–79.9]	75.4 [58.5–86.9]
$ScvO_2$ after BT	69.3* [58.8–74.5]	65.4 [55.5–69.7]	77.4 [71.0–80.8]	75.9 [67.7–80.8]
Hb before BT	7.4 [7.2–7.9]	8.0 [7.6–8.5]	7.6 [7.2–8.2]	7.5 [7.3–8.02]
Hb after BT	9.2* [8.7–9.8]	9.9* [9.4–10.3]	9.7* [9.2–10.6]	10.2* [9.2–10.7]

26 BT do not follow FG for BT (49%) in which 12 (22.6%) had however a $ScvO_2$ < 70%.

Conclusion: $ScvO_2$ might be an interesting additional parameter to complete the FG for BT in surgical patients.

A-340

Timing of preoperative preparation for knee arthroplasty patients

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Background and Goals of Study: In order to perform a high-quality preoperative evaluation and to prevent surgical cancellations, we aimed to establish the adequate timing of preoperative preparation, based on: need for medical consultation, drugs discontinuation and blood saving strategies requirements.
Materials and Methods: Patients scheduled for knee arthroplasty were prospectively studied. An anaesthetist evaluated all patients 4–6 weeks before surgery. Number and reasons for consults, consulted physician, preoperative drugs discontinuation and blood saving strategies were recorded.
Results: 444 patients, 340 (76.6%) women and 104 (23.4%) men. Age 72.4 ± 7.1 years being ASA 2: 348 (78.3%), ASA 3: 96 (21.7%). Number of consults: 14 (3.1%) being ASA 2: 5 (0.9%), ASA 3: 9 (2.0%). Consulted physician: Cardiologist: 8 (1.8%). Haemathologist: 2 (0.4%). General Practicioner: 1 (0.2%). Allergologist: 1 (0.2%). Digestologist: 1 (0.2%). Neurologist: 1 (0.2%). Surgery contraindication: 2 (0.4%). Surgery cancellations: 2 (0.4%).

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Table 1. Patients requiring blood saving strategies.

	ASA 2 (n = 348)	ASA 3 (n = 96)	Total (n = 444)
Epo	37 (10.6%)	10 (10.4%)	47 (10.5%)
Oral Fe	206 (59.1%)	49 (51.1%)	255 (57.4%)
IV Fe	16 (4.5%)	14 (14.6%)	30 (6.7%)
Others	45 (12.8%)	22 (22.8%)	67 (15%)
Total	299 (85.9%)	80 (83.3%)	279 (85.3%)

Time required for blood saving varies between 2–4 weeks.

Table 2. Patients drugs discontinuation.

	ASA 2	ASA 3
Drug discontinuation	65 (5.1%)	49 (18.8%)
– Antiplatelets (4–7 days)	33 (3.7%)	19 (7.4%)
– Cumarinics (3 days)	11 (1.2%)	16 (6.2%)
– Others	14 (1.5%)	8 (3.1%)

Conclusions: Only 3% of our patients needed a consultation, and drugs were discontinued for more than 4 days in 12% patients. Over 85% of patients (ASA status independent) required blood saving strategies. Therefore, to provide a comprehensive preoperative preparation, knee arthroplasty patients should be evaluated 3–4 weeks before surgery.

A-341

Perioperative bleeding effects of SSRI in hip fracture surgery

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Background and Goal of Study: Specific serotonin reuptake inhibitors (SSRI) have an antiplatelet activity through attenuation of serotonin-mediated platelet activation. SSRI are safe and effective for the treatment of recurrent depression in patients with recent myocardial infarction or unstable angina [1]. However, SSRI treatment is a risk factor for haemorrhagic syndromes [2] and for blood transfusion requirement in orthopaedic surgery [3]. The aim of this study was to estimate the risk of abnormal bleeding and blood transfusion in elderly hip-fractured patients under SSRI and to establish the relationship between the concurrent use of aspirin.

Materials and Methods: This retrospective cohort study included all hip fracture not related to traffic accidents or cancer in patients over 70 years old. Statistical analysis was performed using chi-squared test, Mann-Whitney test and Kruskall-Wallis test. Results were expressed in mean ± SD or median ± [IQ 25–75%]. A logistic regression was performed with blood transfusion as dependant value: $P < 0.05$ was considered significant.

Results and Discussions: 175 cases were included. Patients were divided into 4 groups according to the use of SSRI alone (Group 1, n = 32), aspirin alone (Group 2, n = 32) and neither SSRI nor aspirin (Group 3, n = 111). There were no differences in demographic data and surgical procedures. Mean haemoglobin was 11.8 ± 1.6 g/dl at the hospital admission. Preoperative average haemoglobin was lower in the aspirin group: 11.0 ± 1.8 g/dl vs 11.5 ± 1.8 g/dl in the rest of the population, $p < 0.05$. Blood transfusion occurred in 49% patients: 56% in SSRI users, 46% in the aspirin users.

Only ASA III and age were risk factor of increased blood requirement.

	Group 1	Group 2	Group 3	p
Bleeding volume	80 [0–200]	100 [0–320]	135 [0–250]	>0.05
Transfused volume	250 [0–500]	500 [0–500]	0 [0–500]	>0.05

Values are in ml.

Conclusion: Use of SSRI is not associated with an increased risk of bleeding and subsequent need for blood transfusion during hip surgery in elderly patients.

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A-342

Blood transfusion and postoperative infections after colorectal surgery

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Background and Goal of Study: Allogenic blood transfusion (ABT) after colorectal elective surgery has been associated with higher rates of postoperative infections (PI) (1). Transfusion-induced immunosuppression is thought to mediate this effect (2). The aim of our study was to evaluate our transfusion rate in this kind of surgery and its correlation with PI.

Materials and Methods: We retrospectively studied 526 patients scheduled for elective colorectal cancer surgery during two years period. Preoperative anemia (Hgb < 11 g/dL), number of patients transfused, number of red blood cells (RBC) and the incidence of PI were recorded. Patients were stratified by stage of tumoral disease (T1–T4). Student T-test, Pearson's χ^2 test and χ^2 linear tendency test were used for statistical analysis.

Results and Discussion: Of the 526 patients, 79 (15%) had preoperative anemia and 164 (29%) were transfused before, during or after surgery, with a total number of 475 RBC units. Of the patients transfused, 19% received one or two RBC, 6.5% received three or four and 2.7% received more than four RBC units. ABT increased with tumoral stage ($p = 0.02$). Table shows the incidence of patients transfused and PI in correlation with ABT and tumoral stage.

			% Postoperative infections		
Tumoral stage	N	% ABT	ABT	No ABT	p
T1	30	16	40	16	0.2
T2	78	23	11	5	0.3
T3	340	30	23	10	0.003
T4	78	40	40	6.4	0.004
Total	526	29.2	25	9.7	<0.0001

Conclusion(s): Preoperative anemia is present in 15% of patients scheduled for colorectal cancer surgery. 29% of patients were transfused in some moment of their hospital stay. ABT increased with stage of disease; stratifying by tumoral stage, ABT appears as a risk factor for PI in groups of advanced disease.

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A-343

Predictive value of pre-bypass analysis of whole blood aggregometry and conventional laboratory assays in routine cardiac surgery

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Background and Goal of Study: Cardiac surgery causes significant alterations of platelet function. Factors involved are hemodilution, hypothermia, effects of the anticoagulant, anesthetic drugs as well as the bypass circuit itself. Using a new platelet function analyzer we evaluated platelet function during and after elective cardiac surgery.

Methods: Citrated (3.2) and heparinised (50 U/ml) blood was sampled during 6 time points before, during, and after CPB. Whole blood aggregometry was determined using the Multiplate analyzer (Dynabyte, Munich) using activation by using the agonists ADP (6.4 μM), collagen (3.2 μg/ml) and TRAP-6 (thrombin receptor activating peptide, 32 μM). All aggregation results are expressed as area under the aggregation curve (unit: aggregation units * min).

Results: Aggregation analysis in heparinised blood: Pre-bypass aggregation was 688 ± 186 for ADP, 703 ± 229 for collagen and 1047 ± 210 for TRAP. After 30 min of CPB aggregation dropped significantly to 393 ± 215 (ADP), 353 ± 218 (collagen) and 832 ± 356 (TRAP) respectively ($p < 0.05$ vs. pre-bypass, ANOVA). At the end of the bypass a further reduction of the aggregation response was recorded: 347 ± 210 (ADP), 302 ± 215 (collagen) and 702 ± 344 (TRAP). On the first post-operative day an improved platelet aggregation was determined: 430 ± 191 (ADP), 464 ± 272 (collagen), 947 ± 320 (TRAP). Aggregation response to collagen improved in 34 of 41 non-aspirin-treated patients and 9 of 19 aspirin-treated patients. Aggregation response determined in citrated blood was significantly ($p < 0.05$, ANOVA) lower than using heparinised blood for all agonists.

Conclusion: This pilot study revealed systematic alterations of platelet aggregation during and after elective cardiac surgery. Calcium depletion in the citrated blood suppresses impedance aggregation and might therefore disturb the analysis. Currently no platelet function monitoring is employed during most cardiac surgical procedures. The presented technique may allow for an optimization of CPB management and the hemostatic therapy.

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A-344

Comparison of efficacy of preoperative treatment with erythropoietin combining oral iron vs intravenous iron

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Background and Goal of Study: At our institution, patients with anemia unfit for preoperative autologous blood donation (PABD) are typically treated with EPO + iron before surgery. This study was performed to assess differences between the oral and IV formulations of iron in the recovery of hemoglobin (Hb) levels and the consumption of EPO.

Materials and Methods: Patients unfit for PABD who were treated with EPO (40.000 IU once weekly) + iron prior to elective surgery since 2001, were retrospectively reviewed. EPO was started 3 to 4 weeks before surgery in the absence of iron deficiency only. Supplemental iron was given either orally (240 mg/day) or IV (400 mg weekly). Hb levels were monitored weekly thereafter. EPO was discontinued when Hb levels rose over 13.5 g/dl. Changes of Hb levels with time and the number of weekly doses of EPO were compared between the two treatment groups (oral vs IV iron) using ANOVA tests for repeated measures and Student's t-tests, respectively (SPSS 13.0).

Results and Discussions: Overall, 29 patients were treated with EPO (7 with IV iron, 22 with oral iron). Six patients received orthogenetic surgery, 2 thoracoabdominal surgery, and 21 orthopedic surgery. The mean number of doses of EPO was 1.57 for patients treated with IV iron vs 2.14 for patients receiving iron orally ($p = 0.15$). Mean Hb levels at baseline, after 1 and 2 weeks of therapy, preoperatively, and at the time of discharge were 11.6, 12.2, 12.6, 13.1, and 10.9 g/dl, respectively, in the IV iron group vs 12.7, 13.2, 13.7, 13.4, and 11.0 g/dl, respectively, in the oral iron group. Both patient groups experienced statistically significant increments of Hb levels, yet no differences were found between the two iron formulations ($p = 0.83$).

Conclusion(s): Despite the lack of statistically significant differences between the two treatment groups, the number of doses of EPO appeared to be lower in the patient group treated with IV iron compared to oral iron. This observation suggests that IV iron may be more cost-effective than oral iron based on the potential reduction of EPO requirements. Further research is warranted to define the true benefit associated with the IV administration of iron in combination with EPO to anemic patients unfit for PABD.

Neurosciences

A-345

Hunt and Hess 3 and WFNS III are predictive factors for complications in intensive care unit after coiling cerebral aneurysm

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Background and Goal of Study: The aim this study was to determine predictive factors of complications inducing intensive care unit hospitalisation after coiling ruptured or non ruptured cerebral aneurysm.

Materials and Methods: Retrospective study (1998–2002) included patients admitted in ICU for non ruptured cerebral aneurysm or Hunt & Hess (H&S) grades 1 to 3 and WFNS grade I to III for subarachnoid haemorrhage (SAH) after coiling procedure. Group 1: length of stay in ICU < 1 day (n = 83); group 2: length of stay in ICU > 1 day (n = 39). Age, gender, SAH, H&S and WFNS grades, aneurysm localisation and size, numerous or unique aneurysm, length of coiling procedure, number of coil necessary, heparin amount used during the procedure, all complications and deaths were analysed. Uni and multivariate analysis were performed. p value < 0.05 was considered significant.

Results and Discussions: In group 1, any neurological complication or death were observed until 1 month after treatment. In group 2, mortality raises 18% in ICU. Per procedure rupture (10%), vasospasm (41%), cerebral ischemia (36%) and hydrocephalus (33%) were observed during the ICU stay (day 1 to 30). SAH diagnostic, H&S grades 3 and WFNS grade III were independently significant for complications after coiling therapy.

	G 1 n = 83	G 2 n = 39	p value	Odds ratio
HAS (%)	54	87	0.0004	5.7 [1.5–22.1]
H&H 3 (%)	6	48	<0.001	14.8 [3.5–62.7]
WFNS III (%)	6	46	<0.001	13.4 [3.2–56.8]

Conclusions: Diagnostic of subarachnoid haemorrhage is an itself predictive complication after coiling aneurysm. Nevertheless Hunt & Hess grades 3 and WFNS grade III seems to be a threshold for predictive factors of morbity and mortality after coiling cerebral aneurysm. These predictive factors could be helpful for screening patients in order to orient them in ICU or medical neurological unit.

A-346

Insulin therapy for strict glycaemic control leads to an increased risk of severe hypoglycaemic events in patients undergoing postoperative neurosurgical intensive care

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Background and Goal of Study: Insulin therapy to maintain strict glycemic control (blood glucose concentration range 80–110 mg/dL) is more effective than standard therapy (range 80–215 mg/dL) in reducing the risk of peripheral polyneuropathy in intensive care patients, and in the subgroup of patients with acute cerebral damage leads to a better rehabilitation outcome but also incurs a higher frequency of severe hypoglycemic events (< 50 mg/dL) (12.5% VS 3.5%) (1). Severe hypoglycemia extends acute cerebral damage. We designed this prospective study to verify whether the frequency of severe hypoglycemia differs in patients undergoing postoperative neurosurgical intensive care receiving strict glycemic control or standard therapy.

Materials and Methods: We prospectively and randomly enrolled 396 patients undergoing postoperative neurosurgical intensive care assigned to receive strict glycemic control or standard therapy (198 in each group). This study sample ensured adequate statistical power to detect a difference equal to or greater than 9% in the frequency of severe hypoglycemic episodes (using alpha and beta values of 0.05 and 0.2). Each hypoglycemic event (<50 mg/dL) was recorded. Assessment of treatment was based on intention-to-treat criteria.

Results and Discussions: No difference was found in the mean duration of postoperative intensive care stay or insulin therapy in the 2 groups (8.1 days vs 7.8 days). Each patient received a mean of 8 glycemic measurements per day. The frequency of severe hypoglycemia was higher in patients randomized to receive strict glycemic control than in those randomized to receive standard therapy (12.7% vs 3.0% $p = 0.04$ by Chi square test).

Conclusion: The significantly higher frequency of severe hypoglycemia in patients undergoing postoperative neurosurgical intensive care, determined with an adequately powered sample size, supports treating patients with acute cerebral damage by targeting a wider glycemia range (80–155 mg/dL) (2).

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A-347

Asymmerty for BIS and suppression ratio (SR) in brain injured patients with unilateral focal frontal mass lesion treated by barbiturate

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Background and Goal of Study: Barbiturate therapy in brain-injured (BI) patients with high intracranial pressure (HICP) is usually monitored by an electroencephalogram (EEG) with burst suppression as a target. Bis-XP monitor allow us to manage sedation with a goal of BIS between 5 to 15 or a suppression ratio SR between 65 to 90 *(Ann fr Anesth Réanim 2004; 23: R189)*. However those value come from an asymmetrical electrode analysis. The goal of this study is to look to EEG's and BIS' symmetry between cerebral hemisphere in a group with frontal mass lesion (FL) and another with diffused lesions (DL).

Materials and Methods: 14 BI patients treated by barbiturate are included: 6 with FL and 8 with DL. Numerical EEG are saved once time a day for an

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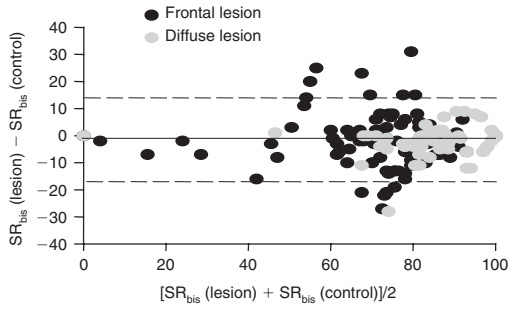
hour. A Neurologist look for 1 minute all 5 minutes the number of burst (B) and the duration of electrical hush (SR_{EEG}). At the same time, value of bis and (SR_{bis}) are saved for each part of the hemisphere (noted "lesion" or "control"). We studied values of BIS and SR by a Bland and Altman representation.

Results and Discussions: Biases observed between both hemisphere are important for bis as for FL: 0.9 (accuracy interval AI [−8; 10]) as for DL (bias: 3.96, AI [−10; 17]. Biases observed for SR_{bis} (figure) are less important (DL: −1.8 [AI: −12; 9]; FL: −2.5 [AI: −19; +17]). For SR_{EEG} biases are less important (DL: 1.5 [AI: −7.5; 10.5]; FL: 0.4 [AI: −7.5; 7]).



Conclusion(s): BI patients treated by barbiturate, we found asymmetric values of BIS and SR both in patients with frontal focal mass lesion or for patient with diffuse lesions. However asymmetry is less important on the EEG. A concordance EEG is necessary for chousing the hemisphere of monitoring with BIS-XP.

A-348

The effect of branched chain amino acids and glutamine supplemented enteral nutrition on nitrogen balance, plasma proteins and septic complications in head trauma patients

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Background and Goal of the Study: Regarding the hypothesis of supplying the hypermetabolic patient who has negative energy and nitrogen balance with extra protein intake, we compared the standardised enteral nutrition (EN) with parenterally (P) branched chain amino acid (BCAA) or glutamine (G) supplemented enteral nutrition in terms of nitrogen balance and nutritional parameters like prealbumine, transferrin and lymphocyte count.

Materials and Methods: 60 patients with sole head trauma (15–75 years; GCS > 4) with no severe organ or metabolic dysfunction and who needed mechanical ventilation were included. All had standardised care for their cerebral pathology and isocaloric-isonitrogeneous enteral diet (30–35 kcal/kg/day-Biosorb).They randomly received three types of diet: Group I, (n = 20): EN; Group II, (n = 20): EN + P-BCAA (33.5 gr/day-TraumAmine 6.9%) and Group III, (n = 20): EN + P-G (20 gr/day-Dipeptiven). Patients who could not reach the targetted calorie requirements in 48 hours or not tolerate EN for more than 24 hours were excluded.

Nitrogen balances were calculated on day 4, 8, 12, 16 and 20. Plasma prealbumine, transferin levels and lymphocyte counts were recorded once a week.

Results: There were no difference in terms of age, Apache II scores, GCS, mean calories and time to reach the targeted calories between groups.

No statistical difference were found between the 4th, 8th, 16th and 20th day nitrogen balances between groups ($p > 0.05$). Neither the 1th, 2th and 3th week prealbumin, transferrin levels and lymphocyte counts were different between groups ($p > 0.05$).

21 day survival rate was highest in group I (88.9% vs 66.7% and 54.4%) although the difference was not significant ($p > 0.05$).

Discussion – Conclusion: We could not show any beneficial effect of BCAA or G supplementation in our patients. Nitrogen balances were improved in the second week in all patients.

Although there are positive results showing improved nutritional parameters with the supplements of BCAA and glutamine, conflicting datas are also present showing the need for further studies.

A-349

Early leukocytosis occurring after subarachnoid hemorrhage could be used as a predictor of later cerebral vasospasm

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Introduction: Cerebral vasospasm occurring after subarachnoid hemorrhage (SAH) remains the main factor contributing to mortality and morbidity. Identification of patients at an increased risk for cerebral vasospasm could allow for more aggressive treatment and improved patient outcomes. As far as today, the blood clot size on admission remains the only factor consistently demonstrated to increase the risk of cerebral vasospasm after SAH. More recently, it was reported (ref) that also leukocytosis may be an independent risk factor for the development of cerebral vasospasm. Therefore, we reviewed all chart of last years ICU admissions for severe subarachnoid hemorrhage.

Patients and Methods: 33 pts were included All pts required intensive neurocritical care management. Clipping or coiling was performed whenever any amelioration in neurological state was observed. All pts remained for at least 10 days at the neuro-ICU. 11 of them had an admission GCS below 8 and the rest of them developed neurological worsening (GCS below 8) during the first hours after bleeding, necessitating admission to the neuro ICU.

For this paper, we analysed all daily neurological, hemodynamic, pulmonary and laboratory data in order to assess them as predictors of vasospasm.

Results: Overall mortality in this group of pts was 30.3% (11 pts). Symptomatic vasospasm occurred in 12 pts (36%). We found 2 independent predictors of vasospasm: Fisher grade 3 SAH and leukocytosis, as measured on day 1. A serum leukocytosis greater than 15 × 10(9)/L on day 1 of OCU admission was independently associated with a 4.2-fold increase in the likelihood of developing cerebral vasospasm. We did not observe any correlation between admission leukocytosis and the presence of fever. Leukocytosis on later days (especially after day 5) showed no relationship anymore with cerebral vasospasm and were closely correlated to fever and to infectious complications.

Conclusion: Leukocytosis was already reported as a possible predictor for the development of cerebral vasospasm. We observed that especially the first leukocyte count on admission to the ICU may have the greatest predictive power and could allow for more aggressive and earlier treatment of cerebral vasospasm.

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A-350

Blood glucose levels reflect cerebral glycerol, but not glucose concentrations, measured by microdialysis during craniotomy

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Background and Goals: Human and animal studies have demonstrated that hyperglycaemia has a detrimental impact on the outcome of ischaemic brain injury. As the effects of blood glucose levels on cerebral metabolism are largely unknown, we examined whether arterial glycaemia would reflect cerebral energy metabolism during craniotomy.

Material and Methods: This prospective, observational study included six patients (age 56 ± 16 y) who underwent craniotomy for procedures with significant risk of cerebral ischaemia (2 aneurysm clippings, 4 lobe retractions during tumour surgery). In 3 patients the iv insulin administration, that had already been initiated to maintain normoglycaemia, was continued. From dural membrane opening to closure, with 10 min intervals, arterial blood glucose levels, together with the glucose, lactate, pyruvate, glycerol and glutamate concentrations in cerebral tissue were determined. The latter was done by inserting a microdialysis catheter with a perfusion rate of 5 μL/min in the ischaemia-prone brain lobe. Due to the non-gaussian distribution of the cerebral glucose and glutamate concentrations, the latter results were log-transformed. Relationships among variables were examined by univariate regression analysis and correlation matrix with Fisher's r to z test. P-values less than 0.05 were considered statistically significant. All data are presented as mean ± SD.

Results: The duration of the microdialysis measurement was 123 ± 26 min. The mean glycaemia for all patients was 150 ± 51 mg/dL (124 ± 52 mg/dL for the patients receiving insulin). There was no significant correlation between glucose levels in the arterial blood and cerebral tissue. However, the cerebral

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glucose levels revealed an inverse relationship with the lactate/pyruvate ratio ($R = -0.53$, $P < 0.001$). Acute major increases in the lactate/pyruvate ratio (>50% change) without significant alterations in cerebral glycaemia only took place during removal of the retractors and in one patient undergoing temporary clipping (3×7 min). For the detection of cerebral cell death and excitotoxicity, glycerol and glutamate, respectively, were significantly correlated with each other ($R = 0.6$, $P < 0.001$). The short elevations of lactate/pyruvate ratio were not associated with significant increases of either glycerol or glutamate. Moreover, blood glucose levels paralleled the cerebral glycerol concentrations ($R = 0.45$, $P < 0.001$).

Conclusion: Arterial blood glucose levels were strongly correlated with cerebral glycerol levels measured during craniotomy, without reflecting the cerebral glucose concentrations. The overall glycaemic control appears to override other potential causes of cerebral glycerol release.

A-351

Incidence of arterial hypoxemia in the peroperative and early postoperative phase after craniotomy

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Introduction: Hypoxic insults may be detrimental during brain surgery, as they my render the brain more vulnerable to ischemia. Not only the peroperative phase is crucial, but also the first postoperative hours should guarantee adequate oxygenation. In the present paper, we want to report on the incidence of hypoxia during and early after elective craniectomy.

Patients and Methods: From 2004 to half 2005, 351 adult pts scheduled for elective brain tumor surgery were included. All patients received the same anesthesia with propofol/sufentanil/rocuronium/O_2 + air. After induction and intubation, ventilation was titrated to end-tidal capnography values of 30 mmHg, FiO_2 was titrated to maintain O_{2S} at above 95%. Arterial blood gas (ABG) analyses were performed every hour during surgery and for the first 4 postoperative hours.

Results: Peroperative ABG analysis revealed the presence of hypoxia (PaO_2 below 90 mmHg) in 17 pts (4%). Half of these hypoxic events were observed on the first ABG measurement and could be reversed in all but one patient. Other hypoxic insults incurred after positioning of the patient or in extremely long-lasting procedures. There was a slight (NS) correlation between peroperative hypoxia and ASA, age and pre-existing pulmonary morbidity. After surgery, all pts were remained sedated and ventilated, and were transferred to the ICU where awakening was allowed after the first half hour. In 64 pts, the first postoperative ABG (within 10 min of ICU admission) revealed hypoxic values, meaning that 18% of postoperative patients were hypoxic, although the same ventilatory settings (as to tidal volume, respiratory rate and FiO_2) were used as during anesthesia.

Conclusion: This study, which aimed to evaluate the incidence of perioperative hypoxia in elective craniectomy pts, revealed that this risk of arterial hypoxemia is fourfold in the early ICU admission compared to during anesthesia. Therefore, more attention should be given to adequate ventilation and monitoring in the early postoperative phase.

A-352

Anatomo-physiological changes in severely brain injury patients

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Background and Goal of Study: A relationship between the Bispectral index (BIS) and the probability of recovering consciousness in patients in a coma state due to severe brain injury has been reported (1). We look for anatomo-physiological changes in these patients using positron emission tomography (PET) and present our first results.

Materials and Methods: Under IRB approval, a prospective study including critically ill brain-injured adult patient who did not regain consciousness after 48 hours of sedation withdrawal, is being conducted. After sedation wears off, patients undergo EEG recording to estimate BIS and EMG activity for 30 minutes. "F-fluordeoxyglucose-PET images of cerebral metabolism" is performed as soon as possible.

Results and Discussions: The preliminary results from two patients are presented. A previously healthy woman with a severe brain injury due to an acute subdural haematoma (HSD) which required emergent surgery was studied 72 h after sedation withdrawal. At that moment she neither opened her eyes nor responded to verbal commands. Patient died in the neurosurgical ward 3 days after her ICU discharge. The second patient had a spontaneous HSD, which also required emergent surgery and decompressive craniotomy. While being in the neurosurgical ward she progressively recovered consciousness being able to be discharged and respond to verbal commands. Table (data in median (min–max)):

	BIS	EMG	SQI
Patient 1	37 (30.5–52.5)	35 (20.9–49.4)	96.2
Patient 2	43 (26.7–72.2)	39 (20.4–63.1)	97.4

PET scan results showed a hypometabolism in basal ganglia and a reduction in the relationship between cortical metabolism and grey substance metabolism, in the patient who died.

Conclusion(s): Differences in brain metabolism as shown in PET scan could be the anatomo-physiological basis of the differences in BIS values in severely brain injured patients after sedation withdrawal.

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1 Fabregas N. Anesthesiology 2004; 101: 43–51.
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A-355

A new electromagnetic surgical navigation system in endoscopic sinus and anterior skull base surgery does not influence EEG-BIS readings

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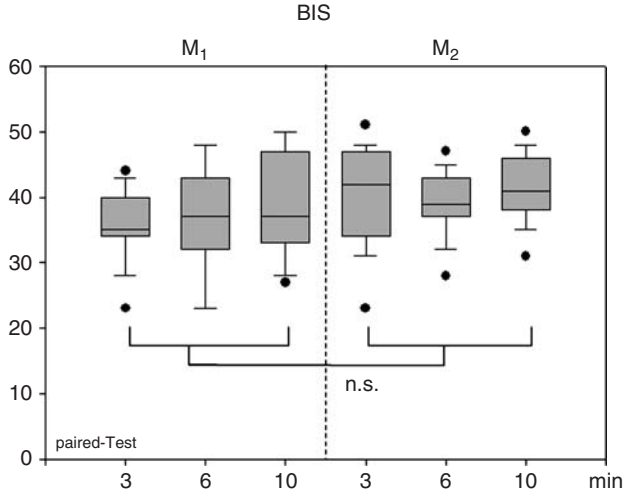
Background and Goal of Study: Computer assisted surgery based on electromagnetic technologies allows real time orientation for the surgeon in paranasal sinus and anterior skull base surgery(1). To prevent awareness during operation, the depth of anaesthesia can be estimated with the EEG bispectral index (BIS). However, BIS values can be influenced by physiological, pharmacological and technical factors(2). The electromagnetic field of surgical navigation systems in Otorhinolaryngology has been described in literature to influence BIS readings(3).

Materials and Methods: We studied whether the BIS readings of an Aspect 2000 BIS monitor were influenced by the electromagnetic field of the image guidance system EN Trak. Seventeen patients with navigation system assisted paranasal sinus and anterior skull base surgery were enrolled in our study. General anaesthesia was performed as total intravenous anaesthesia (propofol/remifentanil) in 10 patients and as balanced anaesthesia (sevofluran/remifentanil) in 7 patients. Bispectral index was recorded before and after activation of the electromagnetic operating system, before starting surgery.

Results: Box plot of bispectral index (BIS) before (M_1) and after (M_2) activation of the electromagnetic operating system before starting surgery ($n = 17$). Note that there is no significant (n.s.) difference.



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Conclusion: In conclusion, the electromagnetic field of the surgical navigation system used in this study in otorhinolaryngology did not appear to influence EEG-BIS readings measured during general anaesthesia.

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2 Bruhn J, Bouillon TW, Shafer SL. *Anesthesiology* 2000; 92: 1485–1487.
3 Hemmerling TM, Desrosiers M. *Anesth Analg* 2003; 96: 1698–1699.

A-356

Effect of single-dose dexamethasone on blood glucose concentration in neurosurgical patients

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Background and Goals: Dexamethasone, a corticosteroid used to treat cerebral edema (1), is known to produce elevations in the blood glucose concentration (2), but the effect of a single intraoperative dose of dexamethasone on the blood glucose concentration is unknown.

Material and Methods: Glucose concentrations in response to either a 10-mg intravenous bolus of dexamethasone or a saline placebo were evaluated in nondiabetic patients undergoing elective craniotomy. Both arterial and venous blood glucose concentrations were obtained immediately before and after treatment and hourly for 4 hours intraoperatively.

Results: The arterial blood glucose concentration in those who received 10 mg dexamethasone ($n = 25$) increased from 97 ± 15 mg/dL (mean $\pm$ SD) to 149 ± 23 mg/dL over the course of the study, compared with a change from 88 ± 11 mg/dL to 103 ± 12 mg/dL in those who received placebo ($n = 25$) ($P < 0.05$ for 4-hour sample vs. baseline for both groups; $P < 0.05$ between groups at 4 hours). Further, venous blood glucose concentrations were highly predictive of arterial glucose values ($R^2 = 0.98$; $P < 0.001$).

Glucose concentration	Dexamethasone (n = 25)		Placebo (n = 25)	
mg/dL	Before	After 4 h	Before	After 4 h
Arterial	97 ± 15	149 ± 23	88 ± 11	103 ± 12
Venous	99 ± 12	156 ± 21	91 ± 13	115 ± 15

Since elevations in the blood glucose concentration should be avoided in the setting of central nervous system ischemia, findings from this investigation suggest that contemplated corticosteroid use should be reviewed for appropriateness of treatment.

Conclusions: If dexamethasone is used, even as a single dose during craniotomy, intraoperative blood glucose concentrations should be carefully monitored and hyperglycemia treated, particularly in patients at risk for glucose-mediated exacerbation of brain injury.

References:

1 Regional cerebral blood flow in peritumoral brain edema during dexamethasone treatment. Neurosurgery 1998 Aug; 43 (2): 235–40.
2 Hyperglycemia in patients administered dexamethasone for craniotomy. Anesth. Analg. 2005 Apr; 100 (4): 1129–33.

A-357

Pre-operative co-morbidities are predictors of death in young but not in elderly patients with intracranial aneurysmal rupture

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Background and Goals: There are no previous studies that showed the effects of aging on mortality predictors in patients who had aneurysmal sub arachnoid hemorrhage (SAH) (1). In the present study, we determined preoperative mortality predictors in younger and elderly individuals who had a repair procedure for a ruptured intracranial aneurysm.

Materials and Methods: After ethical approval, we reviewed the charts of 434 patients who suffered aneurysmal SAH. In-hospital and out-of-hospital events for one month after discharge were recorded. Univariate analysis including Chi-squared and Fisher exact tests were used to evaluate the hypothesis that death is associated with well-defined pre-, intra- and post-operative factors.

Results and Discussions: The mortality rate was 14.87 & 18.78% in patients = 65 & >65 years old respectively. All reviewed patients had aneurysmal repair procedures within 15 days of SAH. There was no significant difference in the WFNS and GCS scores on admission between the younger and elderly groups. Table below shows the p-values of the main pre-operative mortality predictors.

	≤65 yrs old	>65 yrs old
CAD	0.012	0.245
Hypertension	0.0001	0.317
Abnormal ECG	0.0001	0.419
Dysrrhythmia	0.0001	0.584
Preop seizures	0.006	0.498
WFNS grade	0.0001	0.0001
GCS grade	0.0001	0.0001
Fisher grade	0.003	0.0001

WFNS: World Federation Neurosurgical Societies, GCS: Glasgow Coma Scale. $p < 0.05$ is statistically significant.

Conclusion(s): Interestingly, the results indicate that only in younger patients pre-operative co-existing diseases can predict mortality post aneurysmal SAH requiring a repair procedure. However, initial neurological and radiological findings can predict mortality in both age groups. Therefore, better control of pre-operative co-morbidities might decrease the incidence of death after repair procedures for ruptured intracranial aneurysms in younger compared to elderly patients.

Reference:

1 Neurocritical Care 2005; 2:119–123.

A-358

Aneurismal subarachnoid bleeding outbreak influence on blood oxygenation

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Background and Goal of Study: Respiratory complications are frequent in patients suffering aneurismal subarachnoid bleeding and their intensity has significant influence on patient's outcome (1). The goal of the study is to evaluate the relationship between neurological impairment and blood oxygenation at the moment of admission to hospital.

Materials and Methods: 84 patients (age 51.32 ± 8.73, F:M = 38:46) suffering aneurismal subarachnoid bleeding were assessed for their neurological status and blood oxygenation at the moment of their admission (day 3.28 ± 2.56). Their most common other diseases were hypertension (n = 67, 79.7%) and COPD (n = 17, 20.231%). Hunt and Hess, Fisher, GCS and GOS (14-th day) scales as well as seizure events and massive vomits were assessed. Blood oxygenation was valued through PaO_2. Data are given as mean $\pm$ SD, T-test is used for statistical evaluation and $p < 0.05$ is considered as statistically significant.

Results and Discussion: Decrease of PaO_2 at admission is strongly influenced not only by values of Hunt and Hess or Fisher Scales. In our patients with GCS 12–15 pts, who suffered seizures ($PaO_2 = 65.88 \pm 10.54$, n = 18) or massive vomits ($PaO_2 = 71.44 \pm 11.92$, n = 21), although they did not show significant difference on Hunt and Hess or Fisher scales with others ($PaO_2 = 87.03 \pm 7.15$, n = 30) the difference observed is significant ($p < 0.01$). Patients with GCS less than 12 pts ($PaO_2 = 71.86 \pm 14.22$, n = 15) had significantly decreased PaO_2 ($p < 0.001$). We consider important the observation, that patients have showed $PaO_2 > 80$ mmHg (n = 49), had significantly lower score on Hunt and Hess scale (2.12 ± 1.11 to 1.53 ± 0.74, $p < 0.01$) and significantly higher upon GOS (3.62 ± 1.52 to 2.86 ± 1.61, $p < 0.05$). PaO_2 in patients with COPD showed no statistical significance compared with other patients at admission ($p = 0.19$).

Conclusions: These results suggest that during the early period after the outbreak of aneurismal subarachnoid bleeding, seizures, massive vomits or presence of GCS less than 12 pts exert a strong influence on decreasing the blood oxygenation. Our patients with PaO_2 over 80 mmHg at admission had a significantly better neurological status and better outcome.

Reference:

1 Gruber A, et al: Pulmonary function and radiographic abnormalities related to neurological outcome after aneurismal subarachnoid hemorrhage. **J Neurosurg 88:** 18–37, 1998.

A-359

Recovery of cognitive function after general anesthesia and the value of BIS measurement

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Background and Goal of Study: To study the effect of general anesthesia on postanesthetic cognitive function and the possible correlation of the bispectral index on postoperative cognitive indices.

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Materials and Methods: We performed the Mini Mental State Examination (MMSE) on sixty four elderly patients (29 female, 35 male) undergoing general anesthesia for non orthopedic general surgery, preoperatively and on 1st, 2nd, and 3rd day postoperatively and also the short orientation memory concentration test (SOMCT) on the day of surgery, before induction ($SOMCT_{pre}$) and after complete emergence ($SOMCT_{post}$). We recorded the BIS index intraoperatively, by titrating the anesthetic, so that the range of BIS remained as close as possible between 45 to 60. We calculated the number of events when BIS < 45 ($BIS_{occ<45}$).

Results and Discussions: The MMSE score was significantly reduced on the first and second postoperative days and returned towards normal values on the third postoperative day ($MMSE_{preop} = 27.95 \pm 2.2789$, $MMSE_{1stday} = 26.53 \pm 2.5008$, $p = 0.000$ – $MMSE_{2ndday} = 27.26 \pm 2.8317$, $p = 0.000$ – $MMSE_{3dday} = 27.74 \pm 2.6761$ – $p = 0.122$). The SOMCT score was reduced significantly in the immediate postoperative period ($SOMCT_{pre} = 25.21 \pm 2.9745$ and $SOMCT_{post} = 21.47 \pm 3.7801$ – $p = 0.001$). A significant correlation was found between $BIS_{occ<45}$ and the post anesthesia reduction of SOMCT (Pearson $= 0.454$ $p = 0.000$).

Conclusion(s): General anesthesia invariably produced a reduction of MMSE score on the first postoperative day which remained significant also on the second postoperative day. The SOMCT score was also reduced in the immediate postoperative period after an apparent "adequate" emergence (i.e. Aldrete score 9–10). The main proportion of this decrease was due to deterioration of orientation and immediate memory recall. The number of events when BIS < 45 is strongly correlated to a reduction of SOMCT.

Reference:

1 Liu J, Singh H, White PF. Electroencephalographic bispectral index correlates with intraoperative recall and depth of propofol-induced sedation. Anesth Analg. 1997 Jan;84(1):185–9.

A-360

Closed chest deep hypothermic circulatory arrest for the treatment of giant intracranial aneurisms

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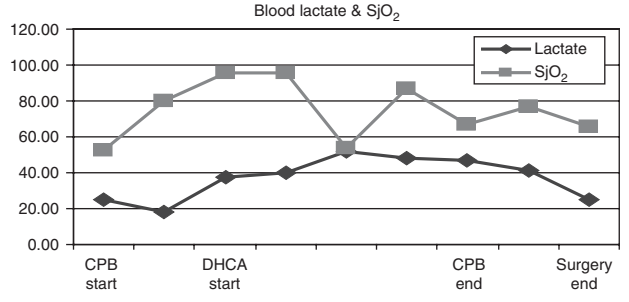
Background and Goal of Study: a few intracranial aneurisms are not treated conventionally. Cause may be site/size, or their impossible clamping. Cardiopulmonary bypass (CPB) and deep hypothermic circulatory arrest (DHCA) allow their exposure and vascular control.

Materials and Methods: From 2000 to 2005 we performed CPB and DHCA to treat six intracranial aneurisms. Femoro-femoral bypass and vacuum technique for venous drainage was used. Anesthesia was conducted by thiopental, cisatracurium, remifentanil, sevoflurane. EEG burst suppression was achieved.

Results and Discussions: mean time on CPB was 190 ± 24 min, and 37 ± 7 min for DHCA; mean inferior temperature was 16.7°C (tympanum) and 18.5°C (bladder). Four patients had good outcome, one patient died six days after for intracranial hypertension, and one patient presented moderate neurological disability. Blood lactates and SjO_2 trends are reported in the figure.

N	Sex	Age	Clinical presentation	Site	Outcome
1	F	56	SAH GCS 14	Left OA	Good
2	M	43	SAH GCS 12	Left MCA	Hemiparesis
3	M	51	Hemianopsia GCS 4	ACoA	Exitus
4	M	49	Hemianopsia GCS 15	Left OA	Good
5	F	54	Hemianopsia GCS 15	ACoA	Good
6	M	53	SAH GCS 12	Right MCA	Good



Conclusion(s): In our small series the morbidity and mortality has been comparable with the previous studies (the patient who died presented on admission GCS = 4 and intracranial hypertension). The groin cannulation was safe.

References:

1 Young WL, Lawton MT, et al. *Anesthesiology* 2002; 96:497–503.
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A-361

The role of controlled anticoagulation with heparin in aneurysmal subarachnoid hemorrhage

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Background and Goal of Study: The rapture of aneurysm in subarachnoid hemorrhage (SAH) results in the activation of coagulation system paralleled with topical release of proinflammatory mediators and proteolytic enzymes [1]. The depletion of the coagulation factors is followed by the disseminated intravascular coagulopathy syndrome. Controlled therapy with heparin might be of value in preventing the reological and coagulation disturbances in SAH [2]. Therefore, the aim of our study was to assess the efficacy of heparin in patients with SAH and cerebral vasospasm.

Materials and Methods: We enrolled 101 patients with aneurismal SAH to the prospective observational study. The patients were assigned either to standard "triple-H" (hypertension, hypervolemia and hemodilution) therapy (3-H, $n = 51$; 45 ± 11 yrs.; 25M/26F) or "triple-H" therapy combined with continuous controlled heparin infusion (4-H, $n = 50$; 43 ± 13 yrs.; 24M/26F). Data were compared using Student's *t*-test paired when appropriate and χ^2 test. $p < 0.05$ was regarded as significant.

Results and Discussions: The severity of SAH as assessed by Hunt-Hess and Fisher scales did not differ between the groups. Transcranial Doppler scan showed an increase of the ischemic threshold by 20% as determined by the peak velocity of basal blood flow in the 4-H group ($p < 0.01$). The incidence of ischemic events and hydrocephaly reduced by 17.2% and 15.6%, respectively, in the 4-H group compared with the 3-H group ($p < 0.05$). Addition of heparin to routine therapy resulted in the decrease of the mortality rate from 27.5 to 10% ($p < 0.05$).

Conclusion: The results of study demonstrated the beneficial effects of anticoagulant therapy in patients with SAH. Further randomized controlled studies required to evaluate the role of "quad-H" approach in this field of acute neurological care.

References:

1 Frankiewicz T. *Neuropharmacology* 2000; 39: 631–642.
2 Romner B, et al. *Acta Neurochir Suppl* 2001; 77: 237–241.

A-362

Glasgow Coma Score < 9, a criterion for tracheal intubation of a patient with a traumatic brain damage?

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Background and Goal of Study: The Glasgow Coma Scale (GCS) was developed as a clinical tool for the longitudinal assessment of the severity of impaired consciousness (1). International guidelines such as the Brain Trauma Foundation guideline uses GCS < 9 as a criterion for tracheal intubation of patients with traumatic brain injury. We hypothesized that there were no evidence for using GCS < 9 as a criterion for tracheal intubation of patients with traumatic brain injury.

Materials and Methods: We searched the electronic databases using relevant search terms for a connection between the numeric GCS and the associated traumatic brain damage and the neuronal mechanisms responsible for intact respiration and pharyngeal and laryngeal reflexes.

Results and Discussions: There were no association between impaired pharyngeal and laryngeal control and a specific GCS value. An association was found for specific respiratory insufficiency e.g. apnoea, irregularity of breathing and low GCS values (GCS < 7). A poor inter-observer agreement of GCS assessment was documented.

Conclusion(s): We found no evidence for using GCS < 9 as a criterion for tracheal intubation of patients with traumatic brain damage. GCS is incorporated

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as an evaluation tool in many guidelines, but should only be used as a supplement in the overall patient assessment. However, GSC has proven valuable in the identification of patients with severe head injuries and may be used as a stratification tool for the initial patient assessment.

Reference:

1 Assessment of Coma and Impaired Consciousness – Practical Scale. Lancet 1974; 2(7872):81–84.

A-363

Predictive value of fractal analysis parameters for outcome following subarachnoid hemorrhage

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Background and Goal of Study: Fractal analysis (FA) provides information on self-similarity and 'roughness' of complex and irregular time series. We applied FA to arterial blood pressure (ABP) and blood flow velocity (FV) and investigated its predictive value following subarachnoid hemorrhage (SAH).

Materials and Methods: In 30 patients with SAH, ABP and middle cerebral artery FV were assessed by radial artery line and transcranial Doppler sonography, respectively. Measurements were performed every other day for 20 minutes. Hurst coefficient (H) was calculated due to the 'dispersional' (H_{Disp}) and 'bridge detrended scaled windowed variance method' (H_{bdSWV}) as described by Eke et al. (2000). Detrended fluctuation analysis (Peng et al., 1995) was performed to determine the scaling exponent α_{DFA}. Finally, the Spearman rank order correlation coefficient r was calculated between these FA parameters and the Glasgow Outcome Score, as assessed one year after SAH.

Results and Discussions: A significant correlation ($p < 0.05$) with outcome was observed in ABP for H_{Disp} ($r = 0.584$), H_{bdSWV} ($r = 0.634$) and α_{DFA} ($r = 0.559$), and in FV for H_{Disp} ($r = 0.489$), H_{bdSWV} ($r = 0.523$) and α_{DFA} ($r = 0.437$). Established outcome predictors such as admission Hunt & Hess grading ($r = -0.623$), WFNS grading ($r = -0.483$) and Glasgow Coma Score ($r = 0.547$) correlated significantly with outcome, as expected.

Conclusion(s): FA parameters such as Hurst coefficient and scaling exponent α_{DFA} are predictive for outcome in SAH. They show a similar or even stronger correlation with outcome as compared to established predictors.

References:

1 Eke A, et al. (2000) Physiological time series: distinguishing fractal noises from motions. Eur J Physiol 439:403–415.

2 Peng CK, et al. (1995) Quantification of scaling exponents and crossover phenomena in nonstationary heartbeat time series. Chaos 5:82–87.

A-364

Neuron-specific enolase fluctuation during carotid endarterectomy

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Background and Goal of Study: Neuron-specific enolase (NSE) has been reported to be a marker of brain damage after stroke in humans (1,2). Aim of this study was to measure NSE during carotid endarterectomy.

Material and Methods: We studied 31 patients who were submitted to carotid endarterectomy under general anaesthesia (22 with shunt, 9 without shunt). The anaesthetic protocol was the same for all patients.

Peripheral blood samples for the measurement of NSE were obtained before surgery, 10 and 30 min after carotid clamping, 10 min post-declamping and 24 hrs after surgery. Patients were assigned to 2 groups according to preoperative neurological symptoms (Group A-no symptoms, n = 19, Group B-symptomatic patients n = 12). Postoperative complications were also recorded. For the statistical analysis of the results, general regression model, repeated measures (SPSS 10.0) was used ($P < 0.05$).

Results: Data (Mean ± SD) are shown in the Table below:

	Preoperatively	10′ after clamping	30′ after clamping	10′ after declamping	24 hrs after surgery
Group A	9.75 ± 3.89	16.39 ± 6.96	14.18 ± 6.18	9.70 ± 6.25	8.73 ± 5.36
Group B	9.40 ± 6.74	11.36 ± 5.60	14.11 ± 5.94	12.59 ± 6.07	10.07 ± 6.24
Total	9.62 ± 5.08	14.43 ± 6.84	14.15 ± 5.99	10.82 ± 6.25	9.25 ± 5.65

No postoperative complications were observed in either group of patients.

Conclusions: No difference in NSE levels between shunt and noshunt patients was observed. NSE levels increase after carotid clamping in both study groups (NSE levels are significantly higher in group A), decrease after declamping and reach the preoperative values 24 hours after surgery.

References:

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A-365

Venous air embolism in patients undergoing posterior cranial fossa surgery in sitting position

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Background and Goal of Study: Use of the sitting position for patients undergoing posterior fossa surgery presents uniqe challenge for the anesthesiologists on account of complications related to its use. Our aim was to evaluate the incidence of one of them, venous air embolism (VAE), as well as its effects on haemodynamics and postoperative morbidity and mortality.

Material and Methods: One hundred and eighty patients undergoing posterior fossa craniectomies performed in sitting position, were prospectively studied during the period 2003–2005. Besides basic monitoring (NIBP, IAP, ECG, SaO_2), capnography was used routinely for detection of VAE. Every sudden and sustained fall from baseline of $ETCO_2$ of more than 5 mmHg (in the absence of sudden hypovolemia) was recorded as an episode of VAE. Hypotension was defined as a decrease of systolic blood pressure >20% of baseline.

Results and Discussion: Capnografy detected VAE in 26% of the patients (the highest incidence resulted from opening and closing of dura). Hypotension occurred in 19.2% of the patients with VAE (4.9% of all patients). During the embolic episode, 12% of the patients developed ventricular arrhythmias (3.1% of all patients). There were no statistically significant differences neither in the incidence of VAE, nor in the frequency of hypotension and ventricular arrhythmias, among different groups (concerning the precise localization and histology of the pathological process) ($p > 0.05$). Postoperative morbidity caused by VAE was noted in 2 patients (one with mild hemiparesis, one with ARDS) (4.2% of patients with detected embolic episodes). During the hospitalization, the patient with ARDS died (2.1% mortality caused by VAE). The preoperative general condition of the patients had no influence on the incidence of VAE and haemodynamic disturbances.

Conclusion(s): The study shows that although venous air emboli occur during posterior fossa surgery in sitting position, they frequently have no serious consequences on the patient outcome. It demonstrates, also, the clinical usefulness of capnography during sitting craniotomy.

References:

1 Porter JC, et al. *Br J Anaesth* 1999;82:117–28.

2 Duke DA, et al. *Neurosurgery* 1998;42:1282–86.

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A-366

Induction and intubation without muscle relaxants under cerebral state index monitoring (CSM)

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Background and Goal of Study: To compare two different techniques of induction of general anaesthesia and intubation without muscle relaxants under Cerebral state index monitoring (CSM).

Materials and Methods: 40 patients ages 21–84 ASA I–II, Mal. I–III were randomly assigned to two groups (Remi1 and Remi2 n = 20). Patients of both groups were continuously monitored by standard monitoring and cerebral state monitoring (CSM). All patients received 1.25–2.5 mg midazolam and 1–1.5 mg/kg lidocaine 2% IV. Patients of Remi1 group received 1 μg/kg

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remifentanil and patients of Remi2 group received 2 μg/Kg remifentanil. Propofol was administered slowly until CSM index (CSI) was decreased to 45.

Recorded parameters were SAP, DAP, HR, CSI, administered amount of propofol and time from induction to intubation. Recordings were performed prior to induction, after remifentanil and propofol administration, immediately after intubation, 1 and 5 minutes after intubation. Reactions to laryngoscopy and intubation (none, inspiration, cough, movement) were also recorded. Intubation conditions were classified as excellent, acceptable and unacceptable.

Statistical analysis was done by one way Anova, t-test, Mann-Withney U test and Wilcoxon test as appropriate (a p value < 0.05 was considered as significant).

Results: Patient demographics were similar for both groups. Group Remi2 technique was found to be superior to group Remi1 technique in terms of better intubation conditions ($p = 0.005$), less intubation time ($204.8 \pm 35''$ versus $266.8 \pm 74''$, $p = 0.003$), reaction to intubation ($p = 0.004$) and less propofol used (1.93 ± 0.46 mg/kg versus 2.31 ± 0.51 mg/kg $p = 0.035$). CSI changes and blood pressure changes throughout the study were similar for both groups ($p > 0.05$) except for the time after intubation when SAP and HR values of the Remi 2 group were significantly lower ($p < 0.05$).

Conclusion(s): CSM index <45 is an indicator of cortical suppres-sion but cannot prevent subcortical reflexes during intubation if efficient amount of suppressive induction agents has not been administered. On the other hand CSM monitoring can protect patients from arousal during intubation.

A-367

Sevoflurane enhances presynaptic GABAergic inhibition in the human spinal cord

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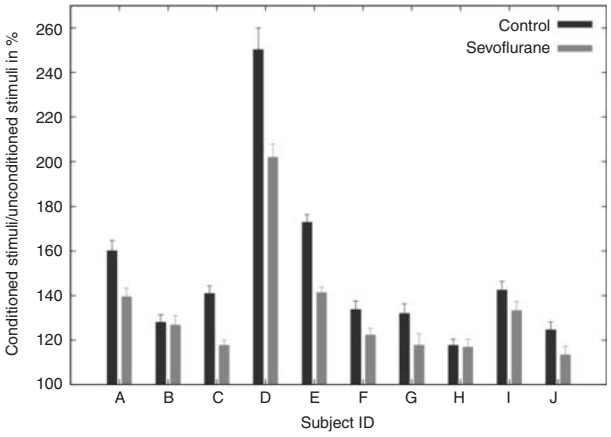
Background and Goal of Study: $GABA_A$ receptors are presumably an important target of anesthetics. However, GABAergic effects have not yet been isolated *in-vivo* in humans. Here we used heteronymous Ia facilitation of the soleus H-reflex from the femoral nerve as a specific pathway involving GABA to demonstrate a presynaptic GABAergic effect of sevoflurane in humans[1].

Materials and Methods: The study was carried out on ten volunteers aged 23–32 years. The soleus H-reflex was evoked by stimulation of the tibial nerve in the popliteal fossa. The stimulation current was adjusted to yield an unconditioned H-reflex of 15% of the maximal muscle response to electric stimulation of the tibial nerve. The soleus H-reflex was conditioned by stimulation Ia afferents from the quadriceps femoris in the femoral triangle. The stimulus was applied 0.3–0.4 ms after the onset of facilitation, to assure a purely monosynaptic EPSP from quadriceps Ia afferents to the soleus motoneuron. We compared the amount of heteronymous H-reflex facilitation under a concentration of 0.8 Vol% sevoflurane with control values obtained before and after the sevoflurane administration.

Results and Discussions: The average H-reflex facilitation was reduced by 11% during sevoflurane administration. This reduction was significant in all but one volunteer.



Conclusion(s): The findings of this study are most likely explained by a specific presynaptic effect of sevoflurane. Strong evidence from neurophysiological studies indicates that this effect is mediated by $GABA_A$ receptors, confirming results from *in-vitro* studies.

Reference:

1 Hultborn et al (1987): J Physiol 389, 729–756.

A-368

Word recognition test after general anesthesia: the influence of previous anesthesia

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Background and Goal of Study: Among other higher brain functions such as consciousness and learning, general anesthesia also affects memory. To determine the effects drugs incite on explicit memory different information retrieval tests are performed. In this study we tried to investigate the recognition of words before and after general anesthesia at the participants which had had one or more anesthesia before this one and those that have not had any.

Materials and Methods: We studied 51 patients, ASA physical status I or II, at median age 50, at least high-school graduates, without head trauma, known psychiatric or memory disorder and taking psychoactive medication. One standardized anesthesia technique, a single surgical procedure and a defined study-test interval were used. We designed our own test which is a combination of story recall test and brief word learning test, both widely used in psychological and psychiatric examination.

Table. Correct word recognition

Anesthesia	Before	After	X^2	p
No (N = 20, Words 100)	70/100	66/100	0.37	0.54
Yes (N = 31, Words 155)	111/155	110/155	0.02	0.90
All	181/255	176/255	0.23	0.62

Results: Data are shown in the Table:

Discussions: A lot of studies indicate that anesthesia and surgery are associated with cognitive impairment lasting = 3 months in 10–14% of elderly patients. We hypothesized that general anesthetics itself can cause prolonged cognitive alterations.

Conclusion(s): From our research it is obvious that previous in addition to this particular anesthesia does not have significant influence on word recognition test.

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1 Ashcraft, Mark H. "Human Memory and Cognition", Second Edition. New York, Harper Collins College Publishers, 1994.
2 Ghoneim MM. *Drugs and Human Memory.* Anesthesiology 2004; 100:987–1002.
3 Heinke W, Koelsch S. "The effects of anesthetics on brain activity and cognitive function". Current Opinion in Anaesthesiology 2005; 18:625–631.

A-369

Venous air embolism in sitting neuroanaesthesia can be prevented by combination of fluid preload, very high PEEP and modified sitting position

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Background and Goal of Study: The sitting position (SP) in posterior fossa surgery offers many advantages. However this approach remains controversial because of possible complications such as potentially fatal venous air embolism (VAE) (1,2). Despite agreed protocols of VAE prophylaxis it has been reported to occur in 9–45% of patients operated in SP. Our goal was to elevate cerebral venous pressure at the level of the surgical incision to above zero by increasing central venous pressure (CVP).

Materials and Methods: We modified the protocol of SP anaesthesia for 26 patients (age 12–70 years, mean 49 years). Exclusion criteria were: COPD, heart failure, ischaemic heart disease. Balanced anaesthesia was applied to every patient: fentanyl, midazolam, vecuronium, sevo (0.75–1.0 MAC), O_2/N_2O. Standard haemodynamic and ventilatory parameters were monitored. A sudden and sustained decrease in end-tidal carbon dioxide tension of >0.5 kPa was presumed to be due to venous air embolism. The "target CVP" was defined as CVP equal to measured distance (in cm)

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between heart right atrial level and the top incision level. This was achieved before surgery by:

1. Intravenous fluid load (Ringer Sol. – 15 ml/kg, 6% Hes – 7 ml/kg) under CVP control.
2. Positioning the patient with legs elevated to heart level ("jack-knife position").
3. Gradually increasing positive end-expiratory pressure (PEEP) to obtain the "target CVP".

Results and Discussions: We did not detect any episodes of VAE in any patient. The "target CVP" was achieved in 25 patients (96%). In 1 case decision was made to change position to prone because CVP was much less than the "target CVP". Target CVP ranged: 20–28 cmH_2O (mean: 22.7). Maximum PEEP applied: 11–20 cmH_2O (mean: 16). Mean arterial pressure (MAP) fell more than 20% in 8 patients (31%) and was easy controlled. Bradycardia <50/min occurred in 6 patients (23%).

Conclusion(s): The combination of fluid load, very high PEEP and "jack-knife position" appear to be safe techniques and can prevent potentially fatal venous air embolism in patients operated in sitting position.

Very high PEEP applied in sitting position anaesthesia had no serious circulatory side effects.

References:

1 Leonard IE, Cunningham AJ. *Br J Anaesth.* 2002; 88(1):1–3.
2 Domaingue CM. *Anaesth Intensive Care.* 2005; 33(3):323–33.

A-370

Increased cerebral blood flow during intra-aortic counterpulsation in cardiac patients

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Background and Goal of Study: As a therapeutic option in reduced left ventricular function, intra-aortic balloon pulsation (IABP) offers cardiac support and can prevent irreversible damage by improving organ perfusion in cardiogenic shock situations in cardiac and non cardiac patients. The effects of intra-aortic balloon pumping (IABP) on cerebral perfusion are still discussed controversially. Goal of the study is the evaluation of a possible effect of IABP on cerebral blood flow and cerebral autoregulation response by means of transcranial Doppler-sonography in anesthetized cardiac surgery patients.

Materials and Methods: After approval by the local ethic committee, in 11 anesthetized and ventilated patients receiving IABP support following coronary bypass grafting, blood flow velocities in the middle cerebral artery (MCA) were assessed by transcranial Doppler-sonography (Multidop P, DWL, Germany). Systemic haemodynamics (MAP, CO, CVP) and blood gases were monitored. In each patient, measurements were performed at different IABP augmentation settings (without support, assist ratio 1 : 1, 1 : 2 and 1 : 3. Additionally hyper- and hypoventilation maneuvres were performed to investigate the cerebral autoregulation response.

Results and Discussions: In 11 patients (age 61 ± 10a, weight 82 ± 14 kg) with decreased left ventricular pump performance (ejection fraction 31 ± 16%) balloon pumping caused an averaged increase of blood flow in the MCA by +18% with general hemodynamic parameters within physiologic range. Mean flow velocity in the middle cerebral artery significantly increased from 49 ± 14 cm s^{-1} (no IABP support) to 59 ± 14 cm s^{-1} (IABP assist ratio 1 : 1) and a normal autoregulation response was to be determined ($p < 0.05$). We conclude that IABP may play an important role for improving cerebral blood flow. In addition the preserved cerebral autoregulation during IABP is an important safety feature in patients with elevated intracranial pressure and e.g. need for hyperventilation therapy. IABP may be particularly useful in those patients with limited cardiac reserve combined with the need of increased cerebral blood flow following cerebral cell lesion.

A-371

Melatonin reduces the severity of anesthesia-induced apoptotic neurodegeneration in the developing rat brain

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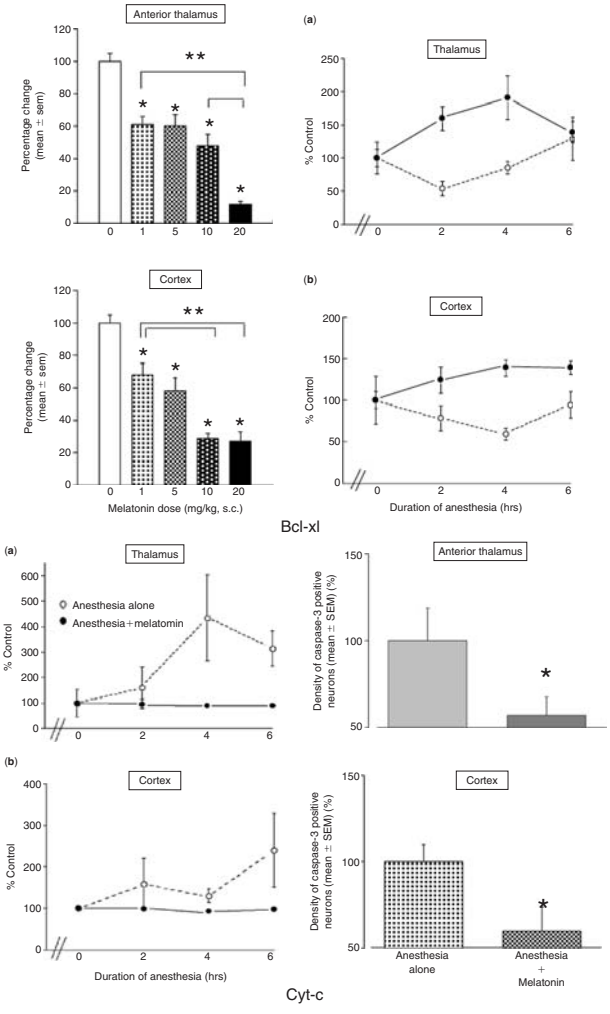
Background and Goal of Study: General anesthetics cause widespread apoptotic neurodegeneration in many regions of the developing rat brain (1). We studied the neuroprotective effect of melatonin against the neurotoxic effect of anesthetic agent.

Materials and Methods: 7-day-old rats were exposed to 2, 4, 6 hrs of a commonly used and highly pro-apoptotic anesthesia cocktail (midazolam, isoflurane, nitrous oxide) in combination with the escalating doses of melatonin (from 1 to 20 mg/kg.s.c). We performed histopathological studies (silver staining, caspase staining) and Western blot studies (cytochrome c, bcl-xl).

Results and Discussions:



Conclusion(s): Melatonin-induced neuroprotection was mediated, at least in part, via the inhibition of the intrinsic pathway since melatonin caused an up-regulation of the anti-apoptotic protein, bcl-xl, reduction in anesthesia-induced cytochrome c release into the cytoplasm and a decrease in anesthesia-induced activation of caspase-3, an important step in the activation of DNAses and the formation of the apoptotic bodies.

Reference:

1 Yon JH. *Neuroscience*, in press.

A-372

Age-related different expression patterns of the regulator of G protein signaling RGS9 protein in the rat sensory and motor nervous systems: An immunohistochemical study

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Background: The key role of regulators of G protein signaling (RGS) proteins is modulators and integrators of G protein-coupled receptors (GPCR). As GTPase-activating proteins (GAP), they terminate G protein signaling by accelerating GTP hydrolysis, thus turning off GPCR-mediated signals. RGS9 has two alternative splicing variants. RGS9-1 is expressed in the retina. RGS9-2 is expressed in the brain and especially abundantly in the striatum,

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and is believed to be an essential regulatory component of dopamine and opioid signaling. However, no studies have systematically examined the general expression of RGS9 according to age.
Methods: In this study, we evaluated the expression pattern of RGS9 proteins in the nervous system of three-week and one-year old rats employing immunohistochemistry.
Results: RGS9 is expressed predominantly in caudate-putamen, nucleus accumbens, olfactory tubercle, and several nuclei of brainstem in both groups. It is also expressed abundantly in spinal cord and the dorsal root ganglion. RGS9 expresses differentially between both groups in specific brain areas, especially in caudate-putamen, nucleus accumbens, olfactory tubercle, periaqueductal gray, thalamic nuclei, and locus coeruleus.
Conclusions: These data suggest that RGS9 is differentially expressed in specific central nervous areas according to age. Such differential expression may play an important role in neuronal function, such as dopamine and opioid signaling.

A-373

Nitric oxide and AT_1–AT_2 receptors influence the pressor effect of angiotensin II

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Background and Goals: Central injection of angiotensin II (ANG II) increases arterial pressure. Nitric oxide (NO) influences ANGII pressor effects. NO, AT_1 and AT_2 receptors on pressor effect of ANGII were studied in awake and anesthetized rats.
Materials and Methods: Losartan, PD123349, FK 409 (NO donor), L-NAME and 7-nitroindazol (7NI) (NO synthase inhibitor) were injected into lateral ventricle (LV) prior to ANGII. Holtzman rats 200–250 g were anesthetized with zoletil 50 mg/Kg (tiletamine chloridrate 125 mg and zolazepan chloridrate 125 mg), implanted with catheter into femoral artery and stainless steel cannula implanted into LV.
Results and Discussion: *Rats awakes:* ANGII increased mean arterial pressure (MAP) 7-NIT potentiated this effect. L-NAME also potentiated the pressor effect of ANGII but with a higher intensity than 7-NIT. FK 409 inhibited the pressor effect of ANGII. Losartan decreased the pressor effect of ANGII. The PD 123319 also decreased the pressor effects of ANGII but with a less intensity than losartan. Losartan + FK 409 blocked the central pressor effect of ANGII.

Rats anesthetized with zoletil (50 mg/Kg) received the same treatments of Exp. 1. No alteration was observed showing the importance of anesthesia in this experimental animal model.
Conclusion: The central mechanism of ANGII in the regulation of MAP is strongly influenced by NO, AT_1 and AT_2 receptor. The anesthesia with Zoletil blocked this mechanism.

A-374

Developmental neurodegeneration – an evaluation in nearly pure neuronal culture

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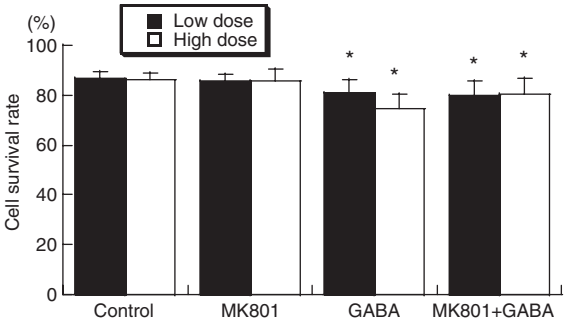
Background and Goal of Study: It has been reported that some anesthetics such as isoflurane induced neurodegeneration in the developing rodent brain by inducing apoptosis through both blocking NMDA receptor and by activating GABA receptor. In this study, we established nearly pure neuronal culture and evaluated whether neurodegeneration occurred in neurons themselves by manipulating these receptors.
Materials and Methods: After the institutional approval, neurons were collected from 18 days embryo-fetus rat brains and nearly pure neurons (>90%) were obtained in Neurobasal medium. MK801 (NMDA antagonist), GABA, or combination of these drugs were applied for 24 hours after 7, 14 or 21 day-culture. Low (10 microM of MK801 and GABA) or high (100 microM of MK801 and GABA) doses were examined. Cell survival rate was measured by using staining technique with trypan blue. One-way ANOVA was used for statistic analysis of survival rate among control (saline), MK801, GABA and their combination in each low or high dosage, followed by Tukey test.
Results: After 14 day-culture, survival rates in GABA and combination were significant less compared to that in control in either dosage (Fig.). After 7 or 21 day-culture, no significant differences were seen among the drugs.



*: sig. vs control in each dosage

Conclusion: By both blocking NMDA receptor and activating GABA receptor, neuronal death was enhanced after 14-day culture. However, this may be related to mainly GABA activation in this nearly pure neuronal culture. No deterioration of cell survival after 7 or 21 day-culture suggested that there may be time window of neurodegeneration in the immature brain.

A-376

Expression of neuronal nitric oxide synthase (nNOS) on ischemia/reperfusion injury in rat spinal cord

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Background and Goal of Study: The aim of this experimental study was investigated the expression of nNOS followed ischemia/reperfusion injury in the rat spinal cord.
Materials and Methods: Spraque-Dawley rats (250–300 gm) were classified two groups according to experimental methods. Control group (n = 5) underwent sham operation. Experimental group (n = 5) underwent clamping the abdominal aorta just below the left renal artery and the abdominal aorta just above the aortic bifurcation for 20 minutes followed by 20 minutes reperfusion. The spinal cord was obtained 7 days after operation. The expression of nNOS was examined using confocal microscope and Image Analyzer.
Results and Discussion: There is no different expression of nNOS between grey matter and white matter in control group. Experimental group was more strong expression of nNOS comparing to the control group ($p < 0.05$).
Conclusions: In this study, we show that nNOS increases in the rat spinal cord after ischemia/reperfusion injury and these results suggest that overproduction of NO may be a role of progressive nerve cell damage.
Reference:
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A-377

Implication of spinal COX in acute opioid hyperalgesia mechanisms in normal and neuropathic rats

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Background: We previously described a model of acute opioid hyperalgesia (OH) under Sevoflurane anesthesia (MACbar SEVO). (1)

Spinal prostaglandins (PGs) are pronociceptive mediators which contribute to the central plasticity and development of neuropathic pain. (2)

Further spinal PG and COX induction are involved in opioid hyperalgesia and withdrawal. (3)

The study evaluates the role spinal COX in acute OH development under normal (C) and neuropathic (NP) conditions.
Material and Methods: In adult male Wistar rats (n = 6 per group), MACbar SEVO was determined by tail clamp stimulus (1) prior and during a low dose SUF infusion (0.005 μg/kg/h) in both C and NP rats (3 months after partial ligation of sciatic nerve). Intrathecal (IT) pretreatment with saline or non selective COX inhibitor ketorolac (KETO 50 μg) was administered before MACbar SEVO determinations.

Results are expressed as MACbar SEVO (%, mean ± SD).

Statistics used paired and non paired t-test.

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Results:

C group	SEVO (%)	SEVO + SUF (%)
IT saline	1.9 ± 0.3	3.1 ± 0.6*
IT keto 50 mcg	0.7 ± 0.65#	1.46 ± 0.99
NP Group		
IT saline	1.7 ± 0.6	1.5 ± 0.8
IT keto 50 mcg	1.6 ± 0.27	1.56 ± 0.5

$P < 0.05$ significant with SEVO (*), with IT saline ( ).

Conclusion: In normal conditions, spinal KETO displays SEVO sparing effect and prevents OH, involving COX system in acute OH expression.

In contrast, NP rats do not display OH nor express analgesia following spinal KETO. Time-changes in spinal COX expression in NP might explain the present results. (3)

References:

1 Docquier, et al. Anest Analg 2003;97:1033–9.
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3 Kang, et al. Anesthesiology 2002;97:1641–4.

A-378

Postoperative pain in the brain – an fMRI study in human volunteers

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Background and Goal of Study: Postoperative, incisional pain is a unique but common form of acute pain. However little is known about cortical activation and the functional significance of distinct brain regions for postoperative incisional pain. In the present study, we examined for the first time the activation of the brain during and after a surgical incision in human volunteers using fMRI.

Materials and Methods: Images were taken on a 3T Philips scanner before, during (0–4.5 min) and after (4.5–10 min, 24–29 min, 44–49 min) an experimental incision (4 mm) in the anterior aspect of the right forearm of 30 volunteers (25.1 ± 5J, right-handed); 14 volunteers (25 ± 4 years) were scanned before and after a sham procedure. Psychophysical tests (non-evoked pain, area of mechanical hyperalgesia) were performed between the scans (block design). During the last fMRI block (49–54 min) mechanical stimulation was performed in 9 volunteers after incision and 7 volunteers after sham procedure.

Results and Discussions: Several brain areas were activated during and after incision but not during and after sham procedure. During incision (0–2 min) there was an exclusive and significant activity of frontal brain regions (BA6 ipsi- (i) and contralateral (c), BA7 and 8i and BA9i and c), areas responsible for the assessment of pain intensity. Starting with 2 min after incision additional activity of the limbic system (BA23c) was observed. Peak brain activity occurred 4.5–10 min after incision (BA6i, 8i, 9i, 23c, 39i, 40i); subsequently neuronal activity decreased. Correlation analysis of brain activation and non-evoked pain during and after incision indicated certain brain areas important for incision-induced non-evoked pain (e.g. Thalamus, BA9i, BA40c, BA45i). Activity of different brain areas (e.g. BA4c, BA9c and Globus pallidum) during mechanical stimulation 44–49 min after incision showed a significant positive correlation to mechanical hyperalgesia in the same volunteers.

Conclusion(s): An incision activates certain brain areas with a very distinct temporal and spatial activation pattern. Correlation analysis with psychophysics revealed an involvement of different brain areas for non-evoked pain and for mechanical hyperalgesia after incision. Thus, different supraspinal mechanisms may be involved in the generation of resting and ambulatory pain after surgery.

A-379

Effects of the application of Erythropoetin (EPO) cerebral recovery after cardiac arrest in rats

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Background and Goal of Study: After transient global cerebral ischaemia, selectively vulnerable brain areas show delayed neuronal degeneration (1). Recent data demonstrated potent neuroprotective effects of the application of growth hormones like Erythropoietin (EPO) after focal cerebral ischaemia (2). In order to assess possible effects of the application of EPO on cerebral recovery after cardiac arrest in rats, the vulnerable hippocampal CA1 sector was investigated.

Materials and Methods: After approval was obtained from the Governmental Animal Care Committee, global cerebral ischaemia was initiated by ventricular fibrillation in 30 male Wistar rats during general anaesthesia. After 6 min, animals were resuscitated by external cardiac massage combined with defibrillation and divided into two groups (EPO vs. placebo; n = 15 per group). Intraperitoneal bolus application of EPO (5000 IE/kg bodyweight) and placebo was performed during three different time points: 5 min pre arrest, as well as 24 h, and 72 h after ischaemia. After 7d of reperfusion coronal brain sections were analyzed by TUNEL- and Nissl-staining. Viable and TUNEL positive neurons were counted in the hippocampal CA1 sector. All experiments were performed in a randomized and blinded setting. For statistical analysis the Kruskal-Wallis, the Wilcoxon and the Chi-square test (mean ± SEM; $p < 0.05$ = significant) were used.

Results and Discussions: In all groups typical delayed neurodegeneration could be found in the hippocampal CA1 sector. However, there was no significant difference in neuronal survival between the groups (viable neurons EPO: 141 ± 28; placebo 139 ± 29). Results from TUNEL staining revealed no differences in the amount of apoptotic cell death between the groups (EPO: 477 ± 48; placebo: 519 ± 47).

Conclusion(s): Despite the well known neuroprotective properties of EPO in ischaemic induced neuronal degeneration, this model could not reveal significant beneficial effects after cardiac arrest in rats.

References:

1 Vogel P et al. (2003) Anesthesiology 99:112–121.
2 Siren AL et al. (2001) Proc Natl Acad Sci USA 98:4044–49.

A-380

The effect of intrathecal bupivacaine with hypothermia on neuronal protection against transient spinal cord ischemia in rats

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Background and Goal of Study: Excitotoxic neuronal injury from ischemia could be reduced by local anesthetics. We investigated neuroprotective effects of intrathecally administered bupivacaine and hypothermia in rat model of transient spinal cord ischemia.

Materials and Methods: A PE-10 intrathecal catheter was implanted into male Sprague-Dawley rats through L4-5 interlaminar space to the level of T12. Thirty six rats that showed no sign of neurologic deficit were randomly assigned to one of four groups. Normothermia and hypothermia groups were administered 15 μl of normal saline, and 15 μl 0.5% bupivacaine for bupivacaine and bupivacaine-hypothermia groups via intrathecal catheter. Transient spinal cord ischemia was induced by inflation of a 2F Forgaty catheter placed into aortic arch (distal to the right innominate artery) through left common carotid artery for 12 minutes under isoflurane anesthesia. During ischemia, rectal temperature was maintained to 37.0 ± 0.5°C for normothermia and bupivacaine groups, 34.5 ± 0.5°C for hypothermia and bupivacaine-hypothermia groups. Motor and sensory deficit score were assessed 2 and 24 hour after reperfusion. Lumbar spinal cords were harvested for histopathology, and for immunoreactivity of heat shock protein 70 (HSP70).

Results and Discussions: The motor deficit score and sensory deficit score in normothermia and bupivacaine group was higher than hypothermia group ($P < 0.05$) and bupivacaine-hypothermia ($P < 0.001$). The histopathologic finding was grossly correlated with neurologic outcome. Neuronal cell death and immunoreactivity of HSP70 was frequently observed in the spinal cords of the normothermia and bupivacaine groups, but not in the hypothermia and bupivacaine-hypothermia groups.

Conclusion(s): These results suggest that intrathecal bupivacaine did not provide neuroprotection during normothermic transient spinal cord ischemia in rats, but it can enhance neuroprotective effects of hypothermia.

Reference:

1 Kanellopoulos GK, Kato H, Hsu CY, Kouchoukos NT. Spinal cord ischemic injury. Development of a new model in the rat. Stroke 1997;28:2532–8.

A-381

Susceptibility of the developing brain to neuronal damage induced by clinical anaesthetic agents

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Background and Goal of Study: Experimental research suggests that clinical anaesthetics may be toxic to the developing brain. NMDA antagonists

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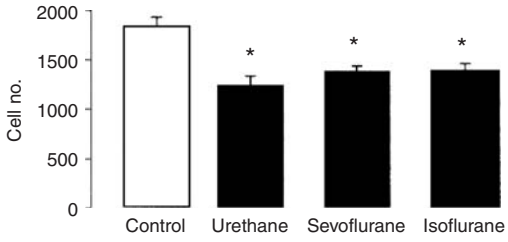
and GABA-memetics, drug classes to which all current anaesthetics belong, produce widespread apoptosis when given as a single dose during synaptogenesis (in humans this corresponds to the last 3 months of pregnancy and first 3 years of life). To date, neither sevoflurane nor isoflurane, clinical anaesthetics in widespread use, have been evaluated in the immature brain.
Materials and Methods: Neonatal rats were given urethane (n = 21), isoflurane (n = 18), sevoflurane (n = 18) or vehicle (n = 22) and allowed to recover for 48 or 96 hours. Brains were then examined for evidence of irreversible neuronal injury: Specifically, in layer II of the piriform cortex, total cell counts and numbers of apoptotic cells were measured.
Results: All agents showed apoptotic neurodegeneration, most severe at 48 hours ($p < 0.05$).



Conclusion: Volatile anaesthetic agents produce neuronal degeneration in the developing rat brain, after a single clinical exposure. The extent of neuronal injury is comparable for sevoflurane and isoflurane at 48 hours, however at 96 hours, there is a possible trend towards limited recovery in the sevoflurane brains. The extent to which this injury may be clinically relevant is unknown.
References:
1 Olney JW. *Trends Pharmacol Sci* 2004; 25:135–139.
2 Jevtovic-Todorovic V. *J Neurosci* 2003; 23:876–882.
3 Thompson KW. *Brain Res Dev Bran Res* 2001; 130:167–171.
4 Olney JW. *Brain Res Dev Brain Res* 2002; 133:115–126.

A-382

Long-term evaluation of cerebral inflammatory reaction and neurologic outcome following cardiopulmonary bypass with deep hypothermic circulatory arrest in the rat

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Background and Goals: Cerebral inflammation is discussed as contributing etiologic factor for neurologic deficits following cardiopulmonary bypass (CPB) and deep hypothermic circulatory arrest (DHCA)[1]. This study aimed to elucidate the time course of neurologic outcome associated to inflammatory reactions in the rat brain following CPB and DHCA.
Materials and Methods: With IRB approval, 36 rats were anesthetized, cannulated, connected to CPB, cooled to a rectal temperature of 15–18°C (30 min) and exposed to 45 min of DHCA. Following reinstitution of flow with CPB and rewarming (40 min), animals were weaned from CPB at 35.5°C. Rats were randomly assigned to 1 of 6 groups (n = 6), sacrificed at day 0, 1, 3, 7, 14 or 28 p.o. Neurologic outcome was assessed using standardized functional tests. Cerebral COX2 and pp38 were evaluated by Western Blot.
Results: During the first p.o. days an increase in cerebral COX2 and pp38 is associated with neurologic impairment. Aforementioned parameters were within normal ranges on the remaining days. Neurologic function improved over time with no detectable deficits on p.o. day 28. Data are presented as means ± SEM.

	COX2/β-actin ratio	pp38/p38 ratio	Beam walking (missteps)
Normal range	0.03 – 0.06	0.41 – 1.57	0
0 days	0.04 ± 0.01	1.45 ± 0.02	–
1 day	0.07 ± 0.01	2.10 ± 0.30	50.0 ± 20.0
3 days	0.08 ± 0.02	1.80 ± 0.22	17.0 ± 15.0
7 days	0.08 ± 0.02	1.24 ± 0.26	1.3 ± 0.9
14 days	0.04 ± 0.00	1.36 ± 0.10	1.3 ± 0.6
28 days	0.05 ± 0.01	0.92 ± 0.15	0.0 ± 0.0

Conclusion: An increased pp38/p38 ratio in brain tissue indicates inflammation, while increased numbers of missteps on the beam demonstrate impaired coordination of the respective rat, showing an association of cerebral inflammation and neurologic outcome over 28 days following CPB with DHCA. Further studies are needed for evaluation of the potential beneficial impact of neuro-protective strategies on neurologic outcome parameters.
Reference:
1 Bellinger DC, et al. J Thorac Cardiovasc Surg. 2003 Nov; 126(5): 1385–96.

A-383

The impact of rewarming rate on neurologic outcome and cerebral inflammation following cardiopulmonary bypass with deep hypothermic circulatory arrest in rats

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Background and Goal of Study: As cerebral inflammation[1] and temperature management[2] during CPB may influence neurologic outcome following cardiac surgery, this study was designed to determine the impact of the rewarming rate on neurologic outcome and cerebral inflammation 24 h after cardiopulmonary bypass (CPB) with deep hypothermic circulatory arrest (DHCA) in rats.
Materials and Methods: After IRB approval, male rats (n = 14) were cannulated for CPB, cooled to a rectal temperature of 15–18°C within 30 min and were assigned to DHCA for 45 min. Rats were rewarmed following either slow (40 min) (n = 7) or rapid (20 min) (n = 7) rewarming protocols and were weaned from CPB at a rectal temperature of 35.5°C. After neurologic performance was assessed on the first postoperative day, inflammatory parameters in the brain were determined using Western Blot. Parameters were analyzed with t-tests.
Results and Discussions: Data are presented as means ± SEM. Neurologic outcome and cerebral inflammation did not differ significantly between groups ($p > 0.05$).

	Normal range	Slow rewarming	Rapid rewarming
Beam Balance [sec]	60	50 ± 5.6	48.5 ± 8.8
Beam Walking [missteps]	0	3.1 ± 0.9	4.3 ± 1.2
COX-2/β-actin ratio	0.046 ± 0.004	0.124 ± 0.023	0.102 ± 0.017
IkB/β-actin ratio	0.055 ± 0.011	0.072 ± 0.003	0.076 ± 0.002
pp38/p38 ratio	0.986 ± 0.112	0.316 ± 0.089	0.345 ± 0.094

Conclusions: The presented CPB/DHCA rat model allows to study neurologic outcome and cerebral inflammation after different rewarming strategies. Surprisingly, in the current study the rewarming rate during CPB did not influence these parameters. However, further aspects of the postoperative temperature management after CPB and DHCA could be addressed with this model.
References:
1 Hindman BJ, Moore SA, Cutkomp J, et al. Anesthesiology 2001; 95:1380–8.
2 Grigore AM, Grocott HP, Mathew JP, et al. Anesth Analg 2002; 94:4–10.

A-384

Interactions of the endocannabinoid system with isoflurane-induced anesthesia

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Background and Goals: The endogenous cannabinoid (EC) system plays a crucial role in controlling neuronal excitability and synaptic transmission suggesting an option for cannabinoids as therapeutic agents. Activation of cannabinoid receptor 1 (CB1) decreases GAB Aergic inhibition of synaptic transmission in most brain regions[1], whereas volatile anesthetics enhance GABAA receptor-mediated inhibition[2].
Materials and Methods: MAC was determined by the bracketing study design in 12 male CB1 knockout mice ($CB1^{-/-}$) and 12 male wild type littermates ($CB1^{+/+}$) (age: 18–20 weeks). Anesthesia was induced by isoflurane in oxygen/air. Losing their righting reflex the mice's nose was put in a continuously flushed chamber (3 l/min). The mice breathed isoflurane in air and oxygen

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(FiO_2 = 0.5) spontaneously. Heart (HR) and respiratory rate (RR) were measured. End-tidal isoflurane concentration were varied between 0.8 and 1.9 Vol % and the motor reaction to toe clamping was recorded. Rectal temperature was maintained between 37.5°C and 38.5°C. Unpaired t-tests were used for statistical analysis (*$p < 0.05$).

Results: Data (Mean ± SD) are shown in the Table:

Group [type]	RR [min^{-1}]	Body weight [g]	HR [beats/min]	MAC isoflurane [Vol %]
$CB^{-/-}$	127 ± 10	25 ± 1*	524 ± 11*	1.06 ± 0.13*
$CB^{+/+}$	117 ± 10	28 ± 2	463 ± 27	1.23 ± 0.13

Conclusion(s): $CB1^{-/-}$ mice had significantly lower MAC-values compared to $CB1^{+/+}$ mice. Although isoflurane activates GABAA receptors, in $CB1^{+/+}$ mice inhibitory GABAergic transmission may be decreased by stress-induced release of ECs and hence, activation of CB1. In contrast, in $CB1^{-/-}$, GABA-effects of isoflurane are not counteracted by ECs and thus more pronounced. The higher heart rate of CB1 deficient mice supports the anesthesia induced activation of the CB1 cannabinoid receptors in the brain stem which has been shown to enhance cardiac vagal tone[3]. These results suggest that isoflurane-induced anesthesia interacts with the EC system.

References:

1 Katona I et al. *J Neurosci* 2001; 21: 9506–18.
2 Haseneder R et al. *Eur J Pharmacol* 2002; 451: 43–50.
3 Pfitzer T et al. *Br J Pharmacol* 2004; 142: 943–52.

A-385

Sevoflurane-induced changes of field potential activity are detected by Benfords Law

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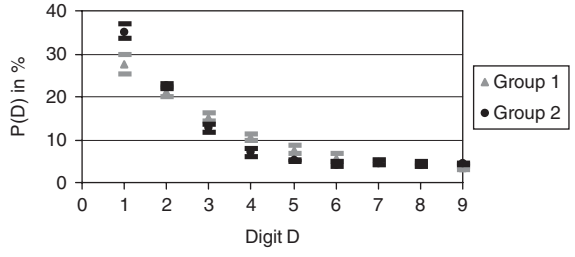
Background and Goal of Study: Benford's Law of anomalous numbers (1) was applied to analyse reactions of field potential activity of cultured rat neocortex related to different concentrations of sevoflurane.

Materials and Methods: Brain slices of rat neocortex were cultured in artificial cerebrospinal fluid. The cells were treated with sevoflurane at increasing concentrations [0, 0.25, 0.5, 0.75, 1, 1.5, 2.5, 5 MAC]. Field potential activity was recorded and low pass filtered at 50 Hz. Recordings of 50 entire signals and 213 periods between "episodes of ongoing activity" (EOA) were analysed using Benford's Law. Data satisfying Benford's Law show a probability distribution following the formula:

$$P(D) = \log_{10}(1 + D^{-1})$$

Results and Discussions: Field potential activity in cortical cells approximately obeys Benford's Law. But two groups can be observed by analyzing both, the EOA and the entire signal with significant differences in the probability of digit D = [1, 4, 5] between the groups. Group 1 includes values up to 0.5 MAC while Group 2 combines 0.75 MAC and higher concentrations. This implies existence of a threshold between 0.5 and 0.75 MAC. EOA data for both groups (mean ± SD) are shown in the Figure:



Conclusion: Based on the differences observed in the probability of digit D = [1, 4, 5], a threshold is identified at the level of "MAC awake".

Reference:

1 Benford F. *Proc. Amer. Phil. Soc.* 1938; 78: 551–572.

A-386

Sevoflurane increases the irregularity of the electrical signal from cultured rat brain neocortical slices

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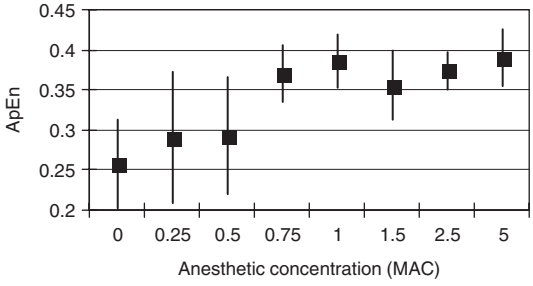
Background and Goal of Study: Approximate Entropy is a measure of regularity and predictability of EEG-signals. In the present study, it was calculated to measure the effect of sevoflurane on field potentials from cultured slices of rat neocortex (1).

Materials and Methods: Neocortical rat brain slices were cultured in artificial cerebrospinal fluid. Increasing concentrations of sevoflurane were administered and local field potentials were measured. We analyzed the periods between "episodes of ongoing activity" (EOA). At each concentration level, three of this periods of 2s length were randomly extracted from the signal and divided into 10 blocks. Approximate Entropy was calculated with an algorithm as used for EEG analysis (2). At each level, entropy results of the three measurements were averaged.

Results and Discussions: Increasing concentrations of sevoflurane result in a higher entropy value. A threshold appears at concentrations between 0.5 and 0.75 MAC. This threshold approximately reflects the level of "MAC awake". At this level, the irregularity of the signal increases.



Conclusion(s): Increasing concentrations of sevoflurane lead to an increase of irregularity of the signal between two EOA in cultured rat brain neocortical slices. The threshold at "MAC awake" concentrations may reflect an underlying mechanism of anesthesia-induced unconsciousness.

References:

1 Antkowiak B, Hentschke H. *Neurosci Lett* 1997; 231: 87–90.
2 Bruhn J, Röpcke H, Hoeft A. *Anesthesiology* 2000; 92: 715–26.

A-387

Central venous-arterial carbon dioxide tension gradient as an indicator of cardiac index during neurosurgical procedures in the sitting position

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Background and Goal of Study: The mixed venous-arterial PCO_2 gradient [P(mv-a)CO_2] has already been shown to be inversely correlated to the cardiac output. Aim of the present study was to validate the clinical applicability of substituting central venous-arterial PCO_2 gradient [P(cv-a)CO_2] for P(mv-a)CO_2 in monitoring hemodynamic performance of patients being operated in the sitting position.

Materials and Methods: A prospective study enrolling 38 consecutive patients (23 M/15 F, ASA II–III) scheduled for posterior fossa and cervical spine surgery in the sitting position. After induction to anesthesia a CCO pulmonary artery catheter and a separate central venous catheter were placed at the same site. Simultaneous blood gas samples from the arterial, central venous (CV) and pulmonary artery (PA) catheter were collected at: baseline, 5 min after sitting position, 5 min before and after return to supine position. At the same time cardiac index (CI) determination was accomplished with CCO technique. The relationship between CI and the venous-arterial PCO_2 difference was evaluated for both circulations using Pearson correlation and linear regression analysis.

Results: The mean (SD) venous-arterial PCO_2 gradients for PA and CV circulations were 4.2 (1.8) and 4.4 (1.9) respectively ($p > 0.05$). The correlation (R)

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between P(mv-a)CO_2 and CI was 0.757 ($p < 0.0001$), which was very similar to the resulting R of 0.625 ($p < 0.0001$) for the P(cv-a)CO_2 data. The resulting regression lines and equations indices are given in Figures 1 & 2.

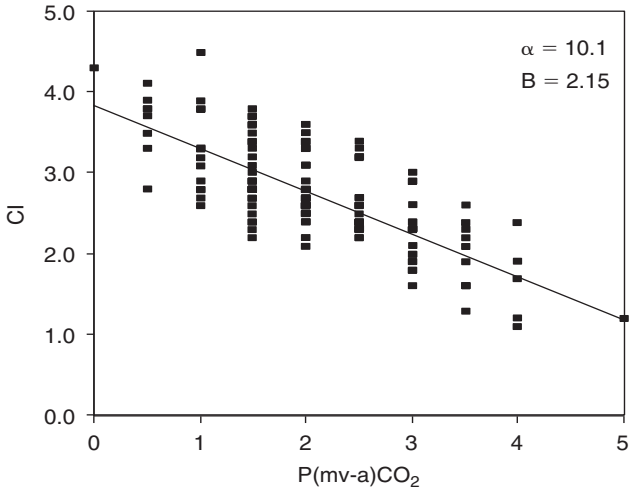

Figure 1.

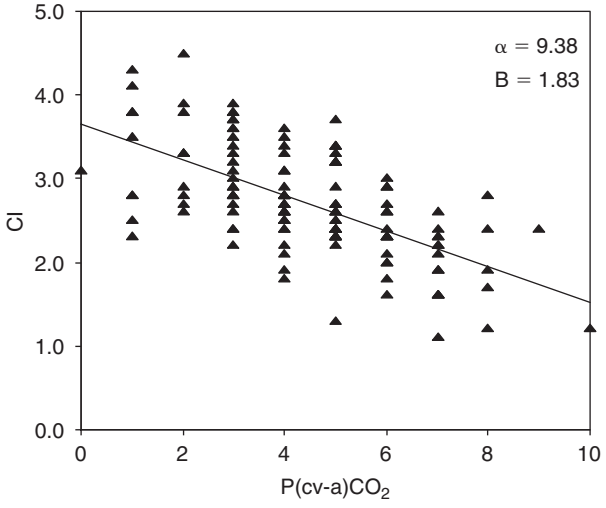

Figure 2.

Conclusion: Central venous-arterial PCO_2 gradient could be an accurate and simple to perform alternative indicator of hemodynamic performance in patients undergoing neurosurgical procedures in the sitting position.

A-388

Effect of parecoxib on intraocular pressure during prone positioning for spine surgery

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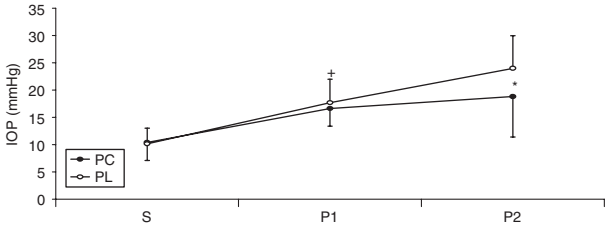
Background: Prone position can raise intraocular pressure (IOP) and compromise ocular perfusion pressure (1). Parecoxib, a COX-2 selective inhibitor used for postoperative analgesia, has been shown to inhibit carbonic anhydrase and lower IOP in animals (2). We investigated the effect of parecoxib on IOP evolution in patients undergoing spine surgery in prone position.

Materials and Methods: After IRB approval and informed consent, 30 ASA I and II patients, without eye disease and scheduled for spine surgery in prone position were enrolled. General anaesthesia was induced and maintained with sufentanil (5–10 μg boluses) and a propofol TCI (effect-site: 2.5–3 μg/ml), at a constant ET_{CO2} (33 ± 3 mmHg). Intubation was facilitated with cisatracurium. Patients were randomly allocated to two groups: the first group (PC, n = 17) received 40 mg IV parecoxib after induction of anaesthesia, the second group (PL, n = 13) received 2 ml IV normal saline. Right IOP was measured using the Tono-Pen XL handled tonometer at three time points: supine after induction (S), 5 min after prone positioning (P1), and prone at the end of the surgery (P2). Delay between P1 and P2 was noted. Data were analyzed using two way mixed-design ANOVA's, χ^2 and two-tailed unpaired t tests. $P < 0.05$ was considered statistically significant.

Results: Demographic data were comparable between groups. Prone position induced a significant increase in IOP in both groups (S: 10.4 ± 3.3 and 10.2 ± 2.9 mmHg, P1: 16.6 ± 3.3 and 17.7 ± 4.3 mmHg in PC and PL, respectively). IOP significantly further raised in PL but not in PC (P2: 18.8 ± 7.4 and 24.0 ± 6.0 mmHg in PC and PL, respectively). Haemodynamic variables and delay between P1 and P2 did not differ between groups.

Conclusion(s): IV parecoxib given after induction of anaesthesia limits the increase in IOP associated with prone position during spine surgery.



+ = significantly higher than at S, both groups.
* = significantly higher in PL than in PC, and significantly higher at P2 than at S and P1 in PL.

References:

1 Cheng MA. *Anesthesiology* 2001;95:1351–5.
2 Weber A. *J Med Chem* 2004;47:550–7.

A-389

Measurement of electrical skin resistance with the electro-sympathicograph correlates with observer's assessment of the alertness/sedation scale and BIS during a target controlled infusion with propofol

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Background and Goal of Study: The eccrine glands are under sympathetic cholinergic control. Sympathetic stimulation leads to changing of electrical skin resistance (galvanic skin reflex). So far it is unclear whether this effect can be used to measure depth of anesthesia. This prospective study was designed to evaluate the galvanic skin reflex in comparison with bispectral index (BIS) and the "observer's assessment of the alertness/sedation scale" (OAA/S) during propofol infusion.

Materials and Methods: For measurement of the galvanic skin reflex an electro-sympathicograph (ESG) was taken. In 22 patients and 8 healthy volunteers anaesthesia was induced and maintained with propofol infusion by a target control infusion pump at stepwise increasing plasma concentrations. BIS, ESG and OAA/S were at six well defined plasma target concentrations (T 1–6) for each patient measured. The statistical analysis were performed using PROC MIXED for SAS.

Results and Discussions: 17 males and 13 females were included in the study. The observation period during induction and maintenance of anesthesia was 27.8 ± 3.44 min. The plasma concentrations of propofol were (0 μg/ml) T1, (1.3 μg/ml) T2, (1.7 μg/ml) T3, (2.0 μg/ml) T4, (2.4 μg/ml) T5 and (2.8 μg/ml) T6. The average dosis of Propofol was 277.37 ± 54.20 mg. The changes of the electrical skin resistance in the ESG correlated highly significant with the changes of BIS at each time measured and during the whole course [$p < 0.0001$], the propofol plasma target concentrations [$p < 0.0001$] and the OAAS scale [$p < 0.0001$].

Conclusion(s): Monitoring level of sedation for propofol due to measurement of the electrical skin resistance with the ESG seemed to be promising.

A-390

Effect of right internal jugular vein cannulation on regional cerebral oxygen saturation in patients with cerebral tumour

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Background and Goals: The purpose of this prospective study was to evaluate the effect of right internal jugular vein cannulation on regional cerebral oxygen saturation (rSO_2) in patients who were at risk of intracranial hypertension.

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Material and Methods: We studied 20 patients (ages 26–67 yr) scheduled for elective craniotomy for resection of a supratentorial mass lesion. Anesthesia was induced with thiopental and maintained with sevoflurane/remifentanil. Cisatracurium was administered as neuromuscular blocking agent. Ventilation was adjusted to achieve a P_aCO_2 of 35 mmHg. The rSO_2 was measured by near-infrared spectroscopy with the INVOS 4100 cerebral oximeter. The right internal jugular vein was cannulated with the patient in a supine, head turn 45° to the opposite side of the procedure (Boulanger approach). Mean arterial pressure (MAP), heart rate (HR), O_2 saturation, and rSO_2 were recorded prior to anesthesia (baseline), during preoxygenation (PO), with the head in neutral position prior cannulation (PC), in left lateral position (LL), during cannulation procedure (C), and with the head in neutral position (NP).
Results: Mean (SD) are shown in the Table.

	B	PO	PC	LL	C	NP
rSO_2 left	60 ± 14	66 ± 14*	67 ± 12	67 ± 13	64 ± 14†	66 ± 15
rSO_2 right	60 ± 12	67 ± 12*	69 ± 13	66 ± 14	65 ± 13†	65 ± 15
MAP	108 ± 16	106 ± 14	84 ± 15	85 ± 15	93 ± 18	88 ± 14
HR	72 ± 16	71 ± 13	69 ± 14	71 ± 16	73 ± 18	70 ± 16

* = $P < 0.05$ *vs* baseline value. † = $P < 0.05$ *vs* PC value.

Conclusion: Our results suggest that cannulation of the right internal jugular vein significantly reduces rSO_2 in patients with supratentorial tumour, but without clinical relevance. No evidence of cerebral ischemia was observed in the studied patients.

A-391

NIRS matrix: a new tool in neuromonitoring during interventional neuroradiology

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[1]Division of Anesthesiology for Neurosurgical and Craniofacial Surgery and Intensive Care; [2]Department of Radiology, Medical University of Graz, Austria

Background and Goals: Regional cerebral oxygen saturation (rSO_2) monitoring using near-infrared spectroscopy (NIRS) is a method for early detection of imbalance of cerebral oxygenation. Our aim is to present our preliminary results about the benefits of rSO_2 monitoring as one endpoint in an algorithm tool (NIRS matrix) (1) to determine immediate onset of therapy of acute cerebral hypoxic episodes during neuroendovascular procedures.
Materials and Methods: rSO_2 was measured continuosly by INVOS 4100 cerebral oxymeter (Somanetics, Troy, USA) in a consecutive series of 184 patients who underwent neuroendovascular procedures, during the whole intervention. The NIRS matrix was applied when significant rSO_2 variations (rSO_2 drops >20% or continous alternate fluctuations) were detected in order to identify a "responsible" vital parameter (Hb, MAP, SaO_2, pCO_2, t) and it was corrected until rSO_2 returned to the baseline value (initial control values under stable vital parameters). If rSO_2 diminished and no "responsible" vital parameter was found the neuroradiologist was required to search a possible complication (catheterization effect, vasospasm, bleeding or thrombosis).
Results: The NIRS matrix was necessary to apply in 42 patients (mean age: 53 years, range: 19–79 years; 16 male, 26 female), in all cases the reduced rSO_2 was successfully corrected by the anesthesiologist with the appropriate correction of its associated vital parameters ($n = 21$) or when the radiologic complications was resolved. No patients showed postinterventional new acquired neurological deficits.
Conclusion: The NIRS matrix can provide an useful tool for a more safe and accurate anesthetic management in neuroendovascular procedures.
Reference:
1 Schwarz G, Litscher G, Delgado PA, et al. Neurol Res 2005; 27: 423–428.

A-392

The effects of isoflurane and desflurane on SSEP monitoring during craniotomy

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Background and Goal of Study: SSEP is a useful electrophysiologic monitoring device for detecting various neuronal injury during brain or spinal surgeries. In this study, by comparing the suppressive effects of isoflurane and desflurane on SSEP, we hope to find out a proper volatile agents and its desirable concentrations during SSEP monitoring.
Materials and Methods: Subjects are 20 neurophysiologically free adult patients (ASA class I–III, age 18–65) who underwent aneurysm clipping operation. Maintenance of anesthesia was done by propofol TCI, at target concentration 3–5 microgram/ml. BIS score was 40–60 during the operation, and phenylephrine was used if mean arterial pressure goes below 60 mmHg. Body temperature of 34–36°C, $PaCO_2$ of 32–36 mmHg was maintained during the surgery. Subjects were devided into two groups at random. In one group, SSEP was measured respectively after end tidal isoflurane concentration equilibrium of 0.5, 0.75, 1.0 MAC was reached and sustained for 20 minutes. Then isoflurane discontinued for 30 minutes for elimination, and desflurane was given to keep the same MAC. Then SSEP was measured again. In the other group, desflurane was given first, then isoflurane was given later. For SSEP measurement, median nerve was stimulated and C_{PZ}, C_{P3}, C_{P4} (10–20 international unit) monitored. And to measure cortical potential at each anesthetics concentration, the latency and the peak to peak amplitude of N_{20}, P_{23} is monitored.
Results and Discussions: Latency of cortical potential was prolonged over the 0.5 MAC of desflurane (24.4 ± 0.6 m/sec) and over the 0.75 MAC of isoflurane (24.5 ± 1.25 m/sec) compared to control (22.9 ± 1.22 m/sec). Peak to peak amplitude of the cortical potential was reduced over the 0.5 MAC of desflurane (0.91 ± 0.14 microvolt) and over the 0.75 MAC of isoflurane (0.85 ± 0.12 microvolt) compared to control (1.39 ± 0.5 microvolt).
Conclusion(s): SSEP monitoring during operation is recommened to be done under 0.75 MAC of isoflurane and under 0.5 MAC of desflurane concentration.
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A-393

Determination of optimal arterial carbon dioxide partial pressure ($paCO_2$) in patients with brain injury

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Background and Study Goals: The aim of current project was to study the relationships between $PaCO_2$ levels and clinical parameters in patients with severe head trauma. Application of therapeutic hyperventilation as well as unintentional (centrally mediated) profound hyperventilation in patients with head injury, make this problem actual.
Materials and Methods: We studied 105 previously healthy head injured patients admitted to our Intensive Care Unit (ICU) (males-84; females-21; mean age 41.2 ± 9). Level of consciousness upon admission varied between 3–15 on Glasgow Coma Scale (GCS); mean duration of ICU stay was 8.8 ± 11.6 days. Intensive care included crystalloid infusions, inotropic support, artificial respiratory support. Various modes of assisted ventilation with maximal preservation of spontaneous respiratory efforts were used to find empirically the "optimal" $PaCO_2$ level. It was hypothesized that this $PaCO_2$ level would provide best conditions for perfusion of injured areas without compromising healthy brain regions. $PaCO_2$ samples were obtained in properly sedated and synchronized patients. Several important physical concepts including hydrodynamic law of Bernoulli laid in the foundation of current hypothesis. Patients were assigned to 7 groups according to GCS points and specific levels of $PaCO_2$. Non-parametric ANOVA (Kruskal-Wallis test) was applied to reveal differences between the groups.
Results and Discussions: Strict correlation between blood $PaCO_2$ and GCS was detected, where decreasing level of consciousness was accompanied with linear decrease in $PaCO_2$ ($r = 0.84$). There was a significant difference in $PaCO_2$ levels between the patient groups with GCS levels 3–8, 9–12, and 13–15 ($p < 0.05$). Mortality rate among the patients with GCS < 8 was 34.4%.
Conclusion: Careful empiric determination of "optimal" $PaCO_2$ is recommended in head injured patients to ensure adequate cerebral perfusion and avoid intracranial hypertension. This is especially important for patients treated with prolonged assisted ventilation. Additional studies in larger groups of patients are necessary for final clarification of this complex issue of brain trauma management.

A-394

Subdural pressure measured before duramater opening in elective craniotomy. A preliminary study

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Background and Goal of Study: Subdural pressure (SDP) measured before durotomy can predict the risk of brain swelling in supratentorial brain tumours surgery. SDP higher than 13 mmHg was associated to a 95% probability of moderate swelling (1). Our aim is to check out the feasibility of measuring SDP in daily routine, and assess its usefulness to prevent brain swelling.
Materials and Methods: Observational study in patients scheduled for craniotomy, under TIVA. Demographical data, diagnostic and tumour localization were recorded. Clinical and laboratory findings, subjective neurosurgeon's impression, anaesthetic management and routine monitoring when measuring SDP were collected.

SDP was measured by placing a 22G catheter under the dura through a small incision without cerebrospinal fluid withdrawal. Zero-point adjustment was done at incision's level. Catheter was eased below the dura until a continuous recording of ICP (SDP) with cardiac and respiratory waves appeared. Mann-Whitney U test was used to compare patients with low and high SPD. Correlation Spearman's test was used to correlate SPD to the clinical variables. $P < 0.05$ was considered statistically significant.
Results and Discussions: Thirteen patients were included (mean age 47.6 years, DE 15.95; 7 male and 6 female). Nine of them were diagnosed of tumoral lesions (primary or metastatic), two vascular diseases (1 aneurysm and 1 arteriovenous malformation) and two temporal resections for epilepsy.

An accurate SPD wave was recorded in every patient. The mean SDP was 8.7 mmHg, DE 4.6 (Range 1–16 mmHg). Only three patients reached SDP $\geqslant$ 13 mmHg but only one case showed clinical evidence of brain swelling that improved after starting standard treatment. No differences in clinical variables were found when patient with SPD $>$ 13 were compared to patients with SPD $<$ 13, probably due to a low number of patients studied.
Conclusion(s): SDP can be easily measured by this technique in daily operation room's routine. We checked that SDP can predict the risk of brain swelling but our data series is too small for further conclusions.
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A-395

Role of end-tidal capnography during craniectomy

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Introduction: Strict normocapnic CO_2 management (with $PaCO_2$ between 32 and 38 mmHg) is of utmost importance during brain surgery. Hypocapnia or hyperventilation ($PaCO_2$ below 32 mmHg) may induce intense cerebral vasoconstriction and cerebral ischemia, whereas hypercapnia ($PaCO_2$ higher than 38 mmHg) may result in cerebral vasodilation and brain bulging. Since January 2004, we introduced a strict protocol as to end-tidal capnography. After induction of anesthesia and intubation, ventilation had to be titrated referring to an end-tidal CO_2 value of strictly 30 mmHg. In the present paper, we want to report on the relationship between $PaCO_2$ and end-tidal (ET) CO_2 after the introduction of the above mentioned protocol and whether we could rely on such a capnography protocol.
Patients and Methods: From 2004 to half 2005, 349 adult pts scheduled for elective brain tumor surgery were included. All patients received the same anesthesia with propofol/sufentanil/rocuronium/O_2 + air. After induction and intubation, ventilation was titrated to end-tidal capnography values of 30 mmHg. At a mean of 38 min after installation of ventilation, arterial blood gas (ABG) analysis was performed. This occurred while the patient was still in the supine position.
Results: At first ABG analysis, 163 measures revealed an arterial $PaCO_2$ within the preset limit (32–38 mmHg), while 136 measures (38%) were higher than 38 mmHg and 27 measures (7.7%) were lower than 32 mmHg. The highest observed $PaCO_2$ was 60.8 mmHg and the lowest was 26.4 mmHg Analysis of the end-tidal CO_2 values for the 3 groups (normal $PaCO_2$, high $PaCO_2$, and low $PaCO_2$) did not reveal significant differences, as all were between 27 and 32 mmHg. We observed a slight (nonsignificant) correlation between higher $PaCO_2$ values and ASA classification. We did not observe any correlation with age, body temperature, blood pressure or heart rate or positioning (as all patients were still in supine position).
Conclusion: This study, which aimed to evaluate whether a strict end-tidal capnography protocol could guarantee a good chance of normocapnic conditions during neurosurgery, indicates that $ETCO_2$ cannot replace $PaCO_2$.

A-396

Local cerebral metabolic changes, induced by brain retraction and surgery, during craniotomy, monitored by cerebral microdialysis

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Introduction: Brain retractors applied during brain surgery may induce local changes in cerebral perfusion.Cerebral microdialysis (MD) is a recently available tool for monitoring local cerebral metabolism. In the present study, we evaluated whether MD revealed any changes in local metabolism in the brain area under the retractor and in the vascular territory of surgery.
Patients and Methods: With IRB approval, 38 pts scheduled for large frontal tumor resection received peroperative MD. After opening of the dura, the MD catheter was inserted into the brain cortex and was perfused at 5 μl/min enabling analysis (for glucose, lactate, pyruvate, glycerol and glutamate) of the dialysates every 5 min. A brain retractor was finally applied for the period of tumor resection above the area of MD catheter insertion.
Results: Insertion of brain retractors resulted in a overall decrease in local glucose, most probably due to a decrease in local perfusion. In all patients, we observed a shortlasting increase in local glucose after removal of the brain retractor. In most (32 pts) of the 38 patients, there was moreover a further marked decrease in glucose during the whole period of brain retraction. In all these pts, we observed an increase in local lactate concentration. In 14 of these 32 patients, we observed an increase in lactate/pyruvate ratio. We observed that 5 of these 14 episodes went along with a large increase in glycerol. In 4 of these patients, no neurosurgical peroperative complications were observed, except for one patient. In this patient, the ischemic pattern was observed 15 min before a major neurosurgical warning sign (extensive brain bulging) occurred. Retrieval of the retractor resulted in an immediate normalization of all parameters. Only in the last patient, an extensive increase in glutamate was observed. Postoperative outcome was uneventful for all patients, except for this last one.
Conclusion: Use of MD during routine brain retraction revealed the possible presence of pronounced local cerebral ischemia under the retractor. Peroperative use of high flow MD, enabling almost on-line metabolic monitoring of brain tissue under the retractor, might become a valuable warning tool during those neurosurgical procedures necessitating extensive brain retraction.

A-397

Scalp nerve blocking combined with propofol and sufentanil or remifentanil infusion for awake craniotomy

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Background and Goal of Study: Awake craniotomy makes functional brain-mapping possible thus allows maximal tumor resection while minimizing postoperative neurologic deficits (1,2). We evaluated the safety and efficacy of scalp nerve blocking and incision infiltration, combined with propofol and sufentanil or remifentanil for awake craniotomy.
Materials and Methods: 60 neurosurgical patients were included in our study. The endotracheal tube was nasally inserted into oropharyngeal after induction and spontaneous respiration was maintained during the whole operation. The anesthesia was maintained with 3 ug · ml^{-1} propofol and either 0.1 ng · ml^{-1} sufentanil (n = 30) or 1 ng · ml^{-1} remifentanil (n = 30) infusion with TCI method. Scalp nerve blocking and incision infiltration with 0.5% ropivacain were performed. The concentration of propofol was reduced to 1 ug · ml^{-1} at arousal while the concentration of sufentanil and remifentanil remained unchanged. Awake degree score were assessed. Blood pressure (BP), heart rate (HR), tidal volume (V_T), respiratory rate (RR), minute volume (MV), end-tidal carbon dioxide tension (P_{ETCO2}), pulse oximetry (SPO_2) and intracranial pressure (ICP) were monitored in both groups.
Results and Discussions: Of the total 60 patients, 48 (80%), 7 (11.6%), 3 (5%), 1 (1.7%) and 1 (1.7%) were classified to awake grade I, II, III, IV and V respectively. Homodynamic stability was kept in both groups. After induction, V_T, RR and MV decreased while P_{ETCO2} and ICP increased in both groups ($P < 0.05$). 3 cases of apnea (10%) and 6 cases of respiratory depression (20%) occurred in sufentanil group while 5 cases of apnea (16.7%) and 4 cases of respiratory depression (13.3%) occurred in remifentanil group.

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Conclusion(s): Scalp nerve blocking and incision infiltration, combined with propofol and sufentanil or remifentanil infusion is safe and effective for awake craniotomy, but respiratory depression should be cautiously avoided.

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A-398

A randomized, double-blind comparison between parecoxib sodium and paracetamol for postoperative analgesia after intracranial surgery

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Background and Goals: The injectable cyclooxygenase-2 selective non-steroidal anti-inflammatory drug, parecoxib, has never been compared with IV paracetamol for postoperative analgesia after intracranial surgery.

Material and Methods: In this prospective, randomised, double-blind study, we randomly assigned 45 patients with cerebral tumour scheduled for supratentorial craniotomy, to receive 40 mg parecoxib (n = 15), 1 g paracetamol (n = 15) or placebo (n = 15) 30 min before completion of surgery. Subsequently, parecoxib was injected 12 h after the end of surgery and both paracetamol and placebo were given 6, 12 and 18 h after surgery. Also, scalp block with bupivacaine 0.25% and morphine 0.05 mg IV was performed in all patients when concluding the surgery. Anaesthesia was standardised. In the postoperative period, IV morphine (2 mg in bolus) was given to treat pain when required, and morphine consumption was registered postoperatively during 24 h. Postoperative pain was assessed at 2, 4, 8, 12, 16 and 24 hours using a Visual Analog Scale (VAS), verbal rating scores (VRS) and Total Pain Relief (TOTPAR).

Results: The total dose of morphine at 24 h was smaller in the parecoxib and paracetamol groups than in the placebo group (4.0 ± 3.1, 4.4 ± 3.7 *vs* 17.4 ± 2.9 mg; $P < 0.001$). The pain scores were significantly lower in the parecoxib and paracetamol groups than in the placebo group. Higher TOTPAR scores were recorded in patients in the parecoxib and paracetamol groups than in the placebo group. The incidence of vomiting was significantly lower in paracetamol group versus parecoxib and placebo groups.

Conclusion: In our study, the administration of 2 injections of 40 mg parecoxib or 4 injections of 1 g paracetamol within the first 24 h after surgery plus surgical wound infiltration with bupivacaíne 0.25% at completion of surgery, had a similar effectiveness for pain management after intracraneal surgery.

A-399

Piracetam is not suitable to prevent postoperative cognitive dysfunction after AICD-implantation under general anesthesia

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Background and Goal of Study: Cognitive dysfunction can occur after implantation of automatic implantable cardioverter/defibrillators (AICD) under general anesthesia (1). In a series of clinical studies it could be shown, that the perioperative administration of piracetam had favorable effects on delirious symptoms (2). Therefore, the aim of this prospective, double-blind study was to assess a possible positive influence of perioperative piracetam administration on cognitive dysfunction after AICD-implantation.

Materials and Methods: After approval of the regional ethics committee, informed consent was obtained by 53 patients undergoing implantation of an AICD. They were randomised into a piracetam-group (n = 25) (800 mg p.o. the evening before surgery, 3 g i.v. × 3 on the day of surgery and 800 mg p.o. × 3 daily on postoperative days 1 to 3) and a placebo-group (n = 28). All patients underwent cognitive testing with a validated battery of neuropsychological tests (3) the day before, 1 week and 3 months after surgery in order to assess cognitive dysfunction. Possible learning-effects were taken into consideration by a healthy control-group (n = 20). From the neuropsychological tests a combined Z-score was calculated, indicating cognitive dysfunction (3).

Results and Discussions: There were no differences regarding demographic data, duration of general anesthesia, ventricular fibrillation and MAP < 50 mm Hg. Patients in the piracetam-group had a non-significant trend towards an increased rate of cognitive dysfunction 3 months postoperatively compared to the placebo group. A possible explanation for these results could be the improved cerebral performance due to piracetam during the intraoperative phase of insufficient brain-perfusion.

Conclusion: Piracetam is not suitable to prevent perioperative cognitive dysfunction after AICD-implantation. Our results even suggest a negative effect regarding cognitive dysfunction 3 months postoperatively in the verum group.

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A-400

The effects of propofol, desflurane and isoflurane on plasma glucose concentrations in patients undergoing intracranial mass operation

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Background and Goal of Study: The perioperative plasma glucose level changes effect prognosis in intracranial mass operations. We investigated the effects of the propofol, desflurane and isoflurane on plasma glucose levels in cranial surgery.

Materials and Methods: Ninety, ASA I-II patients aged between 18–60 years old were scheduled for study. Induction and intubation was performed with 2 mg kg^{-1} fentanyl, 2 mg kg^{-1} propofol and 0.15 mg kg^{-1} cisatracurium in all patients. Anaesthesia was maintained using propofol 4–6 mg kg^{-1} h^{-1} in group P, desflurane and isoflurane 0.5–1 MAC in group D and group I. Remifentanil infusion was applied 0.5 μg kg^{-1} min^{-1} in all groups. Plasma glucose (PG) levels, mean arterial pressure (MAP) and heart rate (HR) measured before the induction, after 2 minutes of intubation (T_1), after 5 minutes of anesthetic agent starting (T_2), after 5 minutes of incision (T_3) and hourly until the end of the operation.

Results and Discussion: In the first hour, PG levels were significantly lower in group P (99.13 ± 16.14) than group D (117.07 ± 21.82) In the second and third hour, PG levels were significantly lower in group P (109.07 ± 21.39/ 111.86 ± 19.14) than group D (125.22 ± 21.33/137.39 ± 28.16) and group I (123.44 ± 32.35/133.95 ± 29,22).

Conclusion: We concluded that total intravenous anaesthesia performed with propofol infusion is more effective than desflurane and isoflurane inhalational anaesthesia to preventing hyperglicemic response caused by surgical stress in intracranial mass operations.

A-401

Prophylactic antiemetics do not reduce the incidence of postoperative nausea & vomiting in microvascular decompressions (MVD) of the trigeminal nerve

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Background and Goal of Study: PONV is a common complication following Microvascular decompression (MVD) of trigeminal nerve.[1,2] The purpose of this study was to determine the effect of prophylactic antiemetics in reducing the incidence of PONV following MVD surgery.

Material and Methods: After IRB approval, all consented patients undergoing MVD for trigeminal neuralgia were prospectively followed. The patients were divided into 2 groups, Control (C = no antiemetic) and Prophylaxis (P = Granisetron (1 mg) & Dexamethasone (8 mg) on induction). Data collected included patient demographics, history of PONV, anesthetic data and the incidence of PONV in recovery room, at 24 hrs and on discharge from hospital (3 days). Nausea and emesis were reported according to a four-point scale. Statistical analysis was by Chi-Square test and t-tests.

Results: A total of 45 patients were followed. The overall incidence of nausea was 48%(22/45) in recovery room, 60%(27/45) at 24 hrs and 33% (15/45) on discharge from hospital. The incidence of emesis was less than nausea. The two groups were comparable with respect to demographic variables. There were no significant difference between the groups ($P > 0.05$) with respect to incidence of nausea and vomiting at any point.

	Prophylaxis (P) (n = 25)	Control (C) (n = 20)
Age (yrs) (mean ± SD)	52 ± 13	52 ± 12
Sex (Male: Female)	10:15	9:11
Incidence of nausea (n) (%)		
Recovery room	10 (40%)	12 (60%)
At 24 hrs	13 (52%)	14 (70%)
At discharge	8 (32%)	7 (35%)
Incidence of Vomiting (n)		
Recovery room	1	3
At 24 hrs	2	6
At discharge	0	0

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Conclusion: We conclude that PONV (nausea or vomiting or both) occur frequently (up to 77% at 24 hrs postoperatively) following MVD surgery. In our study, the prophylactic antiemetic therapy does not reduce the incidence of PONV.

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A-402

Influence of chronic phenitoine therapy on muscle concentrations of rocuronium

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Background and Goal of Study: Rocuronium bromide is a non depolarizing neuromuscular blocking agent (NMBA) widely used in anesthesia. Chronic therapy with phenitoine (CPT) is known to affect the time course of effect of most NMBA, requiring increments in dosing to achieve the same level of effect than patients without CPT. Tissue microdialysis allows the quantification of rocuronium bromide in muscle. The goal of this study was to characterize the influence of CPT on the muscular concentrations of rocuronium in patients undergoing intracranial surgery.

Materials and Methods: Under IRB approval, 21 patients undergoing surgical craniotomy were included. 10 patients were on CPT and 11 were not (control group). All patients were routinely monitored and anesthetized with propofol and remifentanil. Effect was quantified by means of electromyography. Rocuronium was administered as a bolus (weight adjusted) and a continuous infusion, adjusted to maintain 1 response of TOF. All patients had inserted a microdialysis catheter in quadriceps muscle for quantification of tissue concentration of rocuronium. Microdialysis sampling was performed based on previous in vitro experiments. Tissue concentrations and dosing of rocuronium between CPT and control groups, were compared using non parametric measures (Mann Whitney U test). Statistical significance was considered when $p < 0.05$.

Results and Discussions: Rocuronium was detected in microdyalisis samples in 6 patients in CPT group and 7 in the control group. No differences could be detected between groups regarding muscle concentration of rocuronium ($p = 0.156$). The amount of rocuronium (dose kg^{-1} min^{-1}) was significantly higher in the CPT group ($p = 0.000$). This finding suggests that the effect of phenitoine could be explained, at least in part, by pharmacokinetic reasons, probably by an increase in metabolic clearance.

Conclusion(s): Muscle concentrations of rocuronium are similar in patients who do not receive CPT than those under CPT, despite the latter are receiving larger doses, suggesting changes in the pharmacokinetics of rocuronium due to the effect of phenitoine.

A-404

Clinical usefulness of biespectral index for anesthesia recovery in patients with hydrocephalus and brain injury

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Background and Goal of Study: Impaired consciousness occurs in adults hydrocephalus secondary to brain damage. Objective assessment of residual hypnosis in recovery can be difficult in those patients. The objective of this study was to establish a relation between the Biespectral Index (BIS), state of consciousness and recovery time.

Materials and Methods: Prospective study was performed in 42 patients scheduled for ventriculo-peritoneal shunts due to hydrocephalus. Patients were divided into three groups according to the GCS at preanesthesia room admission and BIS or not BIS measurement: control group (GSC 15 and BIS), GCS < 13 and BIS (GSC < 13 BIS) and GCS withouth BIS (GCS < 13 W.BIS). A standardized total intravenous anesthesia (TIVA) technique with propofol and remifentanil constant infusions was performed in all patients. We recorded time of decrease of BIS values since the moment of the start of the induction (AWAKE) to the moment of loss of consciousness (LOC) in the BIS groups (LOC time), the values of the mean range of BIS during anesthesia maintenance in BIS groups and time of recovery of espontaneous breathing and extubation since both propofol and remifentanil infusions were closed down in three groups (recovery time).

Results and Discussions: We observed significant decrease of time of BIS values after the start of propofol bolus to LOC in GCS < 13 BIS group ($p < 0.05$). (30 ± 9 s vs 52 ± 11 s). The median BIS values during anesthesia maintenance were lower in the GCS < 13 BIS group. No significant difference was found ($38 \pm 7, 32 \pm 12$). Recovery time was significant lower in the control group (750 ± 54 s) than GSC < 13 BIS (1.235 ± 274 s); Both GSC < 13 groups presented non significant differences in the recovery time (GSC W.BIS: 1.448 ± 289 s).

Conclusions: Biespectral Index Monitoring may be used to guide anesthetic administration in patients with hydrocephalus who are more sensitive to drugs. Given that BIS was not designed to be applied in neurologic patients, we concluded the obtained data show that BIS could be an index of neurologic dysfunction.

Local and regional anaesthesia

A-408

Systemic vasodilation with p.o. nitroglycerin as a prognostic test for hypotension after spinal block

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Background and Goal of Study: While taking into consideration all the known risk factors, one can not predict severe hypotension – most frequent circulatory side effect of spinal anaesthesia (SA) – in a certain patient [1]. We used similarity of systemic vasodilation to the local one as the basis of such an individual prognosis.

Materials and Methods: 58 ASA I–III patients, aged 22–89, scheduled for elective general, orthopedic and gynecological surgery, were enrolled in this prospective open study. Nitroglycerin (NG, 500 mkg p.o., mean 7.0 ± 1.6 mkg kg^{-1}) was given before the anaesthesia under continuous monitoring of cardiac (CI) and systemic vascular resistance (SVRI) indexes derived from impedance cardiography and NIBP. Left ventricle power was described with the specific index (LVPI, W m^{-2}), calculated as $0.0022 \times CI \times$ mean BP. After crystalloid fluid loading (6.2 ± 3.8 ml kg^{-1}) and on leveling circulatory effect of NG, SA was performed from the puncture in L_{3-4} interspace with 0.5% isobaric bupivacaine (B, 0.2 ± 0.05 mg kg^{-1}). Mean level of sensory blockade was T8. Hypotension was defined as a decrease in mean BP below 75% of base level, resistant to maximal rate fluid loading and thus requiring vasopressor support.

Results: In regard to BP shift due to SA all the patients were distributed between normo- (N-, 44) and hypotensive (H-, 14) groups. N- and H-groups were comparable in regard to age, gender, body mass index, and did not significantly differ by the doses of NG and B, fluid pre-load and time interval between NG test and puncture. In both groups circulatory response to NG was quite similar to SA one, beginning with SVRI decrease followed by CI rise. While increase in CI immediately after NG was significantly higher in N-group (mean + 42.9% of preceding values vs + 22.2% in H-group, $P = 5.5 \cdot 10^{-5}$), the most demonstrative difference between the two was LVPI changes. In N-group NG provoked LVPI rise by 29.7%, but in H-group the same index typically decreased or, at least, remained stable (mean shift −0.77%, $P = 1 \cdot 10^{-6}$).

Conclusions: preoperative systemic vasodilation with p.o. nitroglycerin may be used as simple, fast, safe and relevant prognostic test for hypotension after spinal block.

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A-409

Hypotension after intradural bupivacaine in patients 65-onwards

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Background and Goal of Study: We conducted a study to know the incidence of hypotension among patients 65-onwards undergoing orthopaedic surgery with intradural bupivacaine [1]. We *aimed* to identify those patients at greater risk and determine wich factors can predict outcome.

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Materials and Methods: 540 orthopaedic patients scheduled for lower limb surgery entered the study. Every patient received a crystalloid preload (Hartmann's solution 8–10 mL/Kg) before spinal bupivacaine was administered (0.5%, 12 mg, L2–3/L3–4, 27 G needle) and afterwards patients received Hartmann's solution 100–150 mL/h. In every patient we recorded BP, HR (before spinal punction and afterwards every 5 min until surgery finished), blockade level, blood loss and those variables that could predispose to hypotension as previous hypertension (HTA) and preoperative antihypertensive drugs: angiotensin converting enzime inhibitors (ACIE), angiotensin receptor antagonists, nitrates, betablockers, calcium chanels blockers, antiarrythmics, digoxin or diuretics. Hypotension (SBP $<$ 90 mm Hg) was managed with ephedrine 5 mg and Hydroxietilstarch. Every variable was binary and we tried to determine both variables associated with hypotension (chi square) and those that could predict hypotension appearing (multiple logistic regression model, stepwise method of variable selection). We used SPSS for windows 12.0 ($p < 0.05$ significant).

Results: Patient's characteristics were (mean $\pm$ SD): age 72.38 $\pm$ 2.3, weight 76 $\pm$ 4.8, men 43%, women 67%. Hyotension appeared in 81 patients (15%). Variables associated with hypotension were: blockade level higher than T5, HR $<$ 50 bpm, previous HTA, diuretics and blood loss greater than 1000 mL ($p < 0.05$). Variables that could predict hypotension were: poorly controlled previous HTA and the use of diuretics or ACIE ($p < 0.05$). Ephedrine was used in 75 patients.

Conclusions: In our study previous HTA or HTA poorly controlled and the use of diuretics or ACIE predispose patients to hypotension when we used spinal bupivacaine.

Reference:

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A-410

Paraesthesiae during single-shot spinal anaesthesia. A comparison of sitting versus lateral decubitus position

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Background and Goal of the Study: Paraesthesiae occasionally occurs during dural puncture or injection of local anesthetic for spinal anesthesia. Various factors may influence the occurrence of paraesthesiae; however no information is currently available studying the effects of patient position in the incidence of paraesthesiae. The purpose of this prospective observational study was to compare the occurrence of paraesthesiae in patients who received single-shot spinal anesthesia in sitting position or lateral decubitus position.

Materials and Methods: In this prospective, observational study, a total of 311 patients operated on under spinal anesthesia were included. A 25-gauge Whitacre spinal needle was used in all patients. Patient positions, aspects of block placement including number of skin punctures, paraesthesiae, as well as success, were recorded by an observer.

Results: Spinal anesthesia was performed in sitting position in 95 patients (30%), and in lateral decubitus position in 216 patients (70%). The incidence of paraesthesiae was higher with lateral decubitus position (18%), compared with sitting position (8%, $p < 0.05$). Patients with the lateral decubitus position needed more of one skin puncture (13%) during the technique compared with sitting position (7%, $p < 0.05$). Success rate was similar with the two patient positions.

Conclusions: The present investigations demonstrated that patient position may influence the occurrence of paraesthesiae during spinal anesthesia. Lateral decubitus position resulted in higher incidence of paraesthesiae than sitting position.

References:

1 Reina MA, et al. Rev Esp Anestesiol Reanim 2005; 52: 267–275.
2 McAndrew CR. Anaesth Intensive Care 2003; 31: 514–517.

A-411

Hemodynamic stability of patients under spinal anesthesia. Comparison of two methods of volume preloading

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Background and Goal of Study: The role of crystalloid preloading to prevent hypotension associated with spinal anesthesia in patients undergoing orthopedic surgery (lower limbs), has been challenged. The aim of this study is to compare the effects of volume preload with crystalloid solution and with hydroxyethyl starch 130/0.4, on the hemodynamic status of the above mentioned patients.

Materials and Methods: Two groups of 25 similar patients each, who underwent similar orthopedic surgical procedures at the lower limbs under spinal anesthesia, were studied. In the patients of group A volume loading was performed before anesthesia by infusing a crystalloid solution (10–20 ml/kg body weight). Patients of group B were volume preloaded with hydroxyethyl starch 130/0.4 (10 ml/kg body weight). The arterial pressure of the patients was recorded before and after the volume loading, before the spinal anesthesia and during the operative procedure every five minutes for two hours. The two groups of patients were perfused intraoperatively with the same quantity and quality of liquids.

Results and Discussions: Patients of group A presented a faster rise of arterial pressure, immediately after volume loading, comparing with patients of group B. At the 5 and 10 minutes, after the administration of spinal anesthesia, the arterial pressure of the patients in both groups was stable. The next assessments revealed that the gradual decrease of arterial pressure was significantly lower in the patients of group B.

Conclusion: The volume preloading with hydroxyethyl starch 130/0.4, in patients who undergo surgical procedures under spinal anesthesia, prevents the arterial pressure decreasing and offers hemodynamic stability for longer periods of time.

A-412

Walking spinal with ropivacaine and bupivacaine

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Background and Goal of Study: "Walking Spinal" is a new term and technique in regional anesthesia and lets the patient leave the operating theatre on foot.

The purpose of our study was to compare the equipotent doses of ropivacaine and bupivacaine for walk-out criteria and the characteristics of spinal anesthesia in day-case inguinal herniography surgery.

Materials and Methods: 61 patients were included our study as GrR (n = 31) ropivacaine (7.5 mg/mL) 7.5 mg + fentanyl 25 mcg, GrB (n = 30) bupivacaine (05%) 5 mg + fentanyl 25 mcg. CSEA was performed at L1–2 or L2–3 interspaces in sitting position. Each study solution diluted to 3 mL with distiled water was injected during 180 sec. Then the patients were placed 30°–45° semi-sitting position. Sensory onset time (SOT), motor onset time (MOT), degree of maximum motor block (MBD), time to T6 dermatome (TT6), two dermatom sensory regression time (SBR), S2 dermatom regression time (S2R), motor regression time (MBR), hemodynamic changes, time to first analgesic requirement (FAT), whether patients have ability to stand and walk at the operation ended in recovery room (ASW), comfort of surgery, patient and surgeon satisfaction were determined. Mann Whitney U, Chi-Square tests were used for statistical analysis.

Results: Data of SOT, MOT, TT6, SBR, MBR are shown in table. Median value of MBD was Bromage 2, and similar among groups. The number of ASW patients were 18 in GrR, 13 in GrB and were not statistically different. Hemodynamic parameters, FAT, The comfort of surgery, patient and surgeon satisfaction were similar.

	SOT	MOT	TT6	SBR	MBR*	S2R
GrR	194.8 $\pm$ 29.1	510.9 $\pm$ 396.7	419.3 $\pm$ 136.8	63.2 $\pm$ 16.8	56.1 $\pm$ 36.1	82.7 $\pm$ 30.7
GrB	204.5 $\pm$ 28.1	564.0 $\pm$ 406.2	370.3 $\pm$ 108.7	69.6 $\pm$ 16.6	72.5 $\pm$ 23.3	91.6 $\pm$ 25.8

Conclusions: In inguinal hernia repair; walking spinal anesthesia performed with the equipotent doses of ropivacaine and bupivacaine may provide similar walk-out criteria and sensorial block characteristics but minimum delay motor block regression with bupivacaine may be observed.

References:

1 Vaghadia H. Can J Anesth 2001; 48(3):256–60.
2 Ganapathy S. Can J Anesth 2001; 48(3):222–4.

A-413

Comparison of unilateral and conventional spinal anaesthesia for outpatient inguinal herniorraphy

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Background and Goal of Study: Spinal anaesthesia is widely used for inguinal hernia repair, providing a fast onset and effective sensory and motor blockade. Limiting the block at the operative site (unilateral spinal anaesthesia) can be proposed to obtain high quality and long duration analgesia for outpatient surgery.

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Method(s): forty, ASA physical states I and II patients, scheduled for elective inguinal hernia repair were prospectively enrolled. All patients were placed in a lateral position. They were randomly allocated in tow groups:

G1: conventional spinal anaesthesia: patients were placed immediately after the puncture in the dorsal position

G2: unilateral spinal anaesthesia: the lateral position was maintained for 15 minutes after puncture. All the patients received 8 mg of hyperbaric Bupivacaine 0.5% with 12.5 μg of Fentanyl.

Times from the end of the spinal injection to readiness for surgery, as well as the maximal level of sensory block, time for complete regression of spinal block and eligibility for home discharge were recorded. At the same times the cardiovascular variables were also recorded.

Result(s) and Discussions: Patients characteristics were similar, as well as surgical time. The following table summarizes the results of the study.

	G1	G2	p
Readiness for surgery (mn ± DS)	9 ± 3.42	10.71 ± 3.04	0.16
Regression of sensory block (mn ± DS)	72.73 ± 13.22	90.57 ± 14.00	0.002
Time of PADSS = 9 (mn)	388 ± 34	353 ± 42	0.09
Time to micturition (mn)	298 ± 17	266 ± 19	0.04
Time for home discharge	402 ± 36	380 ± 48	0.06

The unilateral spinal anaesthesia offers a deeper, more durable motor and sensory blocks.

Incidence of Hypotension was higher in conventional group: 26% vs 10% ($p = 0.003$).

Conclusions: The unilateral spinal anaesthesia provides, less incidence of hypotension, a long duration of analgesia and shorter home discharge time.

Reference(s):

1 Casati A, et al. Anesth Analg 2004; 99(5): 1387–1392.
2 Kehlet H, et al. Acta Anesthesiol Scand 2005; 49: 143–146.

A-414

Pain relief following breast augmentation surgery. A comparison between incisional patient controlled regional analgesia and traditional oral analgesia

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Background and Goals: Postoperative pain is a common problem following ambulatory breast augmentation surgery. This study was performed to compare standard of care (oral analgesics) with patient controlled incisional regional analgesia (PCRA).

Methods: Surgery was performed under local anesthesia and Monitored Anesthesia Care (MAC). Sixty adults (ASA 1–2) were randomized to one of two groups. Patients in Group PCRA could self-administer 10 mL of 0.25–0.5% ropivacaine in the left breast and right breast respectively. Patients in Group T (tablets) received our standard of care treatment, i.e. oral paracetamol 1 g 4 times a day and oral ibuprofen 500 mg three times a day. Parameters measured included: analgesic requirements (in PACU and post-discharge), pain intensity (visual analogue scale), patient satisfaction, global analgesia, side effects, and quality of recovery.

Results: VAS pain scores were significantly lower in Group PCRA compared to Group T at all time periods ($p < 0.05$). No differences were found in VAS scores between the right and left breasts. Significantly more patients in Group T requested analgesics in the PACU (27 *vs*. 7; $p = 0.001$) and also at home (20 *vs*. 11; $p < 0.02$). More patients in the Tablet group had nausea and vomiting (10 *vs*. 3; $p < 0.05$). Global analgesia on day 2 was significantly better in PCRA group; however, patient satisfaction was similar in both groups. More patients in tablet group had sleep disturbance and woke up at night due to pain disturbance.

Conclusions: Pain relief after ambulatory breast augmentation is superior with incisional PCRA compared to oral analgesic combination of paracetamol and ibuprofen.

A-415

Analgesic effect of jet injection of different concentrations of lidocaine for i.v. cannulation pain

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Background and Goal of Study: Intravenous cannulation pain is stressful for patients undergoing surgery. In this study, we examined the analgesic effect of local anesthesia using jet injection with different concentrations of lidocaine.

Materials and Methods: After institutional approval and written consent, 14 healthy volunteer participated in this study. Five vessels on the dorsum of hand of subjects were randomly selected, and 4 of them were given 100 μl of saline or lidocaine (0.5, 1.0 or 2.0%) using jet injector MADAjet™ (MADA international, USA). Subjects received intravenous cannulation with 20 gauge needles at each vessel 1 min after jet injection. Pain for jet injection and cannulation were recorded using the visual analog scale (0–100). In addition, usefulness of analgesia by jet injection was evaluated from a questionnaire.

Results and Discussions: The table below shows pain ratings during jet injection, i.v. cannulation, and jet injection plus i.v. cannulation.

Analgesia	None	Saline	0.5%	1.0%	2.0%
Jet injection		7 ± 5	13 ± 9	12 ± 7	18 ± 9
Cannulation	41 ± 22	44 ± 21	9 ± 8	5 ± 6	2 ± 3

Mean ± SD.

Jet injection with 0.5 to 2.0% lidocaine significantly decreased pain associated with i.v. cannulation ($p = 0.001$). However, there were no significant differences between 0.5%, 1.0% and 2.0% lidocaine. Pain during jet injection with 2% lidocaine was significantly higher than that during jet injection of saline ($p = 0.001$). Pain with i.v. cannulation after jet injection with saline was similar to i.v. cannulation alone. All subjects preferred lidocaine to saline, 9 subjects preferred 0.5% or more; 4 subjects preferred 1.0% or more; and one subject preferred 2% lidocaine.

Conclusion: Jet injection with lidocaine significantly suppresses pain of i.v. cannulation, and all subjects prefer jet injection of lidocaine to that of saline.

A-416

Peribulbar block with medial access: comparison between two combination of anaesthetic (lidocaine 4% and ropivacaine 1% vs lidocaine 4% and levobupivacaine 0.75%)

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Background and Goal of Study: Local anaesthesia is the technique most commonly employed in ocular surgery. Among many approaches, peribulbar block with medial access (Pbm) represents an useful variation in reason of its more safety for same effectiveness. A combination of xylocaine (XL) and another anaesthetic drug with longer effects is most frequently used. The aims of our study is: evaluate safety and effectiveness of Pbm and compare two combinations of drugs: XL 4% and ropivacaine (RP) 1% – 1:1 – versus XL 4% and levobupivacaine (LB) 0.75% − 1:1.

Materials and Methods: 534 patients (pt),186 male and 338 female, of range of age: 37–93, ASA I–III were enrolled. Pt were randomizated in 2 groups, R and L, first received XL 4% and RP 1% (1:1) while group L (GL) received XL 4% and LB 0.75% (1:1). We evaluate the score of ocular and eyelid stillness (12 items) at 5 (T1) and 10 (T2) minutes from block and the return of motor and of visual function; the necessity of supplemental anaesthesia (locally or i.v.), the occurrence of complications and the occurrence of pain (evaluated by VAS), nausea and/or vomiting were also assessed.

Results and Discussions: No significant difference in age, sex and weight between the 2 groups. GL showed an earlier onset of block (T1: group R (GR) 3.9/12 mean of stillness score vs 5.3/12 in GL $p > 0.05$). No significant difference between the two groups in the request of supplemental doses of sedative, post-operative nausea or vomiting and motor function reprisal. At 6 hours post-surgery GR necessitated supplementary dose of i.v. analgesic (Ketorolac 30 mg) statistically ($p > 0.05$) more than GR, but at 12 hours pain was < 3 by VAS in all pt of both groups.

Complications comprised 3 cases of hematoma of the lower eyelid and 2 cases of conjunctival chemosis that do not stopped surgical procedures.

Conclusion(s): Our study demonstrates that Pbm is safe and easy to perform, rapidly effective, reliable and free of serious adverse effects. The degree of motor block was less profound, slower to appear and faster to disappear in pt of GR compared to those in GL with high statistical significance ($p > 0.0001$). Despite of this data degree of comfort during and post surgery, elicited from pt and surgeons was comparable between the two groups.

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A-417

The effect of hyaluronidase on the quality of Sub-Tenon's anaesthesia

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Background and Aim of Study: Sub-Tenon's block is widely used and is the anaesthetic technique of choice for eye surgery in many hospitals. In order to improve distribution of the anaesthetic, 15–150 IU/ml of adjuvants hyaluronidase, can be added to the solution. Hyaluronidase is used to render the tissues more easily permeable to injected fluids. The quality of Sub-Tenon's anaesthesia was assessed in the presence of 15, 75 and 150 IU/ml hyaluronidase solution, mixed with 2% Lignocaine and 0.5% Bupivacaine in a 1:1 ratio.

Patients and Methods: After approval of the local ethics committee, patients included in the study were randomly distributed into three groups. All groups obtained good surface anaesthesia (Amethocaine 1%) with a mixture of 5 ml Lignocaine 2% and Bupivacaine 0.5% (ratio 1:1). Sub-Tenon's block was performed with a 19 G, blunt, curved cannula. Group H-15, containing 40 patients of a mean age of 66 ± 7.8 (ASA II–III), were administered with 15 IU/ml, group H-75, 40 patients of mean age 69 ± 7.3 (ASA II–III) were administered with 75 IU/ml and group H-150, 42 patients of mean age 70 ± 6.8 years (ASA II–III) with 150 IU/ml hyaluronidase. Statistics were analysed with the Chi-Squared test and Student's t-test.

Results:

	H-15	H-75	H-150
Block onset (min)	5.12 ± 0.94	4.8 ± 0.69	3.8 ± 0.86
Block duration (min)	47 ± 15.6	48 ± 12.6	60 ± 18.8
Tot. akin. (patients)	15 (38%)	21 (52%)	31 (74%)
Part. akin. (patients)	25 (62%)	19 (48%)	11 (26%)
Pain of operation	0.48	0.56	0.66
Pain after 1 h	0.88	0.78	0.72
Ptosis complete	14 (36%)	15 (38%)	25 (64%)
Ptosis incomplete	26 (64%)	25 (62%)	17 (36%)

Conclusions: Sub-Tenon's block with 150 IU/ml hyaluronidase showed a more rapid onset of the block and akinesia and ptosis were more complete than when smaller amounts of hyaluronidase were used. Intra-operative analgesia was satisfactory in all methods. Post-operative analgesia after 1 hour was similar.

References:

1 Kumar, M. How to do a Sub-Tenon's block. CPD Anaesthesia, 2001; 3(2):56–61.

2 Kumar, et al. A review of Sub-Tenon's block: current practice and recent developments. EJA, 2005; 22(8):567–77.

A-418

Patients' fears and perceptions of regional anaesthesia in Ireland

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Background and Goal: Patients in Ireland may not be well informed about the risks and benefits of regional anaesthesia. A cultural bias may exist against regional anaesthesia with patients expressing a preference for general anaesthesia without the knowledge to make an informed decision. This survey examines the attitudes of patients in Ireland toward a number of commonly perceived fears about regional anaesthesia.

Materials and Methods: A survey of preoperative surgical patients was conducted in St Vincent's University Hospital, Dublin in 2004. Fifty male and 50 female patients aged between 18–90 years old were surveyed. General and regional anaesthesia were defined. A scenario involving major knee surgery was described, and participants were asked to choose between regional and general anaesthesia. Respondents were then questioned about specific aspects of their preference and their attitudes toward commonly perceived fears associated with regional anaesthesia.

Results and Discussions: Sixty three percent of respondents chose general anaesthesia. Approximately 50% of respondents were very concerned about permanent paralysis, peri-operative pain, seeing the surgery and hearing the surgical procedure (see Table 1). Only 27% of patients were aware of the cardiovascular risks with general anaesthesia and 37% were aware of the risk of aspiration.

Table 1. Patients' attitudes and fears of regional anaesthesia

Fear/attitude	Very concerned (%)	Concerned (%)	Not concerned (%)
Being awake	24.0	12.0	58.0
Hearing surgery	44.0	18.0	32.0
Feeling pain	51.0	29.0	20.0
Paralysis	54.0	20.0	26.0
Seeing surgery	51.0	15.0	32.0
Loss of control	28.0	21.0	51.0
Nausea/vomiting	21.0	27.0	52.0
Headache	18.0	21.0	61.0
Needle in back	24.0	20.0	56.0
Back injury	26.0	34.0	40.0
Pain (IV cannula)	4.0	0.0	96.0

Conclusions: Patients' fears and conceptions about regional anaesthesia are distorted due to the lack of information regarding regional anaesthesia and the risks of general anaesthesia. Future anaesthesia-related educational campaigns should address the patient's concerns about regional anaesthesia and inform them of its benefits.

A-419

Comparative study of topical anaesthesia in cataract surgery (lidocaine vs. levobupivacaine)

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Background and Goal of Study: To compare the efficacy of levobupivacaine 0.75% vs. lidocaine 2% during cataract surgery under topical anaesthesia.

Materials and Methods: A prospective, randomized, double-blind study comparing two agents for topical anaesthesia in cataract surgery is reported. One hundred and twenty consecutive cases undergoing clear corneal phacoemulsification were enrolled into two groups, receiving either topical 0.75% levobupivacaine (n = 60) or 2% lidocaine (n = 60). The main outcome measures of the study were intraoperative and postoperative pain, requirement for additional anaesthesia, comfort and cooperation of the patient, and corneal epithelial toxicity induced by topical drugs. Systolic and diastolic blood pressure, pulse rate and peripheral oxygen saturation were recorded preoperatively and during surgery.

Results and Discussions: Levobupivacaine 0.75% provided significantly better topical anaesthesia than lidocaine 2% during cataract surgery ($p = 0.003$) and at the follow-up ($p = 0.007$). There were no statistically differences between the two groups thirty minutes and five hours after surgery. Epithelial toxicity was similar in both groups. Satisfactory comfort of the patient and the surgeon assessment of patient cooperation were clinically better in the levobupivacaine groups.

Conclusion(s): Levobupivacaine 0.75% was more effective than lidocaine 2% for topical anaesthesia in clear corneal phacoemulsification, providing better operative conditions and less systemic toxicity.

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1 Fichman RA. Use of topical anaesthesia alone in cataract surgery. J Cataract Refract Surg 1996; 22:612–14.

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3 Stevens JD. A new local anaesthetic technique for cataract surgery by one quadrant subtenon's infiltration. Br J Ophthalmol 1992; 76:670–4.

A-420

Sub-Tenon block for vitreoretinal surgery: our experience in 470 cases

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Background and Goal of Study: In the past few years sub-Tenon eye block has gained popularity over traditional ophthalmic regional anaesthesia techniques, most likely due to a more acceptable risk profile (1, 2, 3). However, despite its widespread use in anterior segment surgery, there are fewer reports about its use in vitreoretinal surgery. In our center, sub-Tenon block has become the standard technique for this type of surgery.

Materials and Methods: This is a descriptive study in which we present our experience with 470 consecutive patients who underwent posterior pole surgery over a period of 16 months (from July 2004 to October 2005).

Results and Discussions: In the study period 437 (92.98%) patients received a sub-Tenon block, 32 (6.81%) received a general anaesthesia and 1 (0.21%)

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received other regional techniques. There were no serious block-related complications in this series. The only indication for general anesthesia was lack of collaboration of the patient (children and impaired mental status). There was only one case of conversion to a different anaesthetic technique (from sub-Tenon block to general anesthesia) during surgery because of excessive sedation of the patient.

Conclusion(s): In our experience, sub-Tenon block provides good surgical conditions with a very low incidence of major complications and a high success rate for posterior segment surgery.

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2 Guise P.A., Anesthesiology 2003; 98:964–968.
3 Nouvellon E., et al., Anesthesiology 2004; 100:370–374.

A-421

Comparison of needle and syringe and a needleless injection system in producing local anaesthesia for intravenous cannulation

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Background and Goal of Study: Previous work has demonstrated that the Medical House needleless injection system is effective at delivering subcutaneous local anaesthetic (1). The system uses a device that punctures the skin using a coiled spring mechanism. This study tests the null hypothesis that there is no difference in adequacy of local anaesthesia produced between the needleless injection system and a needle and syringe for insertion of intravenous cannulae.

Materials and Methods: After gaining local ethical approval and informed consent, forty patients were recruited. All underwent cannula insertion in the day surgery unit in the University Hospital of Wales, Cardiff, UK. Patients were randomised into two groups. Both groups received 0.1 ml of 2% lignocaine delivered subcutaneously. **Group 1** used 27 G needle and syringe and **Group 2** used the needleless injection system. The pain on insertion of the intravenous cannula and local anaesthetic insertion were assessed using a visual analogue scale (VAS) (0 = no pain, 100 = worst pain imaginable). Surface area of local anaesthesia produced was also documented. Statistical analysis used the Mann Whitney U test.

Significance was taken as $p < 0.05$.

Results:

	Group 1	Group 2	
	Median (interquartile range)		p value
Pain on insertion of cannula (VAS)	6 (1.5–11)	9.5 (2–30.5)	0.131
Pain on insertion of lignocaine (VAS)	7 (2–11)	5 (2.8–8.5)	0.735
Anaesthetised area (mm^2)	431.9 (282–716)	237 (127–393)	0.005

Conclusions: No statistical significant difference was found between the level of pain on cannula insertion using local anaesthetic delivered with either needle and syringe or the needleless system.

Reference:

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A-422

Remifentanil for sedation during carotid endarterectomy and locoregional anaesthesia: comparison of two doses

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Background and Goals: Cervical plexus blockade (CPB) allows early detection of stroke during carotid endarterectomy (CE), but sedation is often required to prevent discomfort and unrest [1]. While remifentanil 0.05 $mcg.kg^{-1}.min^{-1}$ is efficient for this purpose, respiratory depression may occur [2]. Our aim was thus to compare the efficiency and side effects of two different doses: 0.025 *vs* 0.05 $mcg.kg^{-1}.min^{-1}$.

Patients and Methods: After informed consent sixty consecutive patients, scheduled for CE with CPB, were included in this prospective double blind study and randomly allocated to 2 groups (n = 30 each):

- group 1: remifentanil 0.05 $mcg.kg^{-1}.min^{-1}$
- group 2: remifentanil 0.025 $mcg.kg^{-1}.min^{-1}$

Each patient had a combined superficial and deep CPB with 40 mL ropivacaïne 0.475%. Remifentanil infusion was started at cutaneous incision and stopped at the end of surgery. Respiratory rate (RR), $PaCO_2$, MAP, HR, and Ramsay Score were repeatedly collected from 30 min before CPB to 10 min post surgery. The necessity of local anaesthetic supplementation, both patient and surgeon's satisfaction were also quantified. Mann-Withney and Chi-Square tests were used and $p < 0.05$ was considered as significant.

Results: Remifentanil infusion was stopped, because of RR < 6/min or $PaCO_2 > 55$ mmHg in 11 patients of group 1 and in 3 of group 2 (36.6% vs 10%, $p < 0.05$). Increases in $PaCO_2$ were significantly more marked at any time studied in group 1. No intergroup difference was observed for hemodynamics and sedation, but anti-hypertensive treatment was more frequent in group 2 (20% vs 3.3%, $p = 0.04$). Patient and surgeon's satisfaction was elevated in both groups, even if additional local anesthesia was more often required in group 2 (18 patients vs 8, $p = 0.009$).

Conclusion: The 0.05 $mcg.kg^{-1}.min^{-1}$ regimen is not safe enough for additional sedation and analgesia during CE under CPB. Remifentanil 0.025 $mcg.kg^{-1}.min^{-1}$ is efficient and safer but need a tight and constant clinical respiratory monitoring.

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A-423

An anesthetic challenge for a new surgical approach

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Background and Goal of Study: We report our experience in Lacrimal Fossa Block[1]. It is a minimally invasive regional technique for a new surgical approach: Dacryocystorhinostomy (DCR) Transluminal.

Materials and Methods: Between January/2003-November/2006 82 patients were submitted to DCR transluminal. We used the lacrimal fossa block as the main anesthesia technique. We combined with the application of intranasal 10% cocaine paste (Mackintosh technique[2]) and topical conjunctival anesthesia using 4% cloroprochaine eye drops. All the patients were ASA I–III. The median age was 65 years (range 30–80). The male to female ratio was 32:50. After careful explanation of the anesthetic and surgical procedure we administered 2–3 mg midazolam iv. We used the ASA standards for basic anesthetic monitoring. The block was performed using 2 to 3 ml of ropivacaine 7.5 mg/ml.

Results and Discussions: This block enables relevant divisions of the trigeminal nerve with a single entry site. It has a high efficiency and a high level of patient acceptability. The speed of onset of local anesthesia and the low volume used of local anesthetic allows bilateral procedure without the risk of toxicity. We have no reports of vascular or oculars complications. Only 8 patients had transient diplopia that recovered within 2 hours. Any patient required conversion to general anesthesia for inadequate local anesthesia.

Conclusion(s): This block is simple to perform, effective and well tolerated. It has low morbidity and so, an ideal technique for ambulatory surgery.

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A-424

The effect of spinal anesthesia and intrathecal clonidine on propofol hypnotic requirements for conscious sedation

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Background and Goal of Study: It is stated frequently that patients with spinal block may be drowsy, although they may not have received any sedative drugs. Intrathecal clonidine increase the duration of sensory and motor blockade, and also have sedative effect. Thus we have conducted a study to investigate the effect of spinal anesthesia and intrathecal clonidine on propofol hypnotic requirement.

Materials and Methods: Forty-five adult patients scheduled to undergo local or spinal anesthesia were enrolled in this study. Group 1 included patients on local anesthesia, group 2 were patients on spinal anesthesia with 0.5% hyperbaric bupivacaine, group 3 were patients on spinal anesthesia with 0.5% hyperbaric bupivacaine and 75 μg clonidine. Target controlled infusion (TCI) of propofol was started at a target concentration of 1 μg/Ml and we checked lowest BIS during 5 min observation after effect site concentration (Ce) was reached at 1 μg/Ml. And then TCI of propofol was restarted at a target concentration of 1.5 μg/Ml and we checked lowest BIS during 5 min observation

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after Ce was reached at 1.5 μg/Ml. And we checked Ce when the BIS reached at 80 and 70 during observation.
Results: The minimum BIS at 1 μg/Ml Ce was 86.9 ± 11.3 (Group 1), 80.5 ± 8.5 (Group 2), 66.9 ± 15.5 (Group 3) and the minimum BIS at 1.5 μg/Ml Ce was 76.0 ± 13.4, 62.9 ± 12.4, 48.5 ± 13.7 respectively. The Ce of propofol with BIS 80 was checked initially 1.4 ± 0.5 μg/Ml (Group 1), 1.1 ± 0.3 μg/Ml (Group 2) and 0.8 ± 0.3 μg/Ml (Group 3). The Ce of propofol with BIS 70 was 1.8 ± 0.6 μg/Ml, 1.4 ± 0.3 μg/Ml and 1.0 ± 0.3 μg/Ml respectively.
Conclusions: Spinal anesthesia and intrathecal clonidine reduce the requirement of propofol for conscious sedation, and the Ce of propofol for conscious sedation is 1.4–1.8 μg/Ml at local anesthesia, 1.1–1.4 μg/Ml at spinal anesthesia with 0.5% hyperbaric bupivacaine, 0.6–1.0 μg/Ml at spinal anesthesia with 0.5% hyperbaric bupivacaine and 75 μg clonidine.
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A-425

Effects of immediately initiating ropivacaine infusion on unilateral spinal anaesthesia

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Background and Goal of Study: The present study was planned to investigate the side effects and duration of analgesia of immediately epidural 0.2% ropivacaine infusion in patients under unilateral spinal anesthesia.
Materials and Methods: ASA I–III, 43 patients undergoing partial hip replacement were randomly assigned to two groups receiving either 0.2% ropivacaine (n = 22) or 0.9% NaCl (n = 21) epidural infusion immediately after unilateral spinal anesthesia with 7.5 mg 0.5% heavy bupivacaine. At the end of the surgery, all of the patients in two groups had received PCEA for postoperative pain treatment using 0.2% ropivacaine. The duration and the level of motor and sensory blockade, heart rate, artery blood pressure, VAS, ropivacaine consumptions, side effects were recorded.
Results and Discussions: The duration of motor blockade was significantly longer in ropivacaine group, 312.27 ± 95.15 min versus 198.33 ± 78.40 min ($p < 0.0001$). The maximal level of sensory blockade, two dermatomes regression times of the level of sensory blockade, preoperative and postoperative VAS scores, amount of additional ropivacaine doses were similar among groups. First analgesic requirement time after spinal anesthesia was 256.57 ± 169.08 min in ropivacaine group, 160.42 ± 102.21 min in saline group ($p = 0.06$). Total ropivacaine consumption with PCEA at early postoperative period (4th hour) were 25.36 ± 8.29 mg in ropivacaine group and 32.67 ± 11.60 mg in saline group ($p = 0.029$). But, 24th hour ropivacaine consumptions among groups were similar ($p = 0.429$).

Prolonged motor blockade prevents early mobilization. Although, immediately initiating of infusion of ropivacaine decreased the analgesic requirement at early postoperative period, it prolonged motor blockade without any significant difference in duration of sensory blockade, VAS scores and total postoperative ropivacaine consumption.
Conclusions: Early ropivacaine infusion after unilateral spinal anesthesia may prolong motor blockade without any significant effect on postoperative analgesia and total analgesic consumption.

A-426

Spinal anaesthesia with levobupivacaine in glucose 40 g ml^{-1} or 80 g ml^{-1} for inguinal herniorrhaphy

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Background and Goal of Study: Hyperbaric levobupivacaine has been used successfully to provide spinal anaesthesia. In this study we compared the clinical efficacy of levobupivacaine when glucose was added in concentration of 40 g ml^{-1} for inguinal hernia repair.
Materials and Methods: Fifty ASA grade I–III patients, under spinal anaesthesia were randomized into two groups to received, A group: levobupivacaine 10 mg in glucose 40 g ml^{-1}, 2 ml. B group: levobupivacaine 10 mg in glucose 80 g ml^{-1}, 2 ml. The drug was injected slowly through a 25-gauge directional needle and patients maintained the lateral decubitus position for 15 min. The onset of pinprick analgesia at T 10, time for complete regression of spinal block and the cardiovascular changes were recorded.
Results and Discussions: The onset of pinprick analgesia at T10 was more rapid in the group with greater concentration of glucose ($P = 0.03$). A group: median 7 min. range 3–18 min. B group: median 4 min. range 3–12 min. The maximum level of sensory block on the operative side was the same in both groups. A group T6 (T3–10). B group T5 (T10–2). Complete motor block was produced in all patients of both groups. Complete regression of spinal anaesthesia was the same (222 [192–249] min). Cardiovascular changes were minimal without statistical differences between the groups.
Conclusion(s): Levobupivacaine 10 mg in glucose 40 g ml^{-1} provides an adequate block for inguinal hernia repair.
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A-427

Hyperbarik bupivacaine on spinal anaesthesia with or without clonidine in orthopedics surgery

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Background and Goal: Evaluating of intraspinale Clonidine effect in orthopedics surgery. Prospective comparative randomized study.
Material and Methods: 132 patients included, in orthopedics surgery planned, aged between 30–60 years old, ASA status I–II. Patients were divided into two groups: Bubivacaine group (B), Bubivacaine 12.5-mg + 0.5 ml GL. 5%, & Bubivacaine + Clonidine group (B + C), spinal anesthesia with hyperbaric Bubivacaine 12.5 mg + C 1 μ/kg/weight. Lumbar puncture was performed at the L2–L3 inter spaces, using a pencil point spinal needle, 25 gauge. We studied from one side: establishing, extension, duration time of sensory, motor block and from the other side; side effects of Clonidine hypotension, bradycardia, sedation and side effects of spinal anesthesia: urinary retention, seizures, nausea – vomiting, headache.
Results and Discussion: In group B + C using of 1 μ/kg/weight of Clonidine was associated with duration of motor bloc 186 ± 30′ (m ± sd), while in group B, duration of motor block was 152 ± 40′ (m ± sd) ($P < 0.01$). Postoperative analgesia (sensory block) was longer in group B + C 480 ± 35′, while in group B 200 ± 35′ (m–SD) ($P < 0.001$). Arterial hypotension was a frequent event in 6 cases or 27.3% of cases in group B and 8 cases or 36.4% in-group B + C. Bradycardia noted in 2 cases in the group B + C or in 9.1% of cases. In group B were noted 2 cases with urinary retention, 4 cases with seizures, 2 cases with vomiting, while headache wasn't noticed in any case, compared with group B + C, we did not observe those side effects.
Conclusions: Supplementing of C in dose 1 μ/kg /weight intraspinal with B in orthopedics surgery is associated with significant duration of postoperative analgesia, about 480 ± 35 min, but without significant influence in motor block, associated with neglected consequence in homodynamic. Maybe by small dose using, compared with literature data, where has been used bigger dose.

Non-appearance of side effects in spinal anesthesia as: urinary retention, **seizures**, vomiting, headache is another superiority of this use.
Reference:
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A-428

A dose-response study with hyperbaric articaine in spinal anaesthesia

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Background and Goals: Hyperbaric articaine 50 mg/ml has been found similar to hyperbaric lidocaine 50 mg/ml in spinal anaesthesia (1). Dose-response studies with hyperbaric articaine in spinal anaesthesia are lacking.
Methods: Ninety adult day-case lower-extremity surgery patients were randomised into 3 groups receiving hyperbaric articaine 60 mg (A60), 84 mg (A84), or 108 mg (A108) for spinal anaesthesia in double-blind fashion. Glucose was added to plain articaine 40 mg/ml (Ultracain®, Aventis) to a final concentration of 75 mg/ml. Sensory block was tested using a pinprick needle

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and motor block with a modified Bromage scale at 5, 10, 15, 20, 25, 30, 45, 60, 75, 90, 120, 150, 180, 210, 240, and 270 min.
Results: Patient and surgical characteristics were similar in the groups.

	A60	A84	A108
T10-analg., n	30	30	30
– onset (min)	5 (5–10)	5 (5–10)	5 (5–10)
– duration (h)	1.3 (0.8–2.0)	1.3 (0.5–2.0)	1.5 (0.5–2.0)
Recovery (h)			
– sensory	2.5 (1.5–3.0)	2.5 (1.5–4.0)	2.5 (2.0–3.5)*
– motor	2.0 (1.0–2.5)	2.0 (1.3–2.5)	2.0 (1.5–3.0)*

Results are median (5%, 95% C.I.); *P $<$ 0.05.

Median time from spinal injection to the end of surgery was 56 (35–80) min and to recovery of the block was 2.5 h. Five patients in A60 and 2 in A84 received fentanyl 40–95 μg for pain from thigh tourniquet or operative site at 45–71 min from the spinal injection. None of the A108 group patients needed fentanyl. Two A108 patients had sensory block spread up to the C3 dermatome. A108 patients required significantly more often medication for hypotension, they had more nausea and vomiting, and first voluntary oral drinking occurred later (P $<$ 0.05) compared with the other groups.
Conclusions: Hyperbaric articaine 60 mg or 84 mg offered adequate spinal anaesthesia suitable for short lower extremity surgery, with fast recovery and no serious side-effects. The future role of hyperbaric articaine, *e.g.*, in day-case surgery has to be determined by comparing it with other short acting agents or mixtures in large-scale studies.
Reference:
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A-429

Outpatient spinal anesthesia with 2-chloroprocaine

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Background and Goal of Study: The aim of this prospective, randomized, double blind study was to identify the most effective dose of 2-chloroprocaine for lower limb outpatient procedure.
Materials and Methods: With Ethical Committee approval and patients' written consent, 45 ASA physical status I–II outpatients undergoing elective lower limb surgery received spinal anesthesia with 30 mg (group Chlor-30, n = 15), 40 mg (group Chlor-40, n = 15), or 50 mg (group Chlor-50, n = 15) of 1% preservative free 2-chloroprocaine. Sensory and motor blocks were blindly evaluated until readiness for home discharge.
Results and Discussions: Onset time was similar in the three groups. General anesthesia was never required to complete surgery; however patients of group Chlor-30 showed a trend for requiring more frequent intravenous analgesic supplementation (7 patients; 50%), than both Chlor-40 (5 patients; 33%), and Chlor-50 groups (2 patients; 13%) (P = 0.034). Spinal block resolution and recovery of ambulation were faster in group Chlor-30 [60 (41–98) min and 85 (45–123) min] than in groups Chlor-40 [85 (46–141) min and 180 (72–281) min] and Chlor-50 [97 (60–169) min and 185 (90–355) min] (P = 0.001 and P = 0.003, respectively), with no differences in home discharge [182 (120–267) min in group Chlor-30, 98 (123–271) min in group Chlor-40, and 203 (102–394) min in group Chlor-50 (P = 0.155)]. No transient neurologic symptoms were reported at the 24 h and 7 days follow-up. We concluded that while 40 and 50 mg of 2-chloroprocaine provide adequate spinal anesthesia for outpatient procedures lasting 45–60 min, 30 mg produce a spinal block of insufficient duration.
Conclusion(s): This study showed that 40 and 50 mg of 1% plain 2-chlorprocaine provide adequate surgical block in outpatients undergoing lower limb surgery of 45–60 min; while reducing the dose of 2-chloroprocaine to 30 mg resulted in a spinal block of insufficient duration and has no advantages in terms of home discharge.

A-430

Caudal and low-dose hyperbaric bupivacaine spinal blockade for adult anorectal surgery: a double-blinded randomized controlled study

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The goal of the randomized controlled study was to test the hypothesis that caudal and low-dose spinal hyperbaric bupivacaine block provide similar level and quality of anaesthesia for adult anorectal surgery.
Materials and Methods: The study included 114 consecutive ASA 1–3 patients. Spinal anaesthesia was made in the sitting position at L3–4 or L4–5 with hyperbaric bupivacaine (Marcaine Spinal Heavy 0.5%) injected over 2 min: group S5 (n = 38) 1.0 ml, group S4 (n = 38) 0.8 ml. After sitting for 10 min surgery was started. Caudal block (group K, n = 38) was performed with 7.5 ml of 0.5% bupivacaine + 7.5 ml of 2% lidocaine + 5 μg/ml epinephrine + saline to 20 ml. Comparison was based on: rate of success, level and duration of sensory and motor block, time to voiding and ambulation, mean BP and HR, complications, consumption of analgesics, quality of anaesthesia according to the patient and medical staff (0–2 score). ANOVA, post hoc Bonferroni, χ^2, Kruskall-Wallis and Mann-Whitney tests were used.
Results: The rate of success was 92.1% in group K *vs* 100% in group S5 and S4 (p $>$ 0.05). More patients in group K received i/v thiopentone (p = 0.02). Characteristics of anaesthesia are presented in the table, mean ± SD, no of cases (%), median (range), p $<$ 0.05 significant:

Variable		Group S5	Group S4	Group K
Sens. block:				
Dermatomes		7.1 ± 2.2	6.7 ± 1.9	7.2 ± 1.9
Duration, min		253.2 ± 39.8	231.1 ± 42.3#	300.1 ± 45.5*
Motor block	0	26 (68.4)	32 (84.2)	24 (68.6)
	1	11 (29.0)	3 (7.9)	8 (22.9)
	2	1 (2.6)	3 (7.9)	3 (8.5)
Duration of motor block, min		0 (0–90)	0 (0–60)	0 (0–150)
Time to ambulate, min		136.6 ± 32.2	123.0 ± 45.9	184.3 ± 41.3*

p $<$ 0.05 * group K vs S5 and S4, #S5 vs S4.

Quality of anaesthesia was rated as excellent by the surgeon in 88.6% of cases in group K *vs* 100.0 and 97.4% in group S5 and S4, respectively (p $<$ 0.05).
Conclusion(s): 1) low-dose spinal hyperbaric bupivacaine produces similar level and shorter duration of anaesthesia as caudal lidocaine-bupivacaine (1/1) and can be recommended as alternative methods for anorectal surgery; 2) caudal block produces less quality for surgery.

A-431

Intrathecal morphine decreases pain intensity in patients undergoing spine surgery

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Background and Goal of Study: In this prospective, randomized, placebo-controlled, double-blind study we studied the effect of intrathecal morphine (Mo) on post-operative pain intensity after posterior lumbar interbody fusion (PLIF; 1; 2).
Materials and Methods: After approval by the local ethic committee and informed consent 46 patients (pat) were randomized in 2 groups (gr): Mo gr. and Saline (Sal; placebo) gr. Anaesthesia was induced with fentanyl 2 μg/kg, propofol 2 mg/kg, atracurium and maintained with remifentanil 0.25–0.5 μg/kg/min and isoflurane 0.5 MAC. At the end of surgery Mo 0.4 mg or Sal was administered intrathecally under vision by the surgeon. Blood samples for blood gas analyses were obtained. VAS scores for pain at rest were assessed before surgery and 4 h, 8 h, 12 h, 16 h and 20 h after surgery. PCA-Piritramide (a synthetic opioid) consumption was recorded during the observation period. Stat: Mann-Whitney.
Results and Discussions: Demographic and surgical data were comparable between groups (n.s.). There was no significant difference in side effects and complications after surgery (n.s.). Blood gas analyses were comparable (n.s.). VAS scores for pain before surgery (baseline) were comparable between the groups (n.s.). However, after surgery the VAS scores were significantly decreased in the Mo gr compared with the Sal gr: 20 ± 24 vs. 33 ± 19 (at 4 h), 16 ± 22 vs. 28 ± 16 (at 8 h) respectively; p $<$ 0.05. Moreover, cumulative piritramide consumption was significantly lower in the Mo gr: 20 mg vs. 34 mg (Sal gr), respectively, p $<$ 0.05.
Conclusions: Intrathecal Mo significantly decreased pain intensity and supplementary oipioid consumption after spine surgery. In addition, it is not associated with clinically significant side effects or complications.
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A-432

Double-blind comparison of spinal block with three lidocaine-morphine mixture in knee arthroplasty

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Background and Goal of Study: This prospective, randomized, double-blind study was designed to compare the safety and effectiveness of spinal block with three lidocaine-morphine mixture in patients undergoing knee arthroplasty.
Materials and Methods: Following ethic committee approval and informed patient consent, by using a double-blinded study design, sixty ASA I–II patients undergoing total knee replacement with spinal anaesthesia were randomized into the following three groups: Group I (n = 20), (2%) lidocaine 40 mg + morphine 25 mcg; Group II (n = 20), (2%) lidocaine 40 mg + morphine 50 mcg; Group III (n = 20), (2%) lidocaine 40 mg + morphine 100 mcg. Haemodynamic variables, pain and sedation scores, onset and duration of sensory and motor block, duration of spinal anaesthesia and side effects were recorded before and at 1, 2, 5, 10, 15, 20 and 30 minutes after spinal block.
Results and Discussions: The onset of sensory block was similar between groups. Duration of sensory and motor blockade was significantly longer in Group II and III than in Group I ($p < 0.05$). Bromage scores was significantly higher at 1 and 2 minutes in Group III than in Group I ($p < 0.05$). The duration of spinal anaesthesia was significantly longer in Group III (23.1 ± 2.9 hour) than in Groups II (14.9 ± 3.8 hour) and I (3.9 ± 0.6 hour) ($p < 0.05$). No significant difference was found in pain and sedation scores between groups. Two patients (10%) in Group I, four patients in Group II (20%) and five patients in Group III (26%) experienced nausea and were treated with volume replacement and ephedrine (10 mg) IV. The incidence of nausea was found significantly higher in Group III than in Group I.
Conclusion(s): In patients undergoing knee arthroplasty with spinal anesthesia, the addition of morphine (100 mcg) intrathecally to 40 mg of spinal lidocaine (2%) led to superior analgesia and longer postoperative pain relief, but was associated with high incidence of nausea.

A-433

Spinal anaesthesia using Taylors lumbosacral approach reducing the incidence and severity of haemodynamic side effects in patients undergoing transurethral surgery

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Background and Goal of Study: Bradycardia and hypotension are the most common undesired side effects during spinal anaesthesia (SPA) and are related to the onset and maximum level of sensory block (MLSB). In 1940 Taylor described a SPA technique by a lumbosacral approach which caused less haemodynamic disturbances. The purpose of the present study was to compare the incidence and severity of haemodynamic side effects between a lumbar approach at L4/5 or Taylor's lumbosacral approach.
Material and Methods: All SPA performed by one trainee during his residency using either the lumbar or lumbosacral approach had been accurately recorded according to the institutional residency program. The first 100 spinals were withdrawn to reduce effects of a learning curve. So, the records of all SPA with plain bupivacaine for a standardised operative procedure (transurethral resection) were analyzed, regarding feasibility, time course of MLSB, loss to temperature discrimination, and onset of motor block as well as haemodynamic side effects (decrease in heart rate and mean arterial pressure for more than 10% and 20%).
Results and Discussion: 148 patients received SPA by a L4/5 approach and 113 patients by Taylor's approach. Bupivacaine dose did not differ between groups. Onset of MLSB was faster (17.8 ± 6.5 min vs. 22.6 ± 6.7 min, $p < 0.001$) and extension of blocks was greater (14.3 ± 2.5 segments vs. 12.7 ± 1.8 segments, $p < 0.001$) in the lumbar group. Onset and duration of motor block did not differ between groups. The maximum decrease in heart rate occurred earlier (46.9 ± 31 min vs. 61.8 ± 38.8 min) and to a larger extent (16.7 ± 11.8% vs. 9.4 ± 9.9%, $p < 0.001$) in the lumbar group. The maximum decrease in mean arterial pressure was also greater in the lumbar group (14.9 ± 8.6% vs. 10.5 ± 8.3%, $p < 0.001$). Higher levels of MLSB correlated with the occurrence of bradycardia ($p = 0.01$).
Conclusion: SPA with plain bupivacaine using Taylor's approach was associated with slower onset, lower extent of MLSB, and less haemodynamic disturbances compared to the classical lumbar approach at L4/5. However, the lower MLSB may limit the use of Taylor's approach if a high MLSB is required.

A-434

Comparison of single-shot epidural with ropivacaine-sufentanil and ropivacaine-neostigmine

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Background: In this study,during lower extremity surgery, single-shot epidural ropivacaine plus sufentanil and ropivacaine plus neostigmine are compared according to the parameters of hemodynamics, sensorial and motor block, sedation requirements and perioperative complications.
Materials and Methods: Following ethical committee approval, ASA 1–3, 29–77 years old 40 patients scheduled for lower extremity surgery were included. All patients were premedicated with 0.03 mg/kg midazolam and received 500 ml crystalloid solution intravenously. After standard monitorization patients were randomly allocated into two groups. Patients on lateral decubitous position received epidural injection through the L1–2 or L2–3 intervertebral space via a 18 GaugeTouhy needle. Patients in Group 1 were given 15 ml 0.75% ropivacaine + 20 mcg sufentanil and those in Group 2 15 ml 0.75% ropivacaine + 250 mcg neostigmin. Sedation was done using 1–3 mg midazolam when needed. Mean arterial pressures and heart rates were recorded before epidural intervention and thereafter at 5, 7, 10, 15, 20, 30, 40, 50, 60, 90 and 120 minutes. Time to reach to T10 and maximum sensorial blockade level, motor block, adverse effects and sedation requirements were assessed and recorded. Operation was started when the surgical sensorial level was reached. Statistical analyses were performed using Chi-square and Student's t-tests and $p < 0.05$ was considered statistically significant.
Results: There were no significant differences between groups for demographic variables, motor block, maximum sensorial block level, time to reach T10 dermatomal level and perioperative and postoperative complications ($p > 0.05$). Pre-epidural, 5,7 and 30 minutes' MAPs were significantly high in Group 1 ($p < 0.05$). Time to reach maximum sensorial level and midazolam requirements for sedation were higher significantly in Group 2 ($p < 0.05$).
Conclusions: Both combinations were found to restore necessary conditions for lower extremity surgery. Despite any advantages of the combinations over each other, higher sedation requirements in neostigmin group reveals that addition of narcotics to local anesthetics for single-shot epidural could maintain more comfortable operative conditions for patients.

A-436

The depth of epidural space in clinical practice – analysis of 4964 cases

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Background and Goal of Study: To determine the influence of the puncture site and approach on the depth of epidural space and on the incidence of complications, retrospective case controlled study was applied.
Materials and Methods: All adult surgical patients from 1994 July to 2005 August, who required the epidural catheterization, were enrolled into the study. Originally, successive 5543 cases were extracted from the database and completed 4964 data sets were analyzed.
Results and Discussions: The punctures in upper thoracic level required longer depth of the epidural space than that of other sites in both approaches (Table), and the depth was the shortest in lower thoracic site at midline. Using paramedian approach, no significant difference was found between lower thoracic puncture and lumber one. In thoracic site, patient's age, weight and the vertebral level were significantly correlated with the epidural depth using multivariate analysis. The incidence of CSF regurgitation was significantly higher in lumber catheterization with paramedian approach and that of blood aspiration was significantly higher in thoracic insertion with midline one.

Table. The depth of the epidural space in 4964 cases

Site	Approach	Midline	Para-median
Thoracic	Upper (=Th9/10)	465*	1226*
		4.99 (0.998)	5.15 (0.947)
	Lower (=Th10/11)	590*	550*
		4.11 (0.897)	4.60 (0.989)
Lumber		1835*	298
		4.23 (0.886)	4.63 (0.959)
Total (n)		2890	2074

Upper row: n. lower row: the depth of epidural space, expressed as mean (SD) (cm).
*: $p < 0.05$ between the groups. There were significant differences in the depth between midline and paramedian approach at each puncture site.

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Conclusion(s): The depth of epidural space is varied by site, vertebral level, patient's characteristics including age and weight, and the type of puncture approach. In our operation room, less common approach increased a risk of complication of catheterization.

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A-437

Preemptive gabapentin prevents tourniquet pain in knee cruciate ligament reconstruction patients under epidural anesthesia

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Background and Goal of Study: Tourniquet pain complicates the use of pneumatic tourniquets to produce a bloodless operating field during surgical procedures involving the extremities (1). Gabapentin is an antiepileptic drug and has been recognized as an adjuvant for treating certain symptoms of chronic pain syndromes. Several clinical trials also have indicated that preemptive use of gabapentin can decrease postoperative pain and rescue analgesic requirements in a number of surgeries (2). We thus tested the hypothesis that preoperative gabapentin may delay the onset of tourniquet pain during epidural anesthesia.

Materials and Methods: The institutional review board of our hospital approved the study and written informed consent was obtained from each participant. Forty-two ASA I patients undergoing knee cruciate ligament reconstruction were randomized 1:1 to receive oral gabapentin 1200 mg or placebo 2 hours before surgery and studied in a double-blinded manner. All patients received epidural anesthesia with 20 mL of 2% lidocaine. The onset time and severity of tourniquet pain was recorded. The level of sensory block was determined by the pinprick method at the occurrence of tourniquet pain. Hemodynamic changes and side effects of gabapentin were also recorded.

Results and Discussions: The onset time of tourniquet pain from the tourniquet inflation was significantly longer in the gabapentin group (98 ± 18 min, Mean ± SD) compared with the placebo group (47 ± 12 min; $p < 0.05$).

Conclusion(s): Preoperative gabapentin delays the onset of tourniquet pain during epidural lidocaine anesthesia in patients who undergo knee cruciate ligament reconstruction.

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A-438

Influence of the approach angle on the coiling length of the thoracic epidural catheter

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Background and Goal of Study: Thoracic epidural analgesia has become the standard in pain control after thoracotomy. Most epidural catheters are placed in a blind fashion. Malposition, kinking, and even knotting of the epidural catheter were reported. We hypothesized that the approach angle of the epidural needle may have an affect on the position of the epidural catheter tip. The coiling length (the length of the catheter within the epidural space when any part of the catheter just begins to head caudally) was measured and compared after inserting the epidural catheter with two different approach angles.

Materials and Methods: Eighty patients scheduled for thoracotomy were randomly allocated into two groups depending on the approach angle. Epidural catheterization was performed under fluoroscopic guidance. An end-hole 19-gauge Flextip Plus® epidural catheter was used. The epidural needle was inserted using a paramedian approach at the T8-9 level and entered the epidural space at the T7-8 intervertebral space (acute angle group) or the T6-7 intervertebral space (obtuse angle group). The T6-7 intervertebral space was approached if acute angle approach was unsuccessful or if the epidural catheter tip could not reach the intended level (T4-5). Afterwards, the epidural catheter was slowly advanced under fluoroscopic guidance. After measuring the coiling length, the catheter was placed at the T4-5 intervertebral level.

Results and Discussion: Forty two patients were allocated into the obtuse angle group and 38 patients were allocated into the acute angle group. In 26 patients of the acute angle group, obtuse angle approach was repeated. There was a significant difference in the coiling length between the two groups (acute angle group vs. obtuse angle group: 4.9 ± 3.3 vs. 6.6 ± 3.6 cm; $P = 0.019$). There was no difference in the incidence of paresthesia during catheter insertion. In patients who used both approach angles, the coiling length after the obtuse approach angle was 2.5 ± 3.2 cm longer than the acute approach angle ($P = 0.001$).

Conclusion: Approaching the thoracic epidural space with an obtuse angle provides longer coiling length and may reach the intended level with less risk of knotting or displacement.

A-439

Effect of epidural anesthesia on hemodynamic variables assessed by measuring suprasystolic brachial artery signals

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Background and Goal of Study: Extensive epidural anesthesia (EA) results in hypotension secondary to both arterial dilatation and a reduction in cardiac output (1). These changes can be reversed with vasopressors such as epinephrine (EPI) (1). To determine whether changes in arterial tone and cardiac performance following EA could be assessed non-invasively, we used the Pulsecor® monitor that records suprasystolic signals from a piezoelectric sensor placed over the brachial artery beneath the distal edge of a blood pressure cuff to identify both incident and reflection waves. From these signals, augmentation index (AI) was calculated as a measure of arterial tone (2) and dv and dt as indices of cardiac performance.

Materials and Methods: After IRB approval, 22 patients undergoing total knee arthroplasty under extensive EA were prospectively studied. Measurements were made in the supine position: (1) at baseline; (2) after propofol sedation; (3) after EA; and (4) 2 and 4 μg/min EPI. Data (mean ± SD) were compared by paired t-test and ANOVA with $p < 0.05$ considered significant.

Results: Mean arterial pressure (MAP) decreased with propofol and after EA ($p < 0.0001$) but increased with 2 and 4 μg/min of EPI after EA ($p < 0.001$). AI decreased with propofol and after EA ($p < 0.0001$) and with 2 and 4 μg/min EPI ($p < 0.05$). dt increased with propofol and after EA ($p < 0.001$) and then decreased with EPI after EA ($p < 0.05$). dv increased with EPI after EA ($p < 0.0001$). The degree of hypotension with EA was related to the decrease in both AI ($p < 0.005$) and dv ($p < 0.05$) but not dt.

	Baseline	Propofol	EA	2 μg EPI	4 μg EPI
MAP	98 ± 9	75 ± 9	62 ± 12	65 ± 11	69 ± 12
AI	45 ± 13	28 ± 18	24 ± 18	18 ± 17	11 ± 13
dt	0.06 ± 0.01	0.07 ± 0.01	0.09 ± 0.01	0.08 ± 0.01	0.08 ± 0.01
dv	0.63 ± 0.29	0.62 ± 0.27	0.47 ± 0.19	0.62 ± 0.21	0.93 ± 0.39

Conclusion(s): Changes in suprasystolic signals were detected after EA representing a decrease in arterial tone and cardiac performance. Intravenous EPI infusion improved indices of cardiac performance.

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A-440

Epidural clonidine suppresses the rise in blood cortisol in patients undergoing lung surgery

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Background and Goal of Study: Surgical trauma initiates stress response with consecutive immune suppression (1). It is marked with the rise of stress hormones among which cortisol is the most characteristic one. The goal of this study was to investigate the effects of epidural clonidine on blood cortisol levels in perioperative period.

Materials and Methods: In a prospective, double-blinded study we divided 20 patients with lung carcinoma randomly to two groups, clonidine (CLO; $n = 10$) and control (CON; $n = 10$). We administered a bolus of 40 μg/kg of morphine by epidural catheter (EC) at Th6-7 to all patients. The CLO also received 4 μg/kg of clonidine epidurally, before the induction to general anesthesia. We used continuous epidural infusion of 4 μg/kg/h of morphine and 10 μg/kg/h of bupivacaine in saline for postoperative analgesia in both groups. In addition CLO received 0.2 μg/kg/h of clonidine. We took four blood samples (before inserting EC – T_1, at the end of operation – T_2, the next morning – T_3 and the second morning – T_4) and measured blood cortisol level using standard method. We compared the difference of blood cortisol levels between two samples using T-test.

Results and Discussions: The blood cortisol levels at the end of operation (T_2) were significantly lower in CLO group (Table 1).

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Table 1. Blood cortisol level at T_2 (mean values ± SD)

Group	Cortisol (nmol/l)
CLO	71.2* ± 93.3
CON	949.3 ± 209.1

*$p < 0.01$

There were no significant differences between the two groups on first and second day after operation (T_3, T_4).

The study showed that epidural clonidine suppressed the rise in blood cortisol as a response to surgery, however we couldn't confirm a significant suppression of blood cortisol postoperatively.

Conclusion(s): Epidural clonidine may be advantageous for cancer patients undergoing lung surgery since it suppresses blood cortisol levels during surgery which might be beneficial for their immune status and spread of their disease.

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A-441

The use of levosimendan in patients scheduled for elective minor abdominal surgery under lumbar epidural anaesthesia: effects on hemodynamics

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Background and Goal of Study: The goal of our study was to assess the effects of preoperative infusion of LS (levosimendan) on perioperative hemodynamics in patients with LVEF < 26% undergoing elective minor abdominal surgery under lumbar epidural anaesthesia.

Materials and Methods: Six male patients, ASA III (mean age 76, range 64–85 years) with low output heart failure (mean LVEF 22, range 19–26%) were studied. *Preoperatively*: Before LS administration all patients had arterial and pulmonary artery catheters. LS was given as a bolus (6–24 mcg/kg) followed by continuous infusion (0.1 mcg/kg/min) lasted 24 hours.

Day of surgery: All patients received lumbar epidural anaesthesia with lidocaine 2% (loading dose 14 ± 3 ml) for minor low abdominal surgery lasted 60 ± 10 min. Intraoperatively patients were spontaneously ventilated with FiO_2: 50% (in air) via Venturi mask. Fluids were given PRN to maintain sufficient MAP and PCWP.

Baseline hemodynamic data were collected before LS administration. The second data were obtained in 24 hours, the third after lumbar epidural anaesthesia and the fourth at the end of surgery.

Results and Discussions: After LS infusion CO significantly increased (*t-test on ranks BL vs LS). After installation of epidural anaesthesia CO and BP decreased, the second mare significantly (**t-test on ranks LS vs EA). Results are given as median ± standard deviation, 95% confidence interval.

	BL	LS	EA	ES
HR (beats/min)	75 ± 8	85 ± 7	83 ± 11	70 ± 5
MAP (mmHg)	100 ± 10	93 ± 13	66 ± 4 **	65 ± 13
PCWP (mmHg)	9 ± 2	11 ± 3	11 ± 2	12 ± 3
CO (lt/min)	3.8 ± 0.5	6.9 ± 0.8*	5.7 ± 0.3**	6.6 ± 0.7

(*$p < 0.001$, **$p < 0.04$).
(BL-baseline, LS-after administration of levosimendan, EA-after epidural anaesthesia, ES-end of surgery).

Conclusion(s): The beneficial effects of preoperative administration of LS on CO lasts during epidural anaesthesia in patients undergoing minor abdominal surgery.

A-443

Hindquarter amputation as an anaesthesiologic issue – should epidural bupivacaine be avoided intraoperatively? (An extended case report of 44 patients from one institution)

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Background and Goal of Study: Hindquarter amputation is one of the most extensive oncological resections and poses a significant anaesthesiological problem. We present our experiences, which may allowed to enhance patient safety.

Materials and Methods: 44 ASA II–III patients (25 M; 19W; mean age 39 yrs; range: 21–68) undergoing hemipelvectomy for primary malignant bone tumours at one institution between 1998 and 2005. Perioperative management: combined epidural [bupivacaine and fentanyl (23 pts) or fentanyl (21 pts) only], and general anesthesia (isoflurane/sevoflurane; fentanyl; muscle relaxants); monitoring: ECG; SaO_2; $etCO_2$; invasive 0ABP, hourly diuresis. Postoperative management included constant epidural infusion of 0.25% bupivacaine + fentanyl & for phantom pain: oral amizepine + amitryptiline perioperatively.

Results and Discussions: Mean intraoperative fluid intake was: 3000 ml crystalloids, 1000 ml colloids; 900 ml packed RBC and 400 ml FFP; in 7 cases – catecholamin infusions intraoperatively (all patients from the bupivacaine + fentanyl group); all patients were observed in the ICU for at least 16 hrs after surgery; the patients evaluated postoperative pain treatment as adequate/good (VAS 4-2 in the first 6 hrs. and 2-0 in the following 18 hrs. post-op). Two patients died in the early postoperative period after reoperation for extensive postoperative haemorrhage. One patient developed myocardial infarct on day 6 after surgery, of which she recovered uneventfully. We observed no cases of respiratory failure.

Conclusion(s): (1) due to the likelihood of extensive blood loss during hemipelvectomy epidural drug administration should be, at the onset, limited to opioids, with bupivacaine introduced after tumour excision and adequate haemostasis; (2) epidural bupivacaine + fentanyl provides adequate pain control after hemipelvectomy.

A-445

Penile nerve block with levobupivacaine 0.25% or ropivacaine 0.25% produced similar analgesic effects in children after circumcision

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Background and Goal: Ropivacaine and levobupivacaine never have been compared in equipotent doses as local anesthetics for penile nerve blockade (PNB). The hypothesis was tested that both agents are equivalent to produce pain-free recoveries in children being circumcised under general anesthesia combined with PNB.

Materials and Methods: The study design was double-blinded, prospective and randomized. After institutional approval and parental consent 119 boys (ASA 1, aged 1–4 years), scheduled for circumcision, received a 0.25% bolus of either ropivacaine (group 1) or levobupivacaine (group 2). The POCIS[1] (Pain Observation Scale for Young Children) was used for pain assessment. Calculated sample sizes around 2 × 60 subjects should provide a statistical power of 80% when considering 20% probability differences of having a POCIS > 0 as clinically relevant. The Kaplan-Meier (KM) methodology was used for statistical analysis.

Results: Demographically and clinically groups were comparable. In the 119 patients (pts) enrolled, PNB's were successful with levobupivacaine and ropivacaine in respectively 51 and 54 pts. PNB failure occurred in 14 pts. Figure 1 displays the respective probabilities of having a pain-free recovery over 300 minutes following surgery.

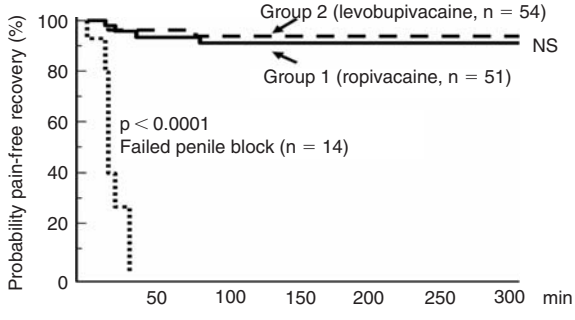

Figure 1. KM curves were nearly identical for group 1 and 2 (NS: not statistical significant). Failure of PNB reduces pain-free recoveries significantly ($p < 0.0001$).

Conclusion: Having a successful PNB is clearly more important than the choice between a low dose of either ropivacaine or levobupivacaine.

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1 Boelen-van der Loo W, Scheffer E, De Haan R, *et al. Journal of Developmental & Behavioral Pediatrics* 1999; 20: 222–227.

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A-448

Epidural naloxone reduces the incidence and severity of morphine-induced pruritus and nausea after total abdominal hysterectomy without affecting analgesia in patients receiving epidural post-operative analgesia with morphine and levobupivacaine

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Background and Goal of Study: To determine whether epidural naloxone reduces the side effects caused by epidural morphine without affecting analgesia.

Materials and Methods: Sixty female patients 35–75 years old, ASA I–III, undergoing abdominal hysterectomy under combined general and epidural anaesthesia. Induction maintenance and emergence from anaesthesia, as well as intraoperative analgesia and muscular blockade were conducted in a similar manner in all patients. All received 2 mg morphine epidurally one hour before the end of the procedure and a continuous epidural infusion of 0.125% levobupivacaine, 0.005% morphine (group A, n = 30), plus naloxone 0.3 μg/kg/h naloxone (group B, n = 30). Vital signs, Bromage score (0–3), itching, nausea and vomiting, pain score (VAS 0–10) were monitored thereafter by blinded observer medical staff.

Results and Discussions: There were no statistically significant differences between the two groups concerning demographic data, vital signs and Bromage score. Pain score was lower in the naloxone group at 4, 8, 12, 16 hour postoperatively ($p < 0.05$). Itching and vomiting were also statistically lower in those patients ($p < 0.05$).

Conclusion(s): Epidural Naloxone reduced pruritus, nausea and vomiting without reversal but even potentiation of the analgesic effects of morphine.

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A-449

Nausea and vomiting after hysterectomy with epidural morphine administration: the role of intraoperative propofol

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Background and Goal of Study: The role of propofol in the prevention of postoperative nausea and vomiting (PONV) induced by epidural morphine administration is controversial (1,2). We examined the efficacy of intraoperative propofol administration to prevent PONV after epidural morphine administration during hysterectomy.

Materials and Methods: Seventy patients ASA I and II undergoing combined epidural and general anaesthesia for hysterectomy were randomly assigned to two groups: the group in which anaesthesia was induced with propofol and fentanyl, and maintained with propofol-N_2O (group P), and the group in which anaesthesia was induced with thiopental and fentanyl and maintained with sevoflurane-N_2O (group S). All patients received 3 mg epidural morphine bolus one hour before the end of surgery. The incidence of postoperative nausea and vomiting (PONV) was recorded in the post-anaesthesia care unit (PACU) and every 4 hours for the first 12 hours postoperatively by blinded observers. Mann-Whitney non-parametric test was used for statistical analysis.

Results and Discussions: Significantly less patients ($p < 0.05$) of group P needed treatment for PONV in the PACU, however there was no difference in the overall incidence of PONV in the two groups. It is possible that residual low plasma concentration of propofol may be related to this protection.

Conclusion(s): Intraoperative propofol seems to protect patients against nausea and vomiting induced by epidural morphine only for the first hour postoperatively, while no protection was detected the next eleven hours.

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A-450

Are paravertebral block and thoracic epidural analgesia comparable for post-thoracotomy pain relief? A systematic review

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Background and Goal of Study: PROSPECT is a web-based initiative (www. postoppain.org), which provides procedure-specific recommendations for postoperative pain. This review aimed to determine whether paravertebral block (PV) and thoracic epidural analgesia (TE) were comparable for the management of pain following thoracotomy.

Materials and Methods: Systematic literature review (1966–May 2004), using the Cochrane protocol. Criteria: randomised controlled trials of PV (local anaesthetic (LA)) or TE (LA + opioid) *vs*. control, or PV *vs*. TE, at comparable times of administration in each group; adult thoracotomy; VAS pain scores at rest [R], on coughing [C] and/or on movement [M].

Results and Discussions: Table: Net analgesic effect of PV and TE *vs.* control and each other (n = number of studies)

Comparison	*VAS 0–6 h*	*VAS 8–12 h*	*VAS Day 1*	*VAS Day 2*	*VAS Day 3*
PV (LA) vs. control (n = 8)	R* C* M*	R* C* M*	R* C* M*	R* C*	R C*
TE (LA + opioid) vs. control (n = 7)	R* C* M*	R* C* (1/2) M*	R* C* M*	R (3/6) C* M*	R* C* M*
TE (LA) vs. PV (LA) (n = 5)	R – C –	R – C –	R – C –	R – C –	

Majority of studies show significant benefit of treatment over control (*), except where indicated (positive studies/total studies); (–) indicates no overall benefit of either TE or PV.

PV (LA) was associated with decreased incidence of hypotension (2 studies), urinary retention (1 study), and PONV (1 study), and improved pulmonary function (2/3 studies), compared with TE (LA).

Conclusion(s): TE (LA + opioid) and PV (LA) are both effective for reducing pain after thoracotomy, but further comparative studies are necessary to evaluate the gold standard for post-thoracotomy pain.

A-451

The effect of epidural analgesia on hypnosis measured by BIS

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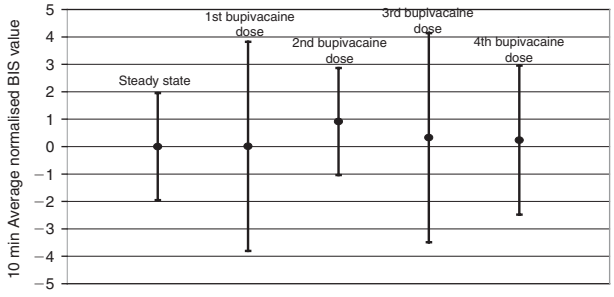
Background and Goal of Study: The effect of epidural analgesia on hypnosis in anaesthetised patients measured using Bispectral Index (BIS) monitoring have either shown MAC-sparing at constant BIS (1), or a between-group reduction in BIS resulting from the epidural (2). Both techniques are open to observer bias.

Materials and Methods: We undertook a simple observational study, electronically logging BIS in 14 patients undergoing combined epidural/general anaesthesia for colorectal surgery. Data from 10 patients who had 3 or 4 sequential doses of 5 ml 0.25% epidural bupivacaine without alteration in inhaled vapour concentrations were analysed. We normalised the BIS values for 10 minutes prior to dosing to a mean of 0 and SD of 1, and using the same normalisation parameters recorded the changes in BIS from 3–13 minutes post-dosing. We computed mean and SD BIS for these periods, and compared pre and post-dose BIS using "t" tests.

Results and Discussions: The results are in the graph below. Changes in BIS are indicated as an offset of the mean from zero, 95% CI's are shown. There was no significant change in BIS resulting from any dose of bupivacaine, nor any trend (a constant offset from zero with each dose).



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We have not confirmed deafferentation alters hypnosis measured by BIS. This may be because insufficient bupivacaine was used, or that previous studies using anaesthetist-induced changes in vapour or between group BIS comparisons as outcomes are flawed by observer bias.

Conclusion: During clinical anaesthesia, modest epidural doses of 0.25% bupivacaine do not alter BIS.

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A-452

Efficiency and complications during postoperative continuous epidural analgesia. A 4-year survey

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Background and Goal of Study: Continuous epidural analgesia (CEA) with local anaesthetics and opioids is an important element within perioperative care pathways. In patients undergoing major abdominal surgery, CEA provides excellent postoperative analgesia and reduces the incidence of pulmonary, cardiac, and gastrointestinal complications. However, complications due to the invasive character of the procedure may occur.

Materials and Methods: In 1995 a computer database was established in our institution for on-line registration of all anaesthetic records as well as the records of the acute pain service (APS). Such records include data regarding quality of pain relief, as well as any side effects or complications possibly related to the analgesic method. Institutional approval was obtained for database analysis. The purpose of the present study was to evaluate the incidence and severity of any complications related to CEA between 1/1998 and 12/2001 within a standardized protocol for postoperative pain relief.

Results and Discussions: Within the first four years of CEA with local anaesthetics and opioids 3799 patients were treated by our APS. 2378 patients received thoracic epidural analgesia (TEA) and 1421 patients received lumbar epidural analgesia (LEA). Quality of pain relief was sufficient in 96% of patients. Side effects were seen during catheter placement in 4.9% and 9.6% of patients, respectively. The most commonly seen events were bloody tap (1.5% vs 3.2%; $p = 0.001$), wet tap (0.3% vs 0.6%; n.s.) as well as paresthesia (0.6% vs 2.3%; $p = 0.005$). During mobilisation 8.7% vs 9.9% of catheters were lost (n.s.). Local infection occurred in 0.1% and 0.2% of patients (n.s.). Secondary subarachnoid local anaesthetic spread was suspected in 0.1% and 0.4% of patients (n.s.).

Conclusions: CEA with local anaesthetics and opioids is an effective method for pain relief. Among both procedures, undesired side effects and minor complications were more common in LEA as compared to TEA. As undesired side effects occur in a low percentage continuous control of efficiency as well as side effects is required.

A-454

Combined spinal-epidural anesthesia with ropivacaine plus fentanyl for open prostatectomy

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Background: In this prospective randomized double-blind study we evaluated the effects of low-dose spinal ropivacaine with or without fentanyl for open prostatectomy.

Methods: Thirty patients suffering from benign prostatic hyperplasia ASA II–III, mean age 65 ± 7, weight 72 ± 8, height 170 ± 8 were randomized in two equal groups to receive combined-spinal anesthesia either isobaric ropivacaine 15 mg (Group R) or isobaric ropivacaine 10 mg plus fentanyl 20 microgram (Group RF) through a 27-gauge quincke needle at the L1–2 level. Sensory block was tested by pinprick and motor block was tested at the level of the thigh by using a four-point scale.

Results: The groups did not differ significantly regarding success, median onset time (10 ± 5 min) or median duration of T10 sensory block (60 ± 20 min). The cephalad spread of sensory blockade was slightly higher in Group R than in Group RF. Full motor block occurred only in group R (7 of 15). Three patients in Group R and 2 in Group FR needed medication for hypotension or bradycardia. Pruritus occurred only in 2 patients of Group RF. There was no need for supplementary epidural medication in both groups.

Conclusions: Spinal solution (2.2 ml) of ropivacaine 10 mg plus fentanyl 20 microgram provided adequate anesthesia and faster mobilization in elderly patients for open prostatectomy.

A-455

Pharmacokinetic of intermitent infusion of 0.375% ropivacaine through an intrapleural catheter for post-thoracotomy pain-relief

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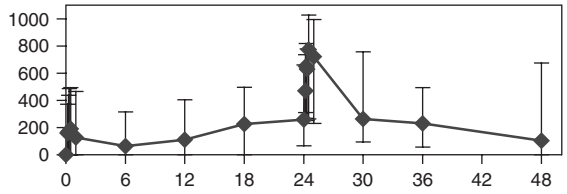
Background: Intra pleural analgesia is a safe technique for post thoracotomy pain relief (1) But with ropivacaine the plasmatic concentrations delivered by intermittent intrapleural infusion during 48 first hours is unknown.

Methods: Controlled and randomised prospective study on 10 first patients for oncology thoracic surgery. The post operative pain associated intravenous analgesia, a epidural morphinic analgesia and an intrapleural analgesia delivered by a catheter with 10 mL of 0.375% ropivacaine every 6 hours. Blood was sampled at H0, H + 10 min, H + 15 min, H + 20 min, H + 30 min, H1, H6, H12, H18, H24, H24 + 10 min, H24 + 15 min, H24 + 20 min, H24 + 30 min, H25, H30, H36, H48 to determine plasmatic ropivacaine concentration.

Results: Mean concentration ($pg \cdot ml^{-1}$) and 10^e–90^e percentile.



Discussion: Intrapleural bupivacaine infusion is associated with toxic concentrations (2). In our study, concentrations were largely under the toxic level in all patients despite interindividual variability. Higher dose can be use, without risk of toxicity. The Tmax is reached 30 min after each injection despite the vasconstrictive property of ropivacaine.

Conclusion: Intermittent intrapleural administration of 0.375% ropivacaine (10 ml) is a save technique in the management of post-thoracotomy pain relief.

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A-456

CSE or CES? Comparative evaluation of technical simplicity and safety profile of a new versus conventional combined spinal epidural technique

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Background and Goal of Study: Combined Spinal Epidural (CSE) is an established central neuraxial anaesthesia technique with related problems. A new CSE method is compared against the conventional technique for analysis of technical ease and safety concerns.

Material and Methods: 501 consecutive patients entered this prospective, randomized study and were allocated to receive either CSE-standard (CSE-S; n = 249) or CSE-new (CSE-N; n = 252). Problems related to the technique, epidural catheter placement and patient's complaints were recorded.

Results:

PROBLEMS	CSE-S	CSE-N
Technique related:		
Dural puncture (epidural needle)	9	1
CSE-spinal needle short of dura mater	0	2
Ventral dural puncture with CSE-spinal needle	22	0
Epidural catheter related:		
Difficult/failed insertion	23	2
Paresthesiae on insertion	20	6
Drug/CSF/blood in catheter	24	8
Subarachnoid migration	3	0
Subjective:		
Post dural puncture headache	10	1
Backache (3-month follow up)	12	2
Persistent CSF leak	4	0

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Conclusion(s): Overall, CSE-N technique proved superior ($P < 0.05$) to the conventional method in respect to insertion, complications and patient complaints.

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A-457

Paraplegia 15 minutes after thoracic epidural puncture

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Background: Spinal haematoma with neurologic sequela is a serious complication after epidural catheterization with a frequency of 1:150.000 (1). Most of these cases are correlated with anticoagulation therapy or pre-existing coagulation disorders and have an onset of neurologic symptoms after approximately 15 hours (2).

Case Report: We report the case of a 61 years old man, suffering from an acute exacerbation of a chronic pancreatitis with severe persistent pain (VAS 10). As there was good pain control with epidural analgesia in former episodes of his illness an epidural catheter was inserted between thoracic segment 8 and 9. Medical history and laboratory results showed no coagulation disorders. Pain decreased to VAS 1 to 2 for the next 6 days. On the sixth day the catheter dislocated accidentally. Following intravenous application of analgesics (Piritramid, Metamizol) was ineffective (VAS 7). Therefore we decided to insert a new epidural catheter (thoracic 7/8). Again laboratory results showed normal coagulation parameters and the interval to the last dose of 40 mg Enoxaparin was more than sixteen hours. After three attempts the catheter was inserted. A hemorragheous backflow occurred and the catheter was pulled back 1 cm. Now hemorrhage stopped. Ten minutes later the patient reported severe back pain (VAS 10) with a punctum maximum 3 segments below the puncture site, again 5 minutes later paraplegia of the legs developed. Computertomography and MRI revealed a large haematoma with neuronal compression between T4 to T9. Emergency hemilaminectomia for haematoma evacuation was performed 1 hour later and a large bleeding venous network was detected. 12 days after this procedure the patient left the hospital without any neurologic disorders.

Conclusion: Paraplegia due to iatrogenic spinal hemorrhage can develop within a few minutes after epidural puncture. If severe pain a few segments below puncture site is observed one should consider the possibility of a spinal bleeding. If spinal decompression is performed without time delay neurological prognosis can be excellent.

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A-458

Is awake heart surgery safe enough in high-risk patients?

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Background and Goal of Study: Depressed level of consciousness is the first cause of postoperative "failure to extubate" (1). Awake heart surgery avoids opioids and maintains consciousness, thus leading to the improvement of postoperative course in some high risks patients (2).

Materials and Methods: Thoracic epidural block (C7-T9) followed by awake heart surgery has been performed on two high-risk patients. Case 1: 88 years old female patient, Body Mass Index = 36, with severe aortic valvular stenosis and congestive heart failure (NYHA III) with diastolic dysfunction. The patient presented also asymptomatic 80% stenosis of the right internal carotid artery. Standard and logistic Euroscore were respectively 9 and 14.55%. Aortic valve replacement was performed under normothermic cardio-pulmonary bypass (CPB). Intra-operative continuous monitoring of brain function allowed to maintain adequate pump flow and perfusion pressure. Postoperative period was uneventful and the patient was discharged from the ICU in the second postoperative day. Case 2: 81 years old male patient, with aortic valvular stenosis, mitral valve regurgitation, left ventricular systolic dysfunction (LVEF = 35%), congestive heart failure (NYHA III), pulmonary hypertension, chronic atrial fibrillation with VVI pacemaker, COPD with severe compromised ventilatory function ($FEV_1 < 1L$), chronic renal failure (serum creatinine = 177 μmol/dL). Standard and logistic Euroscore were 15 and 61.39% respectively. Aortic valve replacement and mitral valve repair were performed under normo-thermic CPB. Weaning from bypass and postoperative course were uneventful, no inotropic support was required. The patient was discharged from the ICU in the third postoperative day.

Conclusion: Awake heart surgery can be evaluated in some high-risk patients, to avoid prolonged postoperative mechanical ventilation and to improve postoperative course. This technique allows for continuous monitoring of neurological function and avoids positive pressure ventilation, thus reducing morbidity in subsets of very critical patients.

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A-459

Can high thoracic epidural anaesthesia provide better postoperative glycaemic control in cardiac surgery?

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Background and Goal of Study: Hyperglycaemia during major surgery is related to metabolic and endocrine alterations induced by the surgical insult. In the last years several studies revealed that mortality after cardiac surgery can be related to blood levels of glucose. Lower mortality and morbidity rates have been observed when mean glucose levels were less than 149 mg · dL^{-1} (1). Epidural anaesthesia reduces the level of stress hormones that accompanies cardiac procedures (2). Primary endpoint of this study is to evaluate if high thoracic epidural anaesthesia (HTEA) alone can reduce glucose levels after cardiac surgery.

Materials and Methods: This retrospective study includes 349 consecutive cardiac surgical patients operated between February and September 2005. These patients have been included into two groups, depending on the type of anaesthesia performed. Group 1: 93 patients who received HTEA combined with light total intravenous anaesthesia (TIVA). Group 2: 256 patients who received exclusively TIVA. Demographic data, incidence of diabetes mellitus, type of surgical procedure, duration of cardiopulmonary bypass, use of inotropes were homogeneous. Mean blood glucose levels in the first postoperative 24 hours has been divided into three ranges: under 150, between 150 and 200 and above 200 mg · dL^{-1}.

Results and Discussions: Correlation between type of anaesthesia and levels of glycaemia has been observed (p = 0.03). The results are shown in the following Table.

Glycaemia	TIVA	Light TIVA + HTEA
<150 mg · dL^{-1}	37.1%	49.4%
150–200 mg · dL^{-1}	48.1%	44.1%
>200 mg · dL^{-1}	14.8%	6.5%
	100%	100%

Almost 50% of patients with HTEA had normal levels of glycaemia, compared with more than 63% of patients with TIVA alone who showed high glucose levels. Patients with TIVA alone showed double incidence of very high glucose levels (>200 mg · dL^{-1}).

Conclusions: HTEA allows for better control of postoperative glucose levels after cardiac surgery.

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A-460

Continuous thoracic epidural analgesia within a clinical pathway in tetraplegic patients undergoing abdominal surgery

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Background and Goal of Study: During the perioperative course life-threatening autonomic hyperreflexia (AH) triggered by bladder distension and surgical stimulus may occur in paraplegic patients in up to 85% of all patients, possibly resulting in severe hypertension, intracerebral hemorrhage, ileus or even fatal outcome. In paraplegic pregnant patients control of AH was successfully achieved by blocking sympathetic afferents by means of epidural analgesia (EA). We report our experience with a standardized care pathway in 13 consecutive paraplegic patients undergoing appendicovesicostomy for clean self-catheterisation (Mitrofanoff's principle; MP).

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Materials and Methods: All patients were offered EA for intra and postoperative pain control and operated on by a single surgeon by the same method. EA was continued until haemodynamic control was possible without application of any kind of vasoactive co-medication and regular gastrointestinal function (GIF) including full oral nutrition was restored. All perioperative data concerning the care program were sampled online by a computed database and analysed regarding any kind of perioperative complications with special regards to hemodynamic and respiratory control as well as return of GIF.
Results and Discussions: Within a 7 year period 13 patients (10 female-3 male; 33 ± 12 years; 65 ± 12 kg) underwent MP. Eight patients suffered from cervical lesions (C4–6) and 5 patients suffered from complete thoracic paraplegia. EA was provided for at least 5 days. In all patients gastrointestinal function was restored within 4 postoperative days (POD; 2.9 ± 0.8 d) and regular oral diet was tolerated within 2.3 ± 1.0 d without nausea or vomiting. None of the patients suffered from respiratory depression or AH until full ambulation, which was achieved within 2 POD. With the exception of one patient who underwent re-surgery no complications occurred in the postoperative course.
Conclusion(s): These results, although only originating from a case series, indicate that the incidence of common and potentially life threatening complications like AH as well as postoperative ileus may be successfully limited by the use of collaborate perioperative care pathways including continuous EA as well as early oral feeding and mobilisation.

A-461

Continuous thoracic epidural analgesia within a care pathway in young adolescents undergoing Nuss' procedure for pectus excavatum repair

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Background and Goal of Study: Patients undergoing open thoracic surgery may benefit from thoracic epidural analgesia (TEA) in the postoperative course (1,2). However, little is reported about perioperative TEA in adolescents undergoing Nuss' procedure for pectus excavatum repair. In 2000 a collaborate clinical pathway was established in our institution including standards of surgery, method of pain relief and perioperative care. The purpose of the present study was to report the experience with thoracic epidural analgesia in young adolescents undergoing Nuss' procedure.
Material and Methods: Perioperative data of all patients undergoing Nuss' procedure from 05/2001 to 12/2004 were analysed using the computed anaesthesia data documentation system (ANDOK™, Datapec, Pliezhausen, Germany). Thoracic epidural catheters were placed at a midthoracic level (T6–8), preoperatively. TEA was started preoperatively and provided continuously by ropivacaine 0.2% and sufentanil 0.5 μg/ml as requested by the patients. Pain was scored by means of a 10-points NAS-scale. A pain score ⩽2 at rest and ⩽4 during ambulation was intended.
Results and Discussion: Thirty-three consecutive patients (28 male, 5 female; aged 14 ± 1 y; 172 ± 10 cm; 53 ± 9 kg; chest wall index (3) 4.54 ± 1.20) underwent Nuss' procedure. Postoperative TEA was provided for 5 ± 2 days. In six patients epidural catheters were lost during ambulation. Two patients required additional i.v. opioids. Another two patients required i.v. opioids after catheter removal. Uncomplicated oral intake of fluids and oral diet was possible within 24 h following surgery. All patients were fully mobilized until the 5th postoperative day. No complications associated with TEA occurred.
Conclusion(s): TEA using local anaesthetics and opioids provided excellent postoperative analgesia allowing early ambulation and physiotherapy as well as uncomplicated restoration of gastrointestinal function and oral nutrition in adolescents undergoing Nuss' procedure.
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A-462

Thoracic epidural anesthesia induces thoracic and abdominal sympathetic block

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Background and Goal of Study: The protective effects of thoracic epidural anesthesia (TEA) may be related to sympathetic block. However, data concerning sympathetic activity during TEA are incomplete and contradictory. This study investigated skin sympathetic activity during TEA using infrared thermography.
Materials and Methods: 21 patients were included in a prospective, randomized, blinded study. Thoracic epidural catheters were placed at a median insertion level of Th 8/9. After 20 min of accommodation, 10 ml saline (Control) or 10 ml bupivacaine 0.25% (TEA) was epidurally administered. At baseline, 5 min and 20 min heart rate, arterial pressure and core body temperature were measured. Sensoric block was identified by cold-warm-discrimination. Skin temperature was recorded by infrared thermography. Mean temperature of dermatomes Th4–Th12 was measured and sympathetic skin temperature regulation was evaluated by calculating temperature difference to baseline values (ΔT). Data were analyzed by Mann-Whitney-U-Test. ΔT at thumb and toe was categorized (warming/cooling) and tested by Fishers-Exact-test. Significance was defined as $p < 0.05$.
Results and Discussion: Groups did not differ concerning age, gender distribution, body mass index or coexisting diseases. Baseline body and skin temperature and hemodynamic parameters were comparable. Median level of sensoric block was Th5–L5. In thoracic and abdominal dermatomes, temperature decreased less during TEA than in Control (Fig. 1). Toe temperature dropped in all patients in Control, while increasing in 9/10 in TEA ($p < 0.01$).

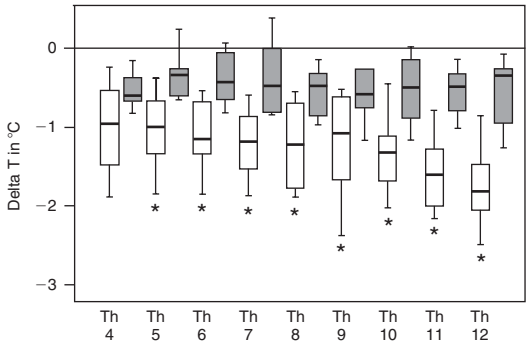

Figure 1. ΔT (°C) at 20 min; Control □; TEA ■ *$p < 0.05$.

Conclusion: This is the first study to demonstrate that TEA using low concentration of bupivacaine induces thoracic and sympathetic block in patients. Caudal limit of sympathetic block could not be demonstrated in this study.

A-463

Comparison of continuous spinal, continuous epidural and general anaesthesia in patients undergoing total hip arthroplasty: perioperative complications and stress response

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Background and Goals: The aim of this study was to compare three different anaesthetic techniques with respect to perioperative complications and their effects on the stress response in hip arthroplasty.
Material and Method: After obtaining Ethics Committee approval and patients' consents, 45 patients undergoing hip arthroplasty were randomly allocated to one of the three groups: continuous spinal (CSA, n = 15), continuous epidural (CEA, n = 15), and general anaesthesia (GA, n = 15). Serum cortisol, norepinephrine (NE), and leptin levels were measured pre- and postoperatively (immediately and 24 hours after the surgery) as markers of stress response to surgery. The incidence of DVT was examined by bilateral lower extremity venous Doppler.
Results: The groups were similar regarding demographic data, and DVT incidence. Incidence of intraoperative hypotension was significantly lower in group CSA than other groups ($p < 0.025$). Serum cortisol and NE levels were similar among the groups however, compared with other groups the immediate postoperative serum leptin levels were significantly higher in group GA ($p < 0.010$).
Conclusion: CSA is associated with a lower incidence of intraoperative hypotension when compared with GA and CEA techniques during hip arthroplasty. The significance of a higher immediate postoperative serum leptin levels after GA than after CSA or CEA may be a good marker for metabolic stress response.

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A-464

Impact of regional analgesia in patients outcomes after hip fracture repair surgery

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Background and Goal of Study: Postoperative femoral nerve patient controlled analgesia (FPCA) after hip fracture facilitates early mobilisation and offers better pain control at movement (1) than intravenous opioid analgesia. This retrospective case-control study was undertaken to determine the association between FPCA and outcomes after hip fracture repair.

Materials and Methods: The medical records for 100 consecutive patients, age $>$ 50 years, who underwent hip fracture repair at our institution in one year (October 2004–2005), were retrospectively studied. Two groups were analyzed: Group femoral, 49 patients with FPCA. Group no femoral, 50 patients with conventional analgesia (control). The following variables were analyzed: age, gender, length of stay, transfusion, delirium, morbidity, rescue opioid analgesic, sitting and walking times.

Results:

	Femoral (n:49)		No femoral (n:50)		
Rescue	0		14		
opioid	0.0%	Intervals	28.0%	Intervals	P $<$ 0.001
	4		21		
Delirium	8.2%	0.5-15.8	42.0 %	28.3-5.7	P $<$ 0.001
Sitting time*	1.6	1.4–1.7	2.0	1.8–2.2	P = 0.002
Walking time*	2.9	2.6–3.2	3.1	2.8–3.4	P = 0.225
Length of stay*	7.8	6.8-8.5	8.6	7.6–9.6	P = 0.157

(*) Mean: days.

Conclusion: The FPCA in hip fracture repair seems to improve the quality of postoperative analgesia, without need of rescue opioid. The incidence of postoperative delirium was lower in the FPCA group. Pain evaluation might be inaccurate in elderly patients with pre-existing cognitive dysfunction or cultural barriers, and thus in turn might lead to inappropriate analgesic dosing or to confuse pain with delirium.

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A-466

Effects of different anaesthetic techniques on serum leptin, C-reactive protein and cortisol concentrations in anorectal surgery

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Background and Goal of Study: Research has been conducted for finding "stress free anaesthetic technique" in order to limit stress response to surgery. The effects of intratracheal general anaesthesia (ITGA) and regional anaesthesia (saddle block) on leptin, C-reactive protein (CRP) and cortisol concentrations were compared in patients (ASA I-II) undergoing anorectal surgery.

Materials and Methods: In group-I (n: 29), patients received ITGA. Anaesthesia was induced with thiopental (5 mg/kg) and fentanyl (1 μg/kg) iv. Vecuronium was administered as muscle relaxant. Sevoflurane 2% was used for maintenance. In group-II (n: 29), a 25-G spinal needle was inserted through the L3-4 intervertebral space in sitting position. Hyperbaric bupivacaine 0.5% 2.5 ml was injected into subarachnoid space. Blood samples were collected before induction of anaesthesia, at 3 and 24 hours postoperatively. Demographic data and leptin, CRP, and cortisol levels were compared with Student's *t*-tests. The changes within the groups were analysed using repeated measures of ANOVA and paired *t*-tests. Statistical significance was considered at $P < 0.05$.

Results: Patient characteristics, surgical data and preoperative leptin, cortisol and CRP levels were comparable. Cortisol increased slightly during early postoperative period, then decreased in group-I. In group-II cortisol did not increase at 3 hours postoperatively but decreased later. Cortisol levels in group-I were higher than in group-II at 3 hours after surgery ($P = 0.034$). Leptin concentrations increased postoperatively in all patients. CRP displayed a pattern resembling leptin (Table 1).

Conclusion: Concerning surgical interventions in which tissue damage is minimal, neuronal transmission plays a primary role for generation of stress response. In such cases, anaesthetic technique, which blocks access of peripheric impulses to CNS can prevent the onset of response. This assumption is reflected well by the cortisol levels at 3 hours after operation.

Table 1. Leptin, CRP and Cortisol levels. Mean (min-max).

	Sample	ITGA	Saddle
Leptin (ng/ml)	1	7.62 (1.08-32.10)	5.88 (0.65-26.87)
	2	9.04 (0.96-41.69)	6.95 (0.85-40.26)
	3	17.99 (1.01-74.05)[b]	11.43 (0.77-46.98)[b]
CRP (mg/L)	1	6.64 (0.10-69.20)	5.26 (0.17-56.95)
	2	8.40 (0.10-71.90)	6.02 (0.21-61.55)
	3	15.08 (0.10-63.61)[c]	18.06 (2.75-70.72)[b]
Cortisol (nM/L)	1	456.7 (119-1613)	383.6 (80-758)
	2	611.4 (81-1912)[a]	343.7 (68-1836)
	3	340.7 (84-842)[d]	297.9 (70-679)[e]

Significantly higher than group Saddle[a], sample 1 and 2[b], sample 1[c], significantly lower than sample 2[d], sample 1[e].

A-467

The effect of spinal and general anesthesia on hemodynamic and stress response in lumbar spinal surgery

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Background and Goal of Study: As it is not only the surgical technique to provide advantages but also anesthesia technique performed for the procedure (1). This study was designed to compare the hemodynamic and stress hormonal responses between spinal anesthesia and general anesthesia techniques in patients undergoing lumbar disc surgery.

Materials and Methods: 56 ASA I–II patients, from 18 to 65 years, undergoing elective lumbar spinal surgery for one level were enrolled for the prospective, randomized study. Patients were allocated to Group GA (general anesthesia) or Group SA (spinal anesthesia). Before induction of anesthesia heart rate (HR) and systolic, diastolic and mean blood pressure (SBP, DBP, MBP) were assessed by repeated intervals before and after induction for one hour. In Group GA, anesthesia was induced with thiopental (5 mg/kg), fentanyl (1 gr/kg) and vecuronium (0.1 mg/kg) and maintained with 50% N_2O in oxygen and 1% isoflurane. Once the patients were intubated, patients were placed in the prone position. Spinal anesthesia was obtained using 15 mg heavy bupivacaine in Group SA. Once the adequate block was achieved, the patients were turned into the prone position. Blood samples for cortisol and ACTH was collected at 5 min before induction, 30 min and 6 and 24 hours after the first incision. First voiding, mobilization and analgesic requirement times were noted.

Results and Discussions: There was no difference between the two groups with the regard to demographic data. Surgical time was longer for Group GA. There was no group difference in terms of HR, and MAP. Overall complication rates, first voiding time (7 $\pm$ 1.8 vs 9.6 $\pm$ 2.8 hours; $p < 0.05$) and discharge time (22 $\pm$ 2.4 vs 29 $\pm$ 9.7 hours; $p < 0.05$) were significantly lower in Group SA. There was no difference in plasma cortisol and ACTH levels between groups.

Conclusion(s): We conclude that even spinal anesthesia for lumbar spinal surgeries has advantages over general anesthesia, further studies are needed to evaluate the stress hormonal responses between spinal and general anesthesia.

Reference:

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A-468

Cardiac output changes during regional anaesthesia: an observational study

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Background and Goal of Study: Recent NCEPOD report (1) highlighted the deleterious effects of both over and under hydration in the elderly surgical patients. Close monitoring and optimization of cardiac output with fluid boluses during general anaesthesia speeds the postoperative recovery and reduces the time to discharge (2). We decided to record cardiac output changes in patients undergoing repair of proximal femoral fracture (PFF) under regional anaesthesia.

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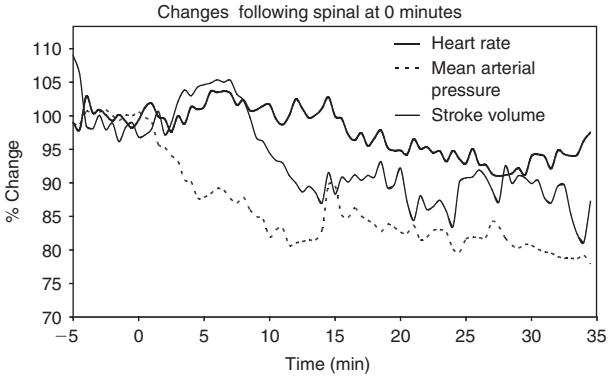
Materials and Methods: After approval of the Local Research Ethics Committee we recruited 20 patients in this observational study. In addition to standard monitoring we used a lithium dilution cardiac output (LiDCO) monitor to record cardiac output, stroke volume (SV) and invasive blood pressure. Administration of fluids and vasoactive drugs were also recorded.
Results and Discussions: Mean changes of the heart rate (HR), SV and mean blood pressure (MBP) following regional anaesthesia are shown.



Conclusion(s): Initially, MBP fell while SV and HR were maintained. Soon after, the SV fell with minor change in HR. This fall in CO is likely to be caused by inadequate preload. Regional anaesthesia for PFF repair can be associated with significant changes in cardiac output.
References:
1 Extremes of Age. *NCPOD*, London; 1999.
2 Venn R, *et al*. *British Journal of Anaesthesia* 2002; **88**:65–71.

A-469

A perioperative assessment of combined epidural with general anesthesia versus general anesthesia in radical cystectomy

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Background and Goal of Study: The radical cystectomy is a major surgery intervention considering the duration, intraoperative bleeding and algic stimulation. The aim of the study is to compare the peroperative hemodynamic stability, blood losses, analgesia and mobilization with two different anesthetic techniques.
Materials and Methods: Thirty-two patients scheduled for radical cystectomy were included into a prospective, randomized, blinded study. The patients were randomly assigned in 2 groups: in A ($n = 16$) they received combined epidural with general anesthesia (CEGA) and in B ($n = 16$) general anesthesia (GA) was performed. The blood pressure changes (mean arterial pressure-MAP) and blood losses (ml) and postoperative quality of analgesia and patients' satisfaction at mobilization were evaluated. The quality of anesthesia was assessed using a visual analogue scale (VAS) from 0–10, at 0, 12, 24 hours after the surgery; the patients' satisfaction at mobilization was analyzed on VAS (0–10) at 24 hours after the surgery. Data are mean and standard deviations. The results were statistically analyzed using unpaired Student's t test, with a value of $p < 0.05$ considered significant.
Results and Discussions: There were no statistical differences concerning the demographic data and the anesthetic risk (ASA) between the groups. The blood pressure was significantly more stable in group A versus (vs.) B (MAP = 100 ± 20 mmHg vs. 125 ± 35 mmHg) ($p < 0.05$); there were no significant differences with regard to blood losses between the groups (650 ± 120 ml in group A vs. 720 ± 115 ml in group B) ($p > 0.05$). The quality of analgesia postoperative evaluated on VAS was statistically superior in group A vs. B: 2.8 ± 1.8 vs. 6.1 ± 2.1 at 0 h ($p < 0.001$); 2.5 ± 1.2 vs. 5.7 ± 1.8 at 12 h ($p < 0.001$); 2.0 ± 0.8 vs. 5.1 ± 1.9 at 24 h ($p < 0.001$). Patient's comfort at mobilization VAS was significantly superior in group A vs. B at 24 h following the surgery: 8.1 ± 1.1 vs. 5.8 ± 1.3 ($p < 0.001$).
Conclusion(s): CEGA provides significantly superior intraoperative hemodynamic stability comparing with GA with no difference with regard to intraoperative bleeding; the patients' comfort following surgery were significantly better with CEGA, making this anesthetic technique be preferred for radical cystectomy in our clinic.

A-470

The effect of scalp block and local infiltration to skull-pin placement on hemodynamic and stress response in craniotomy

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Background and Goal of Study: The insertion of skull-pins into the periosteum induces noxious stimulation during intracranial surgery which results an increase in not only hemodynamic but also stress hormonal response. We compare the effect of local anesthetic infiltration or scalp block in attenuating the hemodynamic and stress hormonal response to skull-pin placement for craniotomies.
Materials and Methods: Forty-five ASA I-II patients ranging in age from 18 to 65 years, undergoing elective craniotomies were enrolled for the prospective, randomized, placebo-controlled study. Anesthesia was induced with thiopental (5 mg/kg), fentanyl (2 μgr/kg) and vecuronium (0.1 mg/kg). Ventilation was adjusted to achieve $ETCO_2$ levels between 28–32 mmHg. Anesthesia was maintained with %50 N_2O in oxygen and % 1 isoflurane. 5 minutes before head pinning, 0.5% bupivacaine was infiltrated at each pin insertion site in Group L. In Group S, scalp block was performed by blocking supraorbital, supratrochlear, auriculotemporal, occipital, and postauricular branches of the greater auricular nerves using 20 ml 0.5% bupivacaine (1). Opioids are preferred in Group P (placebo) to control hemodynamic responses. Heart rate (HR), arterial blood pressure (SBP, DBP, MBP) were assessed by repeated intervals for one hour. Blood samples were collected for cortisol and ACTH at 5 minutes before induction, 5 and 60 minutes after pin holder insertion.
Results and Discussions: Patient demographics were comparable among groups. There were significant increase in HR, SBP, DBP and MBP in GroupL and P when compared with Group S during head pinning and 1st, 2nd, and 3rd min after pinning ($p < 0.05$). In Group S, the decrease in plasma cortisol and ACTH levels measured at 5th and 60th min after pinning were significantly lower than Group L and P ($p < 0.05$).
Conclusion(s): We concluded that scalp block using 0.5% bupivacaine successfully blunts the hemodynamic and stress response to head pinning and should be considered in conjunction with general anesthesia for craniotomy.
Reference:
1. Pinosky ML, et al. Anesth Analg 1996;83:1256–1261.

A-471

Impact of anesthetic technique on intraoperative blood loss in prostate surgery

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Background and Goal of Study: Patients undergoing prostate surgery are mainly elderly, with burden of mostly cardiovascular comorbidity. Geriatric patients, especially those with cardiovascular diseases, are sensitive to perioperative hemorrhage and anemia. Anesthetic technique can contribute to better outcome in prostate surgery.
Materials and Methods: Retrospective study included 1093 patients who underwent prostate surgery for benign prostate hyperplasia or prostate cancer. General anesthesia was applied in 28, 6% of patients (Group 1), and regional anesthetic techniques in 71, 3% (Group 2). Data regarding preoperative condition, intraoperative blood loss and postoperative anemia were compared in these two groups of patients.
Results and Discussions: Intraoperative hemodynamic instability due to hemorrhage occurred in 7, 2% of patients, without statistically significant difference regarding type of anesthesia. But average blood loss was doubled in patients who underwent prostate surgery in general anesthesia, compared with those who had regional anesthesia (in group 1 it was 1072, 7 ml, compared with 477, 9 ml in group 2). There was no correlation with coexisting comorbidity. Postoperatively there was requirement for additional blood transfusion in 47, 8% of cases.
Conclusion(s): Investigation of complications in prostate surgery in correlation with comorbidity, ASA stage and anesthetic technique enables improvements in perioperative treatment and decrease of incidence of complications. Benefit of regional anesthesia can be conferred most likely by altered coagulation activation in surgery, reduction of operative stress response and consecutive decrease of blood loss.
References:
1 Rodgers A, Walkwr N, Schug S, et al. Reduction of postoperative mortality and morbidity with epidural or spinal anaesthesia: results from overview of randomised trials; BMJ 2000 Dec;321:1493.
2 Hellr AR, Litz RJ, Djonlagic I, et al. Combined anesthesia with epidural catheter, A retrospective analysis of the perioperative course in patients undergoing radical prostatectomy. Anaesthesist 2000 Nov;49(11):949.

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A-472

Use of Ketorolac as adjuvant in brachial plexus block with bupivacaine

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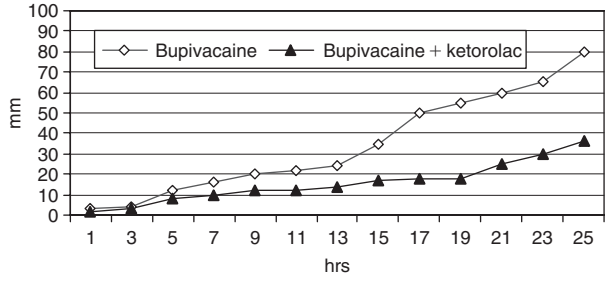
Background and Goal of Study: To evaluate the effects of adding 30 mg ketorolac as adjuvant to 40 ml of bupivacaine 0.25% for brachial plexus block before vascular surgery of the upper extremity.
Materials and Methods: After informed consent, 44 ASA I–II physical status patients, ages 20–60 years, undergoing upper extremity vascular surgery, were randomly divided in two groups. A group (n = 22) received bupivacaine 0.25% (40 ml). B group (n = 22) received bupivacaine 0.25% (40 ml) + ketorolac 30 mg. Time required for onset of sensory and motor block on the operated extremity and resolution of motor block was recorded. SAP, DAP, HR, SpO2, sedation and pain degree were recorded before, during and after surgical procedure. Analysis of variance and t-tests were used for statistical comparisons. Visual analogue pain scores (in mm) were recorded at the post operative 1.., 3.., 5.., 11.., and 25 hours.
Results: The two groups were similar in regard to demographical variables and duration of surgery. The onset of the sensory and motor blockade defined as the time corresponding to the end of regional anesthesia, resolution of the block and quality of the block were similar in group A and group B. The duration of post-operative analgesia was significantly longer in group B (1500 ± 120 min) than group A (840 ± 120 min).



Conclusions: Adding 30 mg ketorolac to 40 ml bupivacaine 0.25% for brachial plexus block effectively prolongs the duration of post-operative analgesia without significant modification of haemodynamic parameters[1].
Reference:
1 Erlacher W, et al. Acta Anaesth. Scand 2000; 44:53–7.

A-473

Comfort and patients satisfaction during axillary brachial plexus block: comparison of two techniques

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Background and Goals: Axillary brachial plexus block (ABPB) is the most widely used regional anesthesia technique for surgical procedures involving the hand and forearm. More studies were conducted to evaluate the successful of several techniques in sensory and motor blocks (1), but none have investigated patient's comfort during different axillary brachial block procedures, such as electrical nerve stimulation (ENS) and "fascial pop" (FP).
Materials and Methods: In 2 months, fifty patients (undergoing to arthrodeses, osteosyntheses, nerve and tendon sutures) were randomly allocated in two groups. In Group 1, a total of 40 ml of a mixture of 0.5% bupivacaine and 2% lidocaine, were administrated with ENS. In Group 2, the same volume was injected through three needles passing through the fascial. Age, sex, types of surgical procedures, % of complications, % of failure, used of drugs for sedation, were collected. Discomfort during the block and surgical comfort were quantified by VAS (0–10). On postoperative day one, each patient was asked to complete a questionnaire regarding satisfaction with the block experience (VAS from 0 very satisfied to 10 very dissatisfied). Even, patients indicated if would like to receive the same type of anaesthesia in the future. Data was analysed using SPSS for Window.
Results: There were not differences regarding age, sex, types of surgical procedure between two groups. No serious complications were observed. There was one block failure in Group 2 and none in Group 1. Discomfort during two block procedures was: 4.5 ± 1.2 for Group 1 and 1.5 ± 1 for Group 2 ($p < 0.05$), while patients reported good surgical comfort in both groups (2.4 ± 2.9 vs 2.2 ± 2.1, NS). 9 patients of Group 1 required sedation during block and none of Group 2. Satisfaction scores were the following (Group 1 vs Group 2): 8% vs 56% very satisfied, 8% vs 40% satisfied, 48% vs 4% dissatisfied and 36% vs 0% very dissatisfied. 4 patients in Group 1 and 24 patients in Group 2 would accept the same block for future hand surgery.
Conclusions: FP seems to be a technique well accepted by patients that reduces sedation's use during axillary block performance.
Reference:
1 Waters JH, Leivers D, et al. Anesth Analg 1997; 84:773–776.

A-474

Effectiveness of stellate ganglion blockade to improve the perfusion of a free flap placed on the upper extremity in pigs

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Background and Goal of Study: To assess the effectiveness of stellate ganglion blockade to improve the perfusion of a free flap placed on the upper extremity of pigs.
Materials and Methods: After board approval ten pigs weighing from 30–40 kg were included in our experiment. Anaesthesia was induced with thiopental, ketamine, fentanyl and pancuronium and maintained with thiopental, pancuronium and fentanyl infusion. Monitoring included ECG, pulse oximetry, invasive arterial pressure, thermography (Thermacam A40, FLIR systems), tissue oximetry (INSPECTRA oximeter, Hutchinson technologies). The depth we measured the haemoglobin saturation was at 12 mm. When the anastomoses of the vessels of the flap were complete and open, and 15 min after the ipsilateral stellate ganglion blockade, oximetry values and thermographic images were recorded. The temperatures of the flap were calculated from the thermographic images before and after the blockade.
Results: The animals were haemodynamically stable during the operation. We found that the stellate ganglion blockade improved the free flap's perfusion (regional haemoglobin saturation change 13.2 (4–19), (paired t-test, $p = 0.001$), temperature change +1.5°C (0.1–3.3°C), (paired t-test, $p = 0.012$).
Conclusions: The stellate ganglion blockade was effective to improve the perfusion of a free flap placed on the upper extremity in pigs.

A-475

Ultrasound-guided infraclavicular block using a catheter produces block quality equivalent to a single-shot technique

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Background and Goal of Study: An ideal catheter-based regional anesthesia technique for limb surgery would provide through-the-catheter block quality equivalent to a single-shot technique, be simple to insert, and immune to inadvertent displacement[1]. Ultrasound guidance facilitates single-shot techniques[2]; this prospective study aimed to demonstrate that ultrasound-guided insertion of infraclavicular catheters would produce a block of equivalent quality to a single-shot technique. Secondary outcomes assessed include performance time and intraoperative positional stability.
Materials and Methods: 80 patients undergoing hand or forearm surgery were randomized into 2 groups of 40; group SS (single-shot) and group K (catheter). A 6–10 MHz 38 mm linear ultrasound probe was used for all blocks. Anesthetic solution consisted of 0.5 ml kg^{-1} lidocaine 2% with epinephrine deposited in a "U" shaped distribution around the posterior aspect of the axillary artery through the needle (SS) or catheter (K). Patients in group K received an additional 0.25 ml kg^{-1} bupivacaine 0.25% with epinephrine 30 min postoperatively. Sensory and motor blockade, as well as supplementation rates, were evaluated for the median, musculocutaneous, radial and ulnar nerves. Analgesia was rated (scale 0 to 10) at 3 h, 6 h and 24 h post operatively, and time to first analgesic medication consumption was noted.
Results and Discussions: All patients were operated under regional anesthesia. Complete sensory blockade of all nerve territories was achieved in 92% of patients in group SS and 90% in group K ($p = 0.51$). Procedure times were 7 ± 4 min in group K (SS: 3 ± 1 min; $p < 0.0001$). Post-operative analgesia was superior in group K in terms of duration (11 h ± 5 h vs SS: 6 h ± 2 h; $p < 0.0001$) and pain scores at 3 h (1 ± 2 vs SS: 4±3; $p < 0.0001$) and 6 h (3 ± 3 vs SS: 5 ± 3; $p = 0.003$), but not at 24 h.

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Conclusion(s): Ultrasound-guided infraclavicular block using a catheter technique produces block quality equivalent to a single-shot block with slightly longer procedure times. Prolonged post-operative analgesia in group K demonstrated positional stability of catheters.

References:
1 Salinas FV. Reg Anesth Pain Med 2003; 28:79–82.
2 Dingemans E, Williams SR, Arcand G et al. (ref poster IARS).

A-476

Teaching nerve root identification with ultrasound to anaesthetic trainees. Not as easy as it sounds?

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Background and Goal of Study: The ideal situation for regional anaesthesia would be the ability to deliver around the target nerve the right dose of local anaesthetic without damaging the nerve or its surrounding structures. The use of 2D ultrasound has been argued by many to be the best current mechanism allowing us to do this.

Materials and Methods: In this study the theory and use of 2D ultrasound was explained to a group of trainees, followed by demonstrations of the use of ultrasound to identify nerve root. The trainees were then made to practise nerve root identification for themselves under supervision until they were able to routinely identify the different approaches to the brachial plexus, the musculocutaneous nerve in or near corachobrachialis, the median nerve in the forearm, the common peroneal, tibial, and sciatic nerves in the popliteal fossa.

Results and Discussions: During the next two months the trainees who had attended the interactive seminar were encouraged to practice their use of ultrasound for identification of nerve roots under supervision.

After this two month trainees who had attended the teaching ($n = 16$) and a group of trainees who had not attended ($n = 10$) were asked to identify a series of nerve roots.

Conclusion(s): There was no significant difference in the rate of successful nerve identification between the two groups. However on subgroup analysis those who had regularly used ultrasound for regional anaesthesia since the teaching session had greater rates of success.

This study appears to demonstrate that the learning how to identify nerve roots with the use of ultrasound will require in depth teaching, regular reinforcement and extensive practice.

References:
1 New perspectives in regional anaesthesia: the use of ultrasound – past, present, and future. Peter Marhofer, MD, Harald Willschke, MD, Manfred Greher, MD and Stephan Kapral, MD. Canadian Journal of Anaesthesia 52:R6 (2005).
2 Ultrasound guidance in regional anaesthesia. Marhofer P, Greher M, Kapral S. Br J Anaesth 2005; 94: 7–17.

A-477

The effect of intravenous dexmedetomidine on brachial plexus block in patients with end-stage renal failure

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Background and Goal of Study: Dexmedetomidine (DXM), a selective $\alpha 2$ adrenoreceptor agonist, enhanced peripheral neural blockade when used as an adjuvant to local anesthetics [1]. We investigated the effect of intravenous DXM on brachial plexus block in end-stage renal failure patients undergoing formation of arteriovenous fistula.

Materials and Methods: Sixty one ASA II/III patients were randomized to receive either DXM ($n = 32$, dose: 1 $\mu g\,kg^{-1}$ during 10 min. followed by infusion 0.3–0.5 $\mu g\,kg^{-1}h^{-1}$) or midazolam ($n = 29$, dose: 0.04 $mg\,kg^{-1}$ followed by infusion 0.04–0.08 $mg\,kg^{-1}h^{-1}$). Groups were similar for demographic and clinical factors. Supraclavicular brachial plexus block was provided using nerve stimulator technique, with 30 ml of 0.375% bupivacaine with adrenaline. After achievement of Bromage score of 2 according to modified Bromage scale (0- normal motor function, 1- ability to move only fingers, 2- complete motor block with inability to move elbow, wrist and fingers) and complete sensory block, administration of the study drug was started. Blood pressure (BP), heart rate (HR), oxygen saturation (SpO_2) and Ramsey sedation score were monitored. Duration of motor and sensory block was assessed. Data were analyzed by ANOVA, U-Mann Whitney and Wilcoxon's tests.

Results: Mean time of infusion of the study drug was 70 min. (35–120 min.). Both agents were well tolerated. Motor block lasted longer in DXM group (11.9 ± 3.8 vs 9.4 ± 3.4 h, $p < 0.05$) however there was no significant difference in duration of sensory block (9.0 ± 3.4 vs 7.3 ± 2.8 h, $p = 0.053$). Requirement for supplemental analgesic agents was greater in midazolam group. The DXM group had lower BP and HR after 20 min. of infusion. Midazolam group had lower SpO_2 values ($p < 0.001$). Both agents effected in mild sedation. No serious adverse effects were observed.

Conclusion: Intravenous DXM prolongs motor blockade after brachial plexus block and decreases requirement for additional analgesia without causing respiratory depression. It can be safely use in patients with renal dysfunction.

Reference:
1 Adnan T., et al. *Acta Anaesthesiol Scand* 2005; 49:563.

A-478

Perioperative analgesic sparing with bilateral superficial plexus block in thyroid surgery

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Background and Goal of Study: The use of regional anaesthesia in thyroid surgery remains controversial. This double blind, randomized controlled study was conducted to evaluate the analgesic efficacy of Bilateral Superficial Cervical Plexus Block (BSCPB) performed under general anaesthesia in patients undergoing total thyroidectomy.

Materials and Methods: 87 consecutive consenting patients were randomized to receive a BSCPB with saline (Group T, $n = 29$), ropivacaine 0.486% (Group R, $n = 29$) or ropivacaine 0.486% plus clonidine 5 μg/ml (Group RC, $n = 29$). BSPCB consisted of a subcutaneous injection (10 ml) behind and under the lateral border of the sternocleidomastoid muscle. Intraoperative administration of opioid was done for a 20% increase of arterial mean pressure and/or heart rate in a patient with a bispectral index between 40 and 60. During the first 24 postoperative hours, pain was assessed by a numeric pain scale (NPS). All patients received systematically 4 gr of acetaminophen. Additional administration of nefopam was done every 4 hours for patient with NPS greater than 4. Data are reported as mean $\pm$ SD. Comparison between groups was performed by Kruskal-Wallis or Mann Whitney test. $P < 0.05$ was considered as significant.

Results and Discussions: Analgesic requirement was significantly reduced during surgery in group RC compared with groups R and T (0.38 ± 0.13 vs 0.51 ± 0.25 and 0.60 ± 0.22 μg/kg; $p < 0.001$). Postoperatively, nefopam requirement was significantly reduced in groups R and RC compared with group T (23.4 ± 24.6 mg and 18 ± 20.2 mg vs. 33.8 ± 27.8 mg; $p < 0.05$). At PACU admission, pain score was significantly lower in groups R and RC compared with group T (4.8 ± 2.1 in group T vs 3.4 ± 2.6 in group R and 3.1 ± 2.5 in group RC, $p = 0.03$). Afterward, the pain score decreased regularly without any difference between groups to reach at the end of the study 1.2 ± 1.3 in group T, 1.2 ± 1.2 in group R and 1.2 ± 1.1 in group RC. No serious side effects were observed in any group.

Conclusion(s): BSCPB is an effective and safe technique to reduce pain during and after thyroid surgery, especially when performed using a combination of ropivacaine and clonidine.

A-479

A comparative study of ropivacaine 0.5% and levobupivacaine 0.33% for brachial plexus block

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Background and Aim: The Minimum Local Analgesic Concentrations (MLAC) for motor block after epidural administration, has been reported to be 0.5% for ropivacaine (R) and 0.33% for levobupivacaine (L) (1). The aim of this prospective, randomized, double-blind study was to compare the characteristics of the block induced by these concentrations of the same local anaesthetics, when used in axillary brachial plexus block.

Methods: The Protocol was approved by the Human Ethics Committee of the Institution, and all patients gave informed consent. Eighty six ASA I–II patients, scheduled for orthopaedic hand and forearm procedures were randomly allocated to receive an axillary brachial plexus block with 30 mL of R 0.5% or L 0.33%, using a selective multiple nerve stimulation technique. Sensory and motor blocks were tested at 2, 5, 10, 15, 20, 25 and 30 min

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after local anesthetic injection. Onset time, the time for the patients to be "ready for surgery", the need for intraoperative opioids and/or supplemental blocks, the duration of analgesia, and adverse effects were recorded.
Results: The results are shown in this table.

Block characteristics	R (mean ± SD)	L (mean ± SD)	t-Student
Onset sensory (min)	10.85 ± 5.90	12.03 ± 5.80	p = 0.363
Onset motor (min)	9.02 ± 5.31	12.42 ± 7.83	p = 0.023
Ready to surgery (min)	25.0	24.18	p = 0.835
Duration analgesia (h)	13.05 ± 5.00	14.18 ± 3.83	p = 0.343
Duration sensory (h)	9.24 ± 3.08	11.36 ± 4.09	p = 0.011
Duration motor (h)	10.37 ± 2.95	10.15 ± 5.55	p = 0.218

Thirty min after local anesthetic injection, most patients presented partial or complete motor block in both groups, suggesting that MLAC motor block of both drugs in brachial plexus block, is less than during epidural block.
Conclusions: R 0.5% induced a shorter onset of block. Thirty min after injection, a higher number of patients presented an adequate block than with L 0.33% (2). However, the duration of sensory block was longer with L.
References:

1 Lacassie HJ. Anesth Analg 2003; 97: 1509–13.
2 Liisanantti O. Acta Anaesthesiol Scand 2004; 48: 601–6.

A-480

Ulnar vs. radial nerve stimulation associated with musculocutaneous nerve block for axillary brachial plexus block

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Background and Objectives: Radial plus musculocutaneous nerve stimulations may have a predominant role in the success of an axillary block. No comparison have been made with ulnar plus musculocutaneous nerve stimulations. We compared the extent of both sensory and motor block with both techniques.
Methods: Sixty patients were randomly assigned to receive an axillary block using either radial plus musculocutaneous or ulnar plus musculocutaneous nerve stimulation with 40 mL plain 1.5% mepivacaine. Patients were assessed for sensory block by the pinprick method at 5 and 20 min.
Results: No statistically significant differences were found in the rates of anesthesia at 20 min in the cutaneous nerve distributions of the upper limb between radial plus musculocutaneous and ulnar plus musculocutaneous nerve stimulations except for the following nerves: radial (90% and 63.3%, respectively), medial cutaneous of the forearm (83.3% and 100%, respectively) and medial cutaneous of the arm (73.3% and 93.3%, respectively). Global sensory score at 20 min was significantly higher after radial than after ulnar nerve stimulation: 12 (11–13) and 11 (10–12), respectively. The rates of median nerve blockade were low in both groups (50% and 53%, respectively).
Conclusions: Radial nerve stimulation produced a more extensive anesthesia of the upper limb. However, there is not an optimal combination of two responses in axillary brachial plexus block since the rates of median nerve block were low in the two groups.
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2 Vester-Andersen T, Christiansen C, Sorensen M, Eriksen C. Perivascular axillary block. I: blockade following 40 ml 1% mepivacaine with adrenaline. *Acta Anaesthesiol Scand* 1982; 26: 519–523.

A-481

Why would we change the way to perform radial nerve block at the elbow: ultrasonographic study on 40 healthy volunteers

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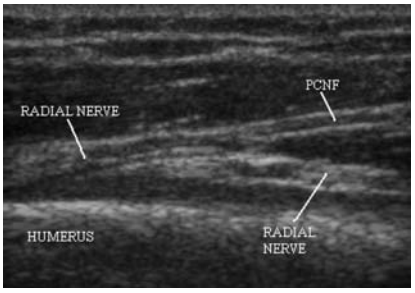
Background and Goals: Radial nerve block at the elbow is the usual complementary block in case of failure of a proximal brachial plexus block. It's commonly performed about 2 cm above the skin fold of the elbow, on the lateral aspect of the biceps brachialis muscle. However, in this approach, the Posterior Cutaneous Nerve of the Forearm (PCNF) is rarely anesthetized, due to its upper emergence. The aim of this study was to determine at which level the PCNF branches from the radial nerve, in order to anesthetize both nerves with a single injection.
Materials and Methods: 40 healthy volunteers underwent bilateral ultrasound examination of the emergence of the PCNF (*TITAN, SonoSite Inc™, Bothell, WA, USA*). The following data were collected: posterior Olecranon face–to-PCNF fork distance (A) and Acromion's lateral edge-to-PCNF fork distance (B), reported as MEAN ± SD. These results were statistically analysed with a Mann-Whitney test. Confidence Intervals (IC) were calculated.



Results:

	Age	Weight (kg)	Height (cm)	A (cm)	B (cm)	A/Height	B/Height
Total (group 40)	35.5 ± 9.20	66.4 ± 10.90	171.7 ± 8.54	15.1 ± 1.44	22.01 ± 1.75	8.88% ± 0.005	12.8% ± 0.006
IC	± 1.45	±1.73	±1.35	±0.21	±0.26	±0.001	±0.001
Male (20)	36.4 ± 9.47	72.85 ± 8.38	177.75 ± 6.12	15.79 ± 1.22*	22.73 ± 1.66**	8.88% ± 0.005	12.8% ± 0.007
Fem. (20)	34.65 ± 9.08	59.95 ± 8.39	165.75 ± 6.03	14.38 ± 1.29*	21.30 ± 1.55**	8.87% ± 0.006	12.8% ± 0.006

There was no statistical difference between right and left measures for A and B ($p > 0.05$) but A and B were statistically different between Male and Female groups (*$p < 0.001$ and **$p < 0.01$). The average ratio for A/Height was 8.88% and B/Height was 12.8%, and there was no significant difference between males and females ($p > 0.05$).
Conclusions: Single injection of local anesthetics close to the radial nerve at a distance of 8.9% of patient's height above the posterior face of Olecranon, or at a distance of 12.8% of patient's height below the Acromial lateral edge may lead to the anesthesia of both motor and sensitive radial territories of forearm.

A-482

Paravertebral block reduces the prevalence of chronic pain symptoms after surgery for breast cancer

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Background and Goal of Study: Preincisional paravertebral block (PVB) provides significant immediate postoperative analgesia (1) possibly reducing the incidence of chronic pain. We now report the results from the 12-month follow-up.
Materials and Methods: The patients received PVB with bupivacaine 1.5 mg/kg (n = 30) or SHAM (n = 30) block with saline at Th3 level before general anaesthesia in a randomised and blinded manner. The follow-up started with a 14-day symptom diary and continued with telephone interviews 1, 6 and 12 months after the operation. The prevalence and intensity of pain (VAS = visual analogue scale 0–10 or NRS = numeral rating scale 0–10) were recorded.
Results and Discussions: The patients in the SHAM group had more VAS > 3 intensity pain compared to the PVB group up to 14 days postoperatively but there was no difference in the consumption of analgesics. We excluded 7 patients in the PVB group and 5 in the SHAM group from analyses of the telephone interview data because they had a second operation 2–4 weeks after the first operation. Radiotherapy was given to 18 patients in the PVB group and 19 in the SHAM group 3–9 months postoperatively.

Variable	Time	PVB	SHAM	*P*-value
Motion related (NRS)	1 mo	2	3.3	0.017
Motion related (NRS)	12 mo	0	2	0.029
Number of pain symptoms	6 mo	0	1	0.045
Number of pain symptoms	12 mo	0	1	0.010
Prevalence of pain	12 mo	39%	76%	0.029

Conclusion(s): In addition to significant immediate postoperative analgesia preincisional PVB reduced the prevalence and intensity of chronic pain symptoms at least one year after breast cancer surgery. Radiotherapy seemed to predispose the patients in the SHAM group to chronic pain symptoms

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whereas PVB prevented from this process. The preincisional PVB may have a pre-emptive analgesic effect, but further studies are warranted.

Reference:

1 Kairaluoma P et al. Anesth Analg 2004; 99:1837–43.

A-483

Efficacy and tolerability of fentanyl or clonidine in combination with diluted levobupivacaine in paravertebral analgesia

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Background and Goal of Study: We investigated the effect of addition of fentanyl (F) or clonidine (C) to levobupivacaine (L) for paravertebral analgesia (PVA) in breast surgery.

Materials and Methods: Fifty-two patients undergoing PVA and general anaesthesia for breast cancer surgery were randomized to one of four groups: Group L received PVA 20 ml bolus L 0.25%, followed by infusion L 0.1%; Group LF received PVA 20 ml bolus L 0.25% with F 50 μg, followed by infusion L 0.05% with F 4 μg/ml; Group LC received PVA 20 ml bolus L 0.25% with C 150 μg, followed by infusion L 0.05% with C 3 μg/ml. Group PCA received general anaesthesia alone, and postoperative i.v. morphine patient-controlled analgesia (PCA). The PVA infusions were administered at 0.15 ml/kg/h (maximum of 15 ml/h) for 24 hr. All PVA patients also received postoperative rescue i.v. morphine PCA. Primary outcome measures were pain scores on a visual analogue scale (VAS) at 2, 4, 8, 12 and 24 hr and also cumulative morphine consumption over 24 hr. Secondary outcomes included haemodynamic parameters, nausea/vomiting, antiemetics use, pruritus, sedation and patient satisfaction scores.

Results and Discussions: The patients' characteristics were similar. The 24 hr morphine consumption [mean (SD)] was significantly decreased in Groups LF [7.93 (14.68) mg] and LC [5.86 (12.00) mg] vs. Groups L [27.73 (31.17) mg] or PCA [22.65 (24.02) mg], $p < 0.01$. Patients in Group PCA experienced higher pain scores [median (range)] at 4, 8 and 24 hr [2(0–4), $p = 0.03$; 2(0–3), $p = 0.04$; and 3(0–5), $p = 0.02$, respectively] and more nausea at 12 hours [2(0–4), $p = 0.04$] vs. all PVA patients. Not surprisingly, patients receiving opioids (Groups LF and PCA) appeared to vomit more and required more antiemetic drugs than patients in Group LC ($p = 0.04$), whereas the latter presented significantly more episodes of arterial hypotension ($p = 0.01$). There was a marginal difference in the satisfaction scores ($p = 0.03$) favoring the PVA mixtures.

Conclusions: The addition of F or C to diluted L (0.05%) in paravertebral analgesia regimens decreases i.v. morphine consumption after breast surgery, but F is associated with vomiting and C is associated with arterial hypotension.

A-484

Standardized procedure note form in peripheral nerve blockade practice

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Background and Goal of Study: Peripheral nerve block (PNB) practice is actually growing: there are many approaches to the nerves and plexus, techniques and different needles, catheters and nervestimulator. Besides PNB are made by practitioners with different degree of experience: anaesthesiologists and residents. Although the use of these techniques have grown, our ability to easily document PNB procedures has not(1). Most practicioners document these procedures in a limited space of their hospital's anaesthesia record. Our objective is to show the standardized peripheral nerve block procedure note form used in our hospital.

Materials and Methods: In our institution a data block sheet is complimented after PNB. It contains some variables: name of anaesthesiologist, date, demographic patient data, approach used, parametres of nerve stimulation, pain or paresthesia with the injection of local anesthetic, degree of sensory and motor block, quality of analgesia, secondary effects and rescue analgesia demanded. These variables are registered at 8, 16, 24, 36 and 48 hours after the block. Besides we register the duration of analgesia and motor block after single shot techniques and the motor response observed removing the stimulating catheter after continuous techniques.

Results and Discussions: From june of 2002 a data block sheet is used to systematize PNB procedure note form. We registered 1268 PNB with nervestimulation in the latest four years: 75% in the lower limb and 25% in the upper limb. 40% practiced by resident and 60% by anesthesiologist. 30% continuous techniques using stimulating catheters and 70% single shot techniques.

Conclusion: It is very important to develope a standardized PNB procedure note form in other to know what we do and how we do it. It could be interesting for legal implications too. This standardized form we have developed will be easily adaptable to any anesthesia practice that utilizes peripheral nerve blockade.

Reference:

1 Gerancher JC, Viscusi ER, Liguory GA, et al. Reg Anesth Pain Med 2005; 30(1):67–71.

A-485

Hypertensive crisis after interscalene block for shoulder surgery

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Background and Goal of Study: Interscalene brachial plexus block (ISB) is a useful technique to provide anesthesia and analgesia for the shoulder surgery[1]. Complications associated with ISB are well known, but hypertension after of ISB is a complication not yet covered in medical literature. The proximity of the carotid sinus baroreceptors would cause a blockade of these receptors leading to hypertension[2]. Baroreceptors transmits information to the nucleus tractus solitarius (NTS). Neurons from the NTS project to the nucleus ambiguus where they influence the firing of sympathetic and parasympathetic nerves.

Materials and Methods: 75 patients ASA I–II underwent to ISB following a standardized technique before induction of general anesthesia. Previous to the blockade, blood pressure (bp) and heart rate were measured. Local anaesthetics used were 0.7% ropivacaine, 0.5% ropivacaine or 1% mepivacaine +0.25% bupivacaine, between 20 and 40 millilitre. A laryngeal mask in lateral position was set to ventilate patients. Induction of anesthesia was achieved by intravenous and the maintenance was made with desflorane 4–6% according to BIS.

Results: 75 patients underwent to ISB. 12 patients (16%) without past medical history of hypertension with normal blood pressure in the preoperative evaluation and in the preoperating room developed arise of the bp between 5′ and 10′ after the ISB without tachycardia. Bp arise between a 40–60% on the previous determination. 6 patients (50%) needed hypertension treatment. No relation with any anaesthetics types or administered volume were found.

Conclusions:

1 The proximity of the carotid sinus baroreceptors, would cause a blockade of these receptors leading to neurogenic hypertension.
2 The ISB can cause brief hypertensive crisis without tachycardia that can require treatment.

References:

1 Borgeat A, Schappi B, Biasca N, et al. Anesthesiology 1997; 87:1343–1347.
2 Pippa G, Dominique Sigaudo-Roussel, Michael E. J. Vasc Surg 2004; 39:1288–1294.

A-486

Patient - controlled interscalene analgesia after shoulder surgery with 0.15%, 0.1% bupivacaine or 0.1% bupivacaine plus clonidine: a prospective, randomized, double - blinded clinical comparison

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Background and Goal of Study: The aim of the present study was to compare analgesic effectiveness of patient - controlled interscalene infusion (PCIA) with 0.15%, 0.1% bupivacaine or 0.1% bupivacaine plus clonidine *to maintain such technique postoperatively*. We hypothesized that a continuous infusion of 0.1% bupivacaine plus 1 μg/ml clonidine through interscalene catheter provides good control of postoperative pain with less motor impairment.

Materials and Methods: 78 patients, ASA 1 to 2, scheduled for elective shoulder surgery were prospectively randomized to receive an interscalene infusion of 5 mL/h plus patient-controlled boluses (2.5 mL/30 min) with either 0.15% (group I), 0.1% bupivacaine (group II) or 0.1% bupivacaine plus clonidine (group III) for postoperative analgesia. All patients received an interscalene brachial plexus block (ISB). Postoperative infusions were maintained for 72 h. Rescue treatment consisted of morphine 0.1 mg/kg subcutaneously. VAS pain scores at rest and with motion every 4 h and postoperative morphine consumption were assessed. Hand strength was measured by means of dynamometer. Statistical analysis was performed using tests of Mann–Whitney, Kolmogorov–Smirnov, Chi^2 and Student t, p value < 0.05 was considered significant.

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Results and Discussions: Pain scores at rest and with motion were similar in group I and III during the whole study period. Pain relief was significantly better controlled in these groups at rest and with motion when compared with the group II, morphine consumption was also less. The strength of the hand on the operated side decreased by 68% 48 h after the ISB in the group I versus 44% in the group III ($p < 0.05$) in comparison with the preoperative value. At 72 h after the ISB, the decrease in strength was 60% versus 34% in the group I and III, respectively ($p < 0.05$). No statisticaly significant difference in the decrease of hand strength at 48 h and 72 h after the ISB in the group II when compared with the group I and III was observed.
Conclusion(s): The administration of bupivacaine 0.1% plus clonidine and bupivacaine 0.15% provides good and comparable control of postoperative pain with a high degree of patient satisfaction. The application of bupivacaine 0.1% by the PCIA technique offers a better preservation of motor function as assessed by hand strength.

A-487

Enhanced tactile acuity of the contralateral hand after nerve block of brachial plexus

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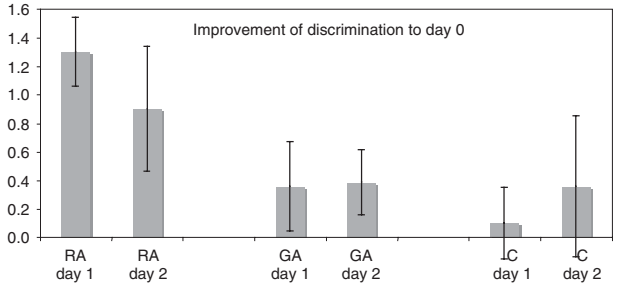
Background and Goal of Study: Recent studies have shown that regional anaesthesia enhances tactile resolution for ipsi- and contralateral areas of the body (1,2).

However, neither the temporal dynamic of this effect is known, nor the occurrence after general anaesthesia.

The purpose of this study was therefore to investigate potential differences of enhancement of tactile resolution after regional vs. general anesthesia during operations of the hand.
Materials and Methods: We studied 10 patients with regional anaesthesia (RA, nerve block of brachial plexus) and 7 patients with general anaesthesia (GA) after operation of the hand and 7 controls (C) at 3 subsequent days. Limits of tactile spatial resolution were measured using Grating Orientation Task (GOT) at the contralateral hand.
Results:



$P < 0.01$ RA > GA day 1-day 0
$p < 0.001$ RA > C day 1-day 0

Conclusions: An enhancement of tactile acuity was observed in RA exclusively, which points to a specific effect of selective deafferentation for functional reorganization.
References:
1 Weiss T, et al. *Eur J Neurosci* 2004; 20: 3413–3423.
2 Werhahn KJ, et al. *Nat Neurosci* 2002; 5: 936–938.

A-488

The analgesic and sedative effect of dexmedetomidine in intravenous regional anaesthesia (IVRA) with prilocaine: a comparison of intravenous or IVRA

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Background and Goal of Study: Dexmedetomidine is highly selective alpha-2 agonist with potent sedative and analgesic effects (1). In this prospective, randomized study, the analgesic and sedative effect of intravenous dexmedetomidine premedication, administered 10 minutes before intravenous regional anaesthesia (IVRA) with prilocaine, was compared with intravenous regional anaesthesia with dexmedetomidine plus prilocaine in patients undergoing minor hand surgery.
Materials and Methods: Sixty patients were randomly allocated to receive intravenous (IV) (Group P), or IVRA (Group S) dexmedetomidine. Group P patients were given a standardised (1 $\mu g\,kg^{-1}$) premedication dose of intravenous dexmedetomidine ten min before IVRA with prilocaine (3 $mg\,kg^{-1}$). Group S patients were given dexmedetomidine (1 $\mu g\,kg^{-1}$) plus prilocaine (3 $mg\,kg^{-1}$) with IVRA. Pain and sedation scores, haemodynamic variables were recorded at 5, 10, 15, 30 and 40 min after IVRA. These variables were measured at 5, 10, 15, 30 and 60 min after deflation of the distal tourniquet. The duration of IVRA, the number of patient requiring supplement fentanyl, the number of patient experiencing tourniquet pain and any side effect was also recorded.
Results and Discussions: Duration of IVRA was similar between two groups. Systolic and diastolic blood pressure and heart rate were significantly lower at each study period in Group P than the Group S ($P < 0.05$). Although, sedation scores were significantly higher in each study period in Group P than in Group S, postoperatively, it was significantly higher in group S than in Group P ($P < 0.05$). Pain scores and the number of patient requiring supplement fentanyl were similar between two groups throughout the study period. The number of patient experiencing tourniquet pain was significantly lower in Group S than in Group P ($P < 0.05$).
Conclusion(s): IV dexmedetomidine administration before IVRA provided high sedation score intraoperatively. However the addition of 1 $\mu g\,kg^{-1}$ dexmedetomidine to prilocaine (3 $mg\,kg^{-1}$) for IVRA improved tourniquet tolerance without prolong the duration of IVRA, but led to high postoperative sedation scores.
Reference:
1 Arain SR, Ruehlow RM, Uhrich TD, Ebert TJ. Anesth Analg 2004; 98:153–158.

A-489

Does Interscalene catheter placement with stimulating catheters improve postoperative pain or functional outcome after shoulder surgery? A randomized, controlled, and double-blinded trial

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Background and Goal of Study: In this randomized double-blinded trial, we investigated if the use of a stimulating catheter [1–2] improves the efficacy of continuous interscalene block in patients scheduled for shoulder surgery. Therefore, we investigated whether stimulating catheters improved onset of block, postoperative pain and long-term functional outcome. (range of pain free shoulder movement and impairment of daily activities by shoulder pain).
Materials and Methods: After ethics committee approval and consent 43 patients scheduled for endoscopic shoulder surgery were included into the study. After eliciting an adequate muscular twitch at $\leqslant 0.5$ mA nerve stimulation output, the catheter was either advanced blindly (CC group, $n = 20$) or guided by the same stimulation over the catheter (SC group). A bolus of 400 mg prilocaine and 75 mg ropivacaine was administered, followed by a patient-controlled infusion of ropivacaine 0.2% (16 mg/h infusion rate, bolus 4 mg, lockout time 20 min). Postoperative pain was measured by means of visual analog scale, local anaesthetic and other analgesic requirements. A subjective score (DASH measuring impairment of daily activity by shoulder pain) and an objective shoulder score (Constant-Murley measuring range and strength of pain free shoulder movement) evaluated before and six weeks after surgery.
Results and Discussions: There were no differences in onset of block between both groups. Mean pain scores at rest on two postoperative days were 2.1 ± 3.3 in the CC group and 1.2 ± 1.9 in the SC group ($P = 0.17$). Both shoulder function scores improved significantly in the SC group by 23% and 32% (Constant-Murley) compared to the improvements in the CC group (7% and 2%; $P \leqslant 0.05$).
Conclusion(s): We conclude that the use of a stimulating catheter results in an unaltered onset of block, only a trend towards improved postoperative pain control and a significantly improved functional outcome 6 weeks postoperatively.
References:
1 Morin AM, et al. Anesth Analg (2005) 100: 1503–10.
2 Casati A, et al. Anesth Analg (2005) 101: 1192–7.

A-490

Intravenous regional anesthesia using lidocaine and ketamine

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Background and Goal of Study: Intravenous IV regional anesthesia (IVRA) is one of the simplest forms of regional anesthesia[(1)]. However, IVRA has

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been limited by tourniquet pain and its inability to provide postoperative analgesia and sometimes block insufficiency especially in bone surgery[2]. We conducted this study to evaluate the effects of ketamine, when added to lidocaine for IVRA, on tourniquet pain and postoperative analgesia.

Materials and Methods: Thirty patients undergoing elective hand surgery during IVRA were randomly assigned to three groups: 1– Case: Ketamine (0.1 mg/Kg) + Lidocaine (40 ml 0.5%) for IVRA. 2– Control: Lidocaine + placebo (normal saline) for IVRA and ketamine (0.1 mg/Kg) IV at the end of operation. 3– Placebo: Lidocaine + placebo for IVRA and placebo IV at the end of operation. The measures of tourniquet and postoperative pain via visual analog scale (VAS), use of fentanyl (25 μg q20 min), and patient and surgeon satisfaction from block quality were obtained.

Results and Discussions: Data are shown in table:

Group	Case	Control	Placebo
tourniquet pain (VAS)	1.00 ± 1.05¥	3.40 ± 2.59	2.90 ± 1.79
Postope. pain (VAS)	1.70 ± 0.67	3.70 ± 2.36	3.10 ± 1.60
Fentanyl (μg)	5.00 ± 10.57	30.00 ± 32.91	27.50 ± 18.45
patient satisfaction%	70#-30*-10$	30#-40*-30$	20#-70*-10$
surgeon satisfaction%	60#-40*-0$	20#-50*-30$	20#-50*-30$

¥:mean ± SD #: excellent *: good $: intermediate.

Ketamine plus lidocaine in IVRA reduces unbearable tourniquet and postoperative pain, fentanyl consumption, and increases patient & surgeon satisfaction, in the other word, block intensity.

Conclusion(s): The addition of ketamine to a local anesthetic in IVRA is effective; however, further studies must be performed with experimental models, other peripheral techniques, and different doses to determine a relevant conclusion before its routine use.

References:

1 Anesthesia Ronald. D. Miller 2000, 43: 1529–153.
2 Johnson CN. CRNA 2000; 11: 57–61.

A-491

Ultrasound guided interscalene cervical block for carotid surgery

R.J. Litz[1], T. Roessel[1], D. Wiessner[2], S. Seifert[2], J. Gastmeier[2], T. Koch[1], A.R. Heller[1]

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Background and Goal of Study: The major advantage of regional blocks for carotid surgery is monitoring cerebral function in the awake patient. Major concerns during block performance in the neck region are lack of block success, unintended puncture of adjacent structures as well as intravascular injection. Ultrasound guided techniques for needle advancement may minimize such risks by visualisation of the puncture site and observation of local anaesthetic spread. The purpose of the present study was to evaluate Winnie's interscalene cervical approach (ICB) for carotid surgery regarding efficiency and safety by means of ultrasound guided puncture.

Materials and Methods: For ICB in carotid surgery an ultrasound guided approach is used in our institution. The target structures are identified by a portable ultrasound device with a 10 MHz linear transducer and saved for documentation. Up to 30 ml of ropivacaine 0.5% / mepivacaine 1% mixture are injected after identification of the target nerves. Onset of block as well as any complication, supplementation, and haemodynamics are on-line recorded by a computer documentation system. So, the records of 102 consecutive patients who received ICB for carotid surgery by the same trainee were analysed regarding the efficiency and safety of ICB by ultrasonic guidance.

Results and Discussions: In all patients identification of the target branches was possible, showing the nerves 1.2 ± 0.4 cm to the skin but closer to the major vessels as compared to a C6 approach. In all patients major and minor vessels could be identified prior to injection so aspiration test did not reveal blood in any patient. Onset of block was 16 ± 4 min. All patients could be operated on without sedation or i.v. analgesia. Intraoperatively, local supplementation of the blocks during preparation of the adventitia was necessary in 48% of patients (4 ± 4 ml). No complications related to the anaesthetic technique occurred. In 2 patients regional anesthesia was converted to general anaesthesia (intraoperative embolism/lack of patient's compliance).

Conclusions: Ultrasound guided ICB for carotid surgery according to Winnie's approach provided a high success rate by a single injection. Typical complications associated with the use of this approach could be prevented.

A-492

The incidence of obturator nerve block: a comparison between posterior lumbar plexus block and the 3-in-1 femoral nerve block

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Background: The goal of this prospective, randomized, blind study was to compare the incidence of obturator nerve block after the classic 3-in-1 femoral nerve block or posterior lumbar plexus block.

Methods: With Ethical committee approval and written informed consent, 24 ASA physical status I–II, 18–83 yr-old patients undergoing major knee surgery were enrolled. All the patients received first the classic Labat's sciatic nerve block by using 15 ml of 0.5% levobupivacaine. By use of computer-generated number sequence, patients were randomly allocated to receive either posterior lumbar plexus block (LP N = 12) or the 3-in-1 femoral nerve block (FB N = 12). In both cases after quadriceps contraction were elicited 30 ml of 1.3% mepivacaine solution were injected. Blockade of obturator nerve was evaluated by the degree of thigh adductor motor block. The strength of adduction was measured before and after the block with the help of a mercury sphygmomanometer. We also recorded the loss of pinprick sensation in the cutaneous-femoral nerve distribution, the time needed to perform block as well as the need for intraoperative analgesic rescue doses or general anesthesia.

Results: No differences in anthropometrics parameters and time for readiness to surgery were found between the two groups. The median range of the time for block placement was 180 sec (115–900) for LP and 150 sec (120–360) for FB. Thirty minutes after anesthetic solution injection strength of adductor muscles decreased by 64% in lumbar plexus group and by 18% in the 3-in-1 femoral group. This difference was statistically significant ($P < 0.05$). Only 2 patients (15%) of the FB group and 11 patients (90%) in the LP group showed cutaneus-femoral nerve block ($P < 0.05$), while 2 patients (15%) of the LP group against 8 patients in the FB asked for intraoperative analgesics rescue doses ($P < 0.05$). Just one patient in the lumbar plexus group showed bilateral sensory block but no treatment was required.

Conclusion: Lumbar plexus nerve block statistically increases the likelihood to get both obturator and cutaneus femoral nerve block compare with the classic 3-in-1 femoral nerve block with similar safety and time for block placement.

A-493

A comparison of the patient satisfaction of femoral and popliteal sciatic nerve blocks with that of epidural anesthesia for greater saphenous vein stripping surgery

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Background and Goal of Study: Epidural anesthesia (EA) has some complications such as hypotension, bradycardia, postlumbar puncture headache and back pain. We test the hypothesis that femoral and popliteal sciatic nerve blocks (FPSNB) would eliminate these side effects and increase patient's satisfaction level in greater saphenous vein stripping surgery.

Materials and Methods: Thirty patients were received unilateral FPSNB with 30–40 ml of 1.5% mepivacaine by using of nerve stimulator, thirty patients were received epidural anesthesia with 15–20 ml of 0.75% ropivacaine.

Results and Discussions:

	EA	FPSNB	P value
Sex (M:F)	7:23	10:20	–
Age (year)	50.2 ± 10.1	47.4 ± 12.6	–
Height (cm)	161 ± 6	163 ± 8	–
Weight (kg)	61.5 ± 8.6	64.4 ± 10.1	–
Operation Time (min)	101 ± 45	71 ± 18	<0.05
Sensory Block Time (min)	277 ± 116	324 ± 89	–
Bradycardia (yes/no)	7/23	0/30	<0.05
Hypotension (yes/no)	9/21	0/30	<0.05
Shivering (yes/no)	10/20	0/30	<0.05
Fentanyl (yes/no)	2/28	18/12	<0.05
Unpleasant feeling with Anesthetic Procedure (yes/no)	17/13	8/22	<0.05
Intraop. Anxiety (yes/no)	17/13	14/16	–
Pain during operation (yes/no)	1/29	8/22	<0.05
Pain on the site of needle entry (yes/no)	19/11	5/25	<0.05
Satisfaction level for anesthesia (100 point scales)	76.5 ± 15.8	88.1 ± 13.3	< 0.05
Future recommendation (yes/no)	23/7	27/3	–

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These results indicate that unilateral FPSNB can be an excellent anesthetic choice for greater saphenous vein stripping surgery.
Conclusion(s): FPSNB can be excellent anesthetic choice with high patient's satisfaction in unilateral greater saphenous vein stripping surgery.
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A-494

Postoperative analgesia with fascia iliaca block in elderly patients with hip fracture

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Background and Goal of Study: Although pain increases risk of adverse outcome (1), often analgesia is not adequate in elderly people (2). We compared different intra- and postoperative managements in order to provide optimal analgesia.
Materials and Methods: Consentient consecutive patients, age >75, undergoing hip fracture repair, were enrolled. Standard analgesia was: intraoperative paracetamol 1 g iv, postoperative paracetamol 1 gq8, ketoprofen 100 mg iv as rescue drug. Patients were randomized to 4 groups: 1) General inhalatory anesthesia; 2) single bolus psoas compartment block (ropivacaine 0.7% 30 ml), parasacral sciatic block (mepivacaine 2% 10 ml), and sedation; 3) General anesthesia and continuous fascia iliaca block (intraoperative dose: ropivacaine 0.5% 30 ml, bolus dose: ropivacaine 0.2% 20 mlq8; 4) spinal anesthesia (hyperbaric bupivacaine 0.5% 6–10 mg). Pain scores (visual analog scale 0–10 cm), consumption and time of first request of ketoprofen were registered for 36 hours. Data (mean ± SD) were compared using analysis of variance with Bonferrroni correction. The rescue-free proportion of each group was described with a Kaplan–Meier curve using a log-rank test.
Results and Discussions: 84 patients were studied. Pain scores were low (VAS ⩽ 3) in all cases. Ketoprofen consumption was reduced in fascia iliaca group (1: 280 ± 337 mg; 2: 114 ± 205 mg; 3: 70 ± 80 mg; 4: 145 ± 140 mg. Group 1vs3: $p = 0.01$). Analgesic request was delayed in psoas and fascia iliaca groups: (1: 654 ± 631 min; 2: 1134 ± 522 min; 3: 1130 ± 467 min; 4: 870 ± 530 min. Group 1vs2: $p = 0.03$; 1vs3: $p = 0.04$). Rescue-free patients were 58% in groups 2 and 3, and 28% in groups 1 and 4 ($p = 0.002$). No side effects were observed.
Conclusion(s): Continuous fascia iliaca block provided adequate analgesia, reduced and delayed ketoprofen consumption without side effects in hip fracture surgery.
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A-495

Standards of peripheral nerve block procedure documentation: a review of practice

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Background and Goal of Study: Peripheral nerve blocks (PNB) form an important part of anaesthetic practice. Clear documentation of the procedure and patient consent is vital. A standardized PNB procedure note form has been developed in the USA as a way to improve documentation (1). Our objective was to review our current standards of PNB documentation and asses the need for a standardized form.
Materials and Methods: In a tertiary referral centre for elective orthopaedic surgery, key data was prospectively collected from 100 consecutive patients where the anaesthetic technique involved PNB.
Results and Discussions: A total of 145 individual PNBs were performed in 100 patients. Only 31% of records noted which major complications had been discussed with the patient prior to PNB. In 42% of records it was not obvious which anaesthetist had performed the PNB. Aseptic technique was noted on only 27% of records. Nerve stimulation threshold was not noted in 21% of blocks. Negative aspiration prior to injection was noted in 20% of records, normal resistance on injection in 16% and immediate disappearance of muscle twitch on injection was never noted. Absence of pain or paraesthesia on injection was only noted in 7% undergoing PNB awake.
Conclusion(s): This study highlights the variable extent of PNB documentation in the anaesthetic records. Regardless of clinical expertise, this may be indirectly seen as evidence of a poor standard of anaesthetic care (2). We propose the introduction of a standardized PNB procedure form, and commend the work of Gerancher et al (1).
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A-496

Low volume and high concentration of local anesthetic seems more efficient than high volume and low concentration with Labat's sciatic nerve block: a prospective, randomized comparison

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Background: Various factors markedly affect the onset time and efficacy of peripheral nerve blocks. The purpose of this prospective, randomized, blinded study was to compare the behavior of a constant dose of mepivacaine 300 mg diluted in a 20 or 30 mL injection volume for sciatic nerve blockade using the classic posterior approach.
Materials and Methods: A total of 42 ASA I–II patients undergoing foot surgery were randomly allocated to receive sciatic nerve blockade using the classic posterior approach with 20 mL of 1.5% mepivacaine ($n = 20$) or 30 mL of 1% mepivacaine ($n = 22$). All blocks were performed with the use of a nerve stimulator (stimulation frequency 2 Hz; intensity 1.5–0.5 mA). In the two groups, an appropriate sciatic stimulation was elicited at <0.5 mA and the targeted evoked motor response was plantar flexion of the foot[2]. Time required for onset of sensory and motor block in the distribution of the tibial and common peroneal nerves were recorded. The success rate was defined as a complete loss of pinprick sensation in the sciatic nerve distribution with concomitant inability to perform plantar or dorsal flexion of the foot.
Results and Discussion: The two groups were similar with regard to demographic variables and duration of surgery. A greater success rate was observed with 20 mL 1.5% mepivacaine (100%) than with 30 mL 1% mepivacaine (68%; $p < 0.05$). There was no significant difference in the onset of sciatic nerve block between the two groups (table 1). When a proximal approach is used to block the sciatic nerve, the two sciatic nerve components are in close proximity and wrapped by a fascial sheath. The size of the sciatic nerve at this level and the thickness of its epineurium may explain the inability of local anesthetics to completely penetrate the nerve when high volume and low concentration of local anesthetic is used.

	20 mL mepivacaine 1.5% ($n = 20$)	30 mL mepivacaine 1% ($n = 22$)
Success rate (number of patients)	20 (100%)†	15 (68%)
Onset time of sensory block (min)		
– In common peroneal nerve distribution	11 ± 4	11 ± 7
– In tibial nerve distribution	10 ± 4	11 ± 8
Onset time of motor block (min)		
– In common peroneal nerve distribution	14 ± 6	13 ± 7
– In tibial nerve distribution	13 ± 6	12 ± 7

Data are mean ± SD or number of patients (%). †$p < 0.05$.

Conclusion: In sciatic nerve block, low volume and high concentration of local anesthetic (20 mL mepivacaine 1.5%), predicts a more frequent success rate than high volume and low concentration (30 mL mepivacaine 1%), when a posterior classical approach (Labat approach) is used.
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A-497

Prospective, randomized comparison between the popliteal and subgluteal approaches for continuous sciatic nerve block with stimulating catheters

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Background and Goal of the Study: No information is available comparing two approaches for continuous sciatic nerve block using stimulating catheters. The purpose of the present study was to compare two different

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approaches (subgluteal and posterior popliteal) for continuous postoperative analgesia using stimulating catheters.
Materials and Methods: In this prospective, randomized, blinded study, a total of 56 patients undergoing hallux valgus repair were randomly allocated to receive continuous sciatic nerve block by means of a posterior subgluteal approach (Group Subgluteal, n = 28), or a posterior popliteal approach (Group Popliteal, n = 28). A perineural stimulating catheter eliciting plantar flexion with less than 0.5 mA was used in all patients. Postoperatively, the stimulating catheter was connected to a patient-controlled analgesia (PCA) pump with 0.0625% levobupivacaine (basal infusion rate of 3 mL/h, patient controlled bolus dose of 3 mL, lockout time of 60 min). Postoperative pain relief, local anesthetic consumed, intravenous analgesic requirements and patient satisfaction were recorded.
Results: Both approaches provided similar postoperative analgesia (table 1), however the consumption of local anesthetic was higher in the popliteal group (4.7 ± 1.3 mL/h) as compared to subgluteal group (3.7 ± 0.6 mL/h, $p < 0.05$). Patient acceptance was good in both groups.

Table 1. VAS pain scores (0–100) during 24 hours postoperatively.

	Subgluteal group (*n* = 28)	Popliteal group (*n* = 28)
VAS 6 hr	0 (0–30)	10 (0–27.5)
VAS 12 hr	10 (0–20)	15 (0–40)
VAS 20–24 hr	0 (0–7.5)	0 (0–20)
Average VAS	10 (10–20)	10 (10–32.5)
Highest VAS	40 (22.5–50)	60 (20–70)

Data are median and 25th-75th percentiles. There were no statistically significant differences between the two groups.

Conclusion: The present investigations demonstrated that continuous postoperative analgesia with the help of stimulating catheters was effective at both injection sites; however, a subgluteal approach reduced the overall consumption of local anesthetic.
References:
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A-498

0.25% ropivacaine vs. 0.25% bupivacaine for lumbar plexus and sciatic nerve block in high risk patients with femur or hip fracture

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Background and Goal: Peripheral nerve block is a substantially advantageous anesthesia technique in high risk patients during hip and femur surgery. (1) Until now, there is no comparative evidence about lumbar plexus and sciatic nerve block via low dose concentration of ropivacaine (0.25%) and bupivacaine (0.25%) in hip and femur surgery especially in a high risk population with co-morbid conditions.
Materials and Methods: In a retrospective analysis 62 ASA III or IV patients, undergoing unilateral hip and femur surgery via lumbar plexus and sciatic nerve block (32, 0.25% ropivacaine; 30, 0.25% bupivacaine) are compared for the anesthesia onset time, intra-operative hemodynamic variables, time for initial postoperative analgesia requirement, duration of intensive care unit (ICU) period and total hospitalization duration.
Results: Block failed in 3 patients in ropivacaine and 4 patients in bupivacaine group. These patients are not taken into analysis. There was no statistically significant difference between two groups in any of the parameters. Data (mean ± SD) are shown in the table:

	Ropivacaine (n = 29)	Bupivacaine (n = 26)
Anesthesia Onset Time* (min)	13.6 ± 4.1	14.6 ± 2.9
Hypotension (# patient)	2 (%7)	2 (%8)
ICU stay (# patient)	4 (%14)	7 (%27)
First analgesic requirement (hr)	10.3 ± 5.2	11.2 ± 4.6
Hospitalization duration (day)	6.8 ± 3.0	8.1 ± 2.7

*Time interval between the completion of anesthetic injections and the readiness for surgery.

Conclusions: 0.25% concentration of ropivacaine provides adequate anesthesia and analgesia as effective as 0.25% bupivacaine in femur or hip surgery via lumbar plexus and sciatic nerve block. Because of its lower toxicity compared with bupivacaine, ropivacaine is possibly a better alternative than bupivacaine in this type of peripheral nerve block especially in high risk patients.
Reference:
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A-499

Intrathecal combination of morphine and fentanyl vs psoas compartment block after primary hip arthroplasty

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Background and Goal of Study: Psoas compartment block and combination of intrathecal morphine and fentanil represent two accepted techniques to provide post-operative analgesia after hip arthroplasty. We designed a prospective randomised study to compare these two techniques.
Materials and Methods: Twenty patients scheduled for primary hip arthroplasty were randomised to receive spinal anesthesia with hyperbaric bupivacaine 15 mg plus fentanyl 15 mcg plus morphine 100 mcg (group I, n = 10) or a psoas compartment block with ropivacaine 0.5% 30 ml followed by general anesthesia (group II, n = 10). Pain scores (VAS), tramadol consumption, associated side-effects were assessed for 48 hr postoperatively. In addition, patient's acceptance and satisfaction of the postoperative analgesic technique were also recorded.
Results and Discussions: During the first 24 hr, pain scores (0 ± 0 mm vs 17 ± 21 mm at H 12, 10 ± 14.5 mm vs 35 ± 29 mm at H 24) were lower in group I than in group II. Tramadol consumption (30 + 70 mg vs 300 + 140, $p < 0.05$) was lower in group I. Itching was the more frequent side-effect occurring in 40% of cases in group I vs 10% in group II ($p < 0.05$). No major complication occurred. The satisfaction score (measured with a VAS from 0 to 10) was higher in Group I than in Group II.
Conclusion(s): The combination of intrathecal fentanyl 15 mcg and morphine 100 mcg provides better postoperative analgesia than single-shot psoas compartment block after primary hip arthroplasty, but is frequently associated with itching.
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A-502

A118G polymorphism mu receptor gene and cortisol response to the opioid agonist in a human acute pain model

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Background and Goals: Genetic factors can contribute to individual variation in pain sensitivity and responses to analgesics. A relationship between polymorphism in encoding genes for opioids receptor and variability in pain perception has been demonstrated.

The most frequent polymorphism in mu opioid receptor protein is an adenine-guanine substitution (A118G) resulting in aminoacid change at N-terminal protein associated with alterated cortisol stress response and variation in opioids effects. Aim of this study was to investigate the relationship between gene polymorphism and opiate sensitivity.
Materials and Methods: We randomized 41 healthy women undergoing elective caesarean delivery, in continuous intra-postoperative Epidural Anesthesia (AE), in two groups: gL (n 19, Levobupivacaine 0.5%), and gLS (n 22, Levo 0.5% + Sufentanil 10 gamma). The postoperative pain was measured on T6h , T24 h and T48 h by visual analog scale (VAS). Blood samples were collected for genetic analysis, and to dose cortisol, IL6 and IL10 prior to AE (T0) on T45 min, T6 h to T24 h. ANOVA test was performed.
Results: The two groups were similar for age, duration of surgery and perioperative cardiovascular data. Six patients from gLS and 3 from gL were *A/G genotype* (with polymorphism in mu receptor) and the remaining were normal, *A/A*.

Cortisol levels in patients receveing Sufentanil increased never in postoperative period. In gL on T45′ cortisol increased both in *A/G* and *A/A*, and on T6 h cortisol decreased significantly in A/G from its basal level (median value 28 microg/ml on T0 vs 15 microg/ml on T6 h).

IL6 and IL10 levels in *A/G subjects* (gL) were higher than in *A/A* at all time points but not significant.

In presence of Sufentanil, in *A/G patients* VAS was slightly lower than in *A/A*; while in absence of Sufentanil *A/G* had higher VAS on t24 h. Moreover there was a large variability in VAS value in all *A/G* subject.

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Conclusions: These preliminary data suggest that A118G variation influence pain sensitivity and neuroendocrine stress response, and these can be modulated by opiate administration.

A-503

Antibacterial effects of local anaesthetics in topical form

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Background and Goals: Local anaesthetics, topically applied, have been used for some pathologic conditions or minor surgical procedures in order to provide analgesia. Antibacterial effects of local anaesthetics had been showed in previous studies. We investigated if the local anaesthetics had antibacterial effects in topical application.

Materials and Methods: The effects of two topical creams (5% lidocaine and 2.5% lidocaine +2.5% prilocaine) with two different doses (21–25, 41–50 mg/disc) on six bacteria were studied. 2% Mupirosin, known antimicrobial pomade, was also used for checking of methodology. Bacterial test suspensions were inoculated on media and standard antibiogram discs containing local anaesthetic creams were plated on the media under aseptic conditions. The plates were then incubated at 37°C for 18 hours, and the diameters of the inhibition zones around discs were measured. Results were compared concerning with drugs and doses.

Results: Data are shown in Table.

Table. The diameters of inhibition zones of the drugs (mm).

Bacteria	Mupirosin	L-1	L-2	L + P-1	L + P-2
S. aureus	31.5 (30–35)	9.5 (9–11)	12 (10–15)	9 (7–10)	10.5 (10–12)
S. epidermidis	35 (30–37)	13 (12–15)	13.5 (10–16)	9.5 (7–13)	12 (11–14)
E. fecalis	25 (24–27)	12 (11–12)	14 (10–14)	0	0
P. aeroginosa	11 (8–13)	0	0	0	0
E. coli	22 (18–24)	15 (10–17)	14.5 (13–15)	11 (10–12)	14 (13–15)
S. pyogenes	38 (35–38)	12 (11–14)	14 (11–15)	0	9 (8–9)

median (min-max).

Conclusions: It was found that topical local anaesthetics had antibacterial effects. In clinical setting, lidocaine and prilocaine, in topical form, may have preventive effects in case of infection risk.

A-504

Preferential injury of unmyelinated C fibres by intrathecal lidocaine in rats

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Background and Goal of Study: Although increasing laboratory evidence and in vivo animal studies suggest that local anaesthetics are potentially neurotoxic, no techniques permitted observation of a difference in the neurotoxic effects on nerve fibres. Accordingly, in the present study, we used two neural tracers, wheat germ agglutinin (WGA) and choleragenoid toxin B (CTB), which are markers for unmyelinated and myelinated fibres, respectively, and sought to examine whether there is a differential nerve injury by intrathecal lidocaine in rats.

Materials and Methods: With approval from our animal research committee, male rats were implanted with an intrathecal cathetre through L4-5 vertebra and received a continuous infusion of saline or 5% lidocaine. Four days after infusion, animals were assessed for persistent functional impairment using the tail-flick (TF), hot plate (HP), paw pressure (PP), and motor function (MF) tests. Then animals received a co-injection of WGA and CTB into the sciatic nerve. Two days after the injection of tracers, spinal cords around L4 were obtained for immunohistochemical analysis. In addition, nerve roots were observed with light microscopy.

Results and Discussions: Four days after intrathecal infusion, rats given lidocaine developed increases in TF and HP latencies. MF did not change in both groups. Immunohistochemical examination revealed that WGA labeling in lamina II was substantially observed in saline-treated rats but little in lidocaine-treated rats. In contrast, CTB labeling was observed in both groups of rats.

Conclusions: The present results suggest that intrathecal lidocaine causes nerve injury preferentially in unmyelinated C fibres in rats. The additional use of neural tracers appears to be useful for observing differential neurotoxic effects of local anaesthetic on nerve fibres.

A-505

Thoracic epidural anesthesia modifies hepatic perfusion and leukocyte adhesion in septic rats

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Background and Goal of Study: During sepsis, the liver triggers systemic inflammatory response and is affected by inflammation and impaired perfusion. Thoracic epidural anesthesia (TEA) has been shown to improve splanchnic perfusion. We hypothesized that TEA influences hepatic microcirculation and leukocyte activation in sepsis.

Materials and Methods: In 24 rats thoracic epidural catheters, central venous and arterial lines were placed. Rats were randomly assigned to Sham, Sepsis and Sepsis + TEA. Sepsis was induced by cecal ligation and puncture. TEA was performed by epidural infusion of 15 μl/h bupivacaine 0.5%. 2 ml/h saline i.v. was infused throughout the study protocol. 24 h after injury, mean arterial pressure (MAP) and heart rate (HR) were recorded. The left liver lobe was exposed for intravital fluorescence microscopy. Sinusoidal width and blood flow were determined. Temporarily adherent (Roller) and permanently adherent (Sticker) leukocytes were counted in sinusoids and venoles. Data (Mean ± SEM) were analyzed by ANOVA. $P < 0.05$ was considered significant.

Results and Discussions: In sepsis, MAP decreased (121 ± 5 vs. 135 ± 4 mmHg; $p < 0.05$) and HR increased (468 ± 7 vs. 414 ± 15 bpm; $p < 0.05$). MAP and HR remained unchanged in Sepsis + TEA compared to Sepsis.

Sinusoidal blood flow increased in Sepsis (13352 ± 1832 vs. 8727 ± 415 μm^3/sec; $p < 0.05$). In Sepsis + TEA flow was reduced (9547 ± 1269 μm^3/sec; $p < 0.05$). Sepsis induced sinusoidal constriction (5.0 ± 0.1 vs. 5.4 ± 0.1 μm; $p < 0.05$), which was not influenced in Sepsis + TEA.

Temporary leukocyte adhesion increased in Sepsis, which was partly prevented in Sepsis + TEA (Table 1).

	Sinusoidal Roller/mm²	Venolar Roller/mm²	Sinusoidal Sticker/mm²	Venolar Sticker/mm²
Sham	142 ± 19	917 ± 95	290 ± 44	278 ± 49
Sepsis	355 ± 64*	1285 ± 119*	361 ± 49	186 ± 38
Sepsis + TEA	244 ± 47	913 ± 65#	483 ± 70	226 ± 39

* $p < 0.05$ vs. Sham; # $p < 0.05$ vs. Sepsis.

Conclusion(s): TEA reduced intrahepatic leukocyte adhesion and normalized liver blood flow in sepsis. TEA may reduce liver dysfunction and influence immunologic response to sepsis.

A-506

Results of a Phase I clinical trial of intrathecal fadolmidine, a novel alpha$_2$-adrenoceptor agonist with potential as a spinal analgesic

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Background and Goal of Study: Fadolmidine (F; 3-(1H-imidazol-4-ylmethyl)-indan-5-ol-hydrochloride) is a novel, full alpha$_2$-adrenoceptor agonist being evaluated for use as a spinal analgesic. This Phase I study examined the safety and tolerability of F after i.v. or intrathecal (i.t.) administration in healthy volunteers.

Materials and Methods: 37 healthy men who provided informed written consent (18–40 years old, weight 60–100 kg, BMI 20–29 kg/m^2) were randomized (single-blind) to receive F (n = 30) or placebo (n = 7). F was given i.v. starting at 2 mcg, with dose-doubling after the previous dose had been tolerated by 3 subjects, according to the criteria for Maximum Tolerated Single Dose (MTSD). Matched i.t. doses were given 1 week after i.v. treatment. Safety/tolerability criteria included hemodynamics and neurologic evaluations; efficacy indices included pain threshold analysis. Formal statistical analyses were not performed.

Results and Discussions: The MTSD for i.v. administration was 60 mcg. The principal safety observation supporting this dose as the MTSD was sustained (⩾2 min) bradycardia (⩽35 beats/min) in 2 subjects given 100 mcg. Pain response to tonic pressure was moderately reduced at the i.v. MTSD, with maximum effect at 6 h post-dose. No clinically relevant sedation was observed. 100 mcg was identified as the i.t. MTSD. Higher doses were

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associated with bradycardia with low diastolic blood pressure or short-lasting sinus arrest or severe nausea. Pain response to tonic pressure was progressively reduced at 15–300 mcg, with onset ~30 min after dosing. Doses of 60–300 mcg raised the threshold to thermal stimulation. Dose-dependent sedation occurred with 30–300 mcg (maximal effect at 1.5–2 h; duration 4–8 h).
Conclusion(s): F exhibited a generally satisfactory safety and tolerability profile in this Phase I study. The i.t. MTSD was 60 mcg; analgesic effect was apparent from 15 mcg and sedation from 30 mcg.

A-507

Results of a phase II clinical trial of intrathecal fadolmidine, a novel alpha$_2$-adrenoceptor agonist with potential as a spinal analgesic, in combination with bupivacaine

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Background and Goal of Study: Fadolmidine (F; 3-(1H-imidazol-4-ylmethyl)-indan-5-ol-hydrochloride) is a novel, full alpha$_2$-adrenoceptor agonist being evaluated for use as a spinal analgesic. This Phase II study examined the safety, tolerability and efficacy of intrathecal (i.t.) F in combination with plain bupivacaine (PB) for peri- and postoperative pain relief.
Materials and Methods: Consenting patients undergoing hallux valgus surgery (n = 122, 35–70 years old; ASA risk grades I–II) were randomized (single-blind) to F + PB or PB only in the induction of spinal anesthesia. The primary intention-to-treat population for efficacy analysis received F 40–240 mcg + PB 5 mg (n = 64) or PB 10 mg only (n = 16); primary endpoint was time to first use of patient-administered morphine (TPAM). Follow-up was for 20 h after dosing.
Results and Discussions: 1) TPAM was longer in all F + PB groups vs. PB. There was no clear dose-response, but $p \leq 0.05$ for F 100–140 mcg + PB and 180–240 mcg + PB vs PB. Mean TPAM was 7–10 h with F + PB vs ~6.25 h with PB. 2) F + PB was associated with a preponderantly dose-dependent reduction in morphine use in the first 10 h postoperatively ($p < 0.05$ for F180, 200 & 240 mcg). The trend across the F dose-range was not significant. 3) Mean morphine consumption over 20 h was highly variable and considered uninformative. 4) Duration of motor blockade was highly variable but with a trend ($p = 0.02$) for longer duration with F + PB than with PB ($p \leq 0.05$ for F60, 120, 140 & 220 mcg). Most frequent AEs comprised: nausea (F + PB 52%; PB 44%); vomiting (34% vs. 13%). 299/304 AEs were mild or moderate; 1/5 serious AEs (difficulty walking) was considered related to F + PB. Systemic blood pressure and axillary temperature were lowered more with F + PB than PB but the differences were not considered clinically relevant. No cases of heart rate < 35 beats/min were seen.
Conclusion(s): F > 100 mcg + PB 5 mg delayed need for additional pain relief and reduced early morphine requirements relative to PB 10 mg alone in patients undergoing surgical toe realignment and was generally well tolerated.

A-508

Lidocaine induced apoptosis is deminished in Bcl-2 protein overexpressing jurkat-cells

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Background and Goal of Study: Toxicity of local anaesthetics, especially lidocaine, can lead to transient neurological symptoms and persistent lumbosacral neuropathy after spinal anaesthesia [1, 2]. Recently, the apoptosis inducing effect of lidocaine has been demonstrated in neural hybrid cell cultures [3]. In order to investigate whether this effect can be prevented specifically by antiapoptotic proteins, we compared the degree of toxicity (cell viability, mitochondrial membrane potential, caspase 3 activation) in wildtype (wt) and Bcl-2 overexpressing Jurkat-cells.
Materials and Methods: Wildtype and genetically engineered Bcl-2 overexpressing Jurkat T-cells (Bcl-2) were exposed to different concentrations of lidocaine for 24 h. Untreated cells were used as negative controls and staurosporine treated cells as positive controls. We investigated cell viability by trypan blue exclusion, mitochondrial potential by flow cytometry (JC-1) and caspase 3 like activity by substrate assay (DEVD-AMC).
Results and Discussions: Cell viability and mitochondrial membrane potential with clinically used concentrations of lidocaine (3 and 6 mM) was grossly reduced in wt cells, whereas it was preserved in Bcl-2 overexpressing cells ($P < 0.05$). Caspase 3 activation in wt cells was increased after treatment with 3 and 6 mM lidocaine, whereas only minor caspase 3 activity was measured in Bcl-2 overexpressing cells ($P < 0.05$). At higher concentrations (10 mM and above) no differences in mitochondrial potential and caspase 3 activation could be detected.
Conclusions: Apoptosis only occurred in clinically measured intrathecal concentrations of lidocaine [4], whereas in higher concentrations lidocaine mainly induced necrosis. The antiapoptotic protein Bcl-2 prevents lidocaine induced apoptosis but not necrosis, suggesting a specific, intrinsic (mitochondrial) pathway of apoptosis induction.
References:
1 Hiller A et al. Br J Anaesth (1999) 82:575–9.
2 Johnson ME Mayo Clin Proc (2000) 75:921–32.
3 Johnson ME et al. Anesthesiology (2004) 101:1184–94.
4 Denson DD et al. Anesth Analg (1983) 62:995–1001.

Pharmacology

A-509

Performance of plasma vs effect-site TCI for propofol during induction in elderly patients

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Background and Goal of Study: There is a debate whether propofol TCI in effect-site control is clinically superior to plasma control. We compared the clinical performance of plasma and effect-site TCI with propofol in elderly patients.
Materials and Methods: After IRB approval and informed consent 30 patients >70 years were randomized to receive propofol TCI in either plasma (Marsh model, 15 pts., group P) or effect-site (Schnider model, 15 pts., group E) control. Anaesthesia induction was ramped up stepwise until both BIS was <60 for at least 60 sec. and patients clinically lost consciousness (LOC), starting for both groups with a target of 2 μg/ml, increasing to 3 μg and 4 μg, respectively, allowing a 10 min equilibration for each step. Arterial propofol blood concentrations, BIS and sedation score (OAAS) were measured throughout the experiment. Time to and measured blood concentration at hypnotic endpoint were compared.
Results and Discussions: The following tables summarises the results (mean values ± SD).

Observation	Group P	Group E	p-value
Time to LOC, minutes	13.5 ± 6.8	21.4 ± 6.9	0.012
Propofol C_m at LOC, μg/ml	3.54 ± 0.81	3.29 ± 1.19	0.346 (n.s.)

We found no difference in propofol C_m at LOC between plasma and effect-site control, whereas the time to reach this endpoint was significantly longer in effect-site control, when titrated slowly. The difference in performance between the two models becomes negligible after the first 20 minutes.
Conclusion(s): With the exception of the initial filling phase, where the Schnider model overpredict, propofol TCI in effect-site control (Schnider model) performs similar to plasma control (Marsh model) in elderly patients.
References:
1 Marsh B, et al. Br J Anaesth 1991;67:41–8.
2 Schnider T, et al. Anesthesiology 1999;90:1502–16.

A-510

Conscious sedation with TCI-propofol versus manual propofol for patients undergoing vertical infraclavicular blockade

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Background and Goal of Study: Target-controlled infusion (TCI) of propofol allows easy alteration of depth of anaesthesia. The aim of the present study was to evaluate the efficacy and safety of propofol-induced conscious sedation with TCI system compared to manual administration technique.
Materials and Methods: 30 ASA I–II patients, undergoing upper limb elective surgery with vertical infraclavicular blockade, received the same premedication and were randomized into 2 groups. Sedation evaluation was based on a standard 5-point scoring scale. Patients of TCI Group received propofol via TCI system [FM-Controller Workstation (E. Braun)], with initial target

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effect site concentration (EC) set at 0.8 μg ml^{-1}, gradually altered by increments of 0.1 μg ml^{-1} until a sedation level of 3 (drowsy with eyes shut responding to verbal command) was achieved. Patients of MAN Group received an initial bolus dose of 0.5 mg kg^{-1} followed by continuous infusion of 2 mg kg^{-1} h^{-1} altered by size steps of 0.25 mg kg^{-1} h^{-1} until the same sedation level was reached. Standard monitoring was used. Following parameters were recorded: dosage and total propofol consumption, sedation score every 5 minutes, up and down steps of propofol levels, time to desired sedation level, duration of sedation, haemodynamic effects (decrease of heart rate and arterial blood pressure >25% of baseline values), respiratory depression episodes (RR < 8 breaths/min), desaturation episodes (SpO_2 < 90%) and BIS < 60. Data were analyzed using student's t-test and chi-square test.

Results and Discussions: Groups were demographically similar. At the time of desired sedation level, mean EC in TCI Group was 1.26 ± 0.124 μg ml^{-1}, whereas mean dosage in MAN Group was 2.3 ± 1.14 mg kg^{-1}. Desired sedation level was achieved in both groups, but with lowered down steps in TCI Group ($p < 0.05$). Time to desired sedation level and duration of sedation were comparable ($p \geqslant 0.05$). There were more haemodynamic changes (4 vs 2, $p \geqslant 0.05$) and episodes of respiratory depression (2vs0, $p \geqslant 0.05$), desaturation (5vs0, $p < 0.01$) and decrease of BIS level (<60) (4vs0, $p < 0.05$) in MAN Group.

Conclusion(s): The use of TCI system in propofol-induced sedation is a safe anaesthetic technique, associated with improved cardiovascular and respiratory stability.

A-511

Modeling interactions of low dose propfol and remifentanil

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Background and Goal of Study: Drug interactions may vary in intensity over the full clinical range that they are used. We explored the degree of synergy present at sedative combinations of propofol and remifentanil and compared the results to reported synergy levels at combinations typically used for surgical procedures using a new flexible model for drug interactions.[1]

Materials and Methods: With IRB approval, 106 patients scheduled to undergo endoscopy received sedation with propofol [P] and remifentanil [R] at Hospital Clinic Barcelona. Patients were randomized to either a fixed target concentration of [P] (0, 1.5, 2, or 3 ug/mL) or [R] (0, 0.5, 1, or 2 ng/mL). The concentration of the other drug was increased to allow adequate patient sedation. During the study, the Ramsay Sedation Score(RSS), A-Line index (AAI), and the EEG bispectral index (BIS) were collected for modeling sedative drug effect.

Results and Discussions: The RSS showed slight synergism that was not statistically significant. AAI and BIS models show that [R] has little impact on these effect measures while the [P] effect is significant. In fact, the interaction terms was negative implying antagonism for both these effect measures when [R] is combined with low levels of [P]. In each case the EC50 of [R] was estimated to be outside the range of data presented.

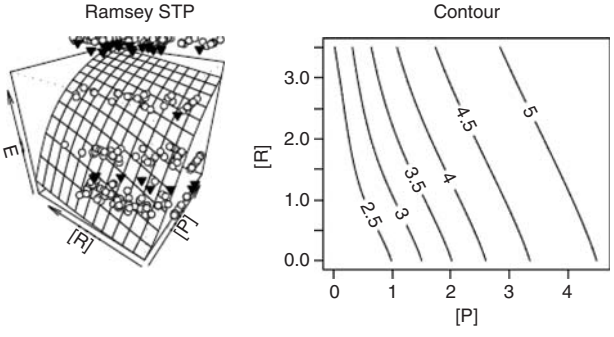

Figure 1. RSS interaction surface and contour for [P] and [R].

Conclusion(s): For low levels of sedation, [R] and [P] appear to have little evidence of synergy and in fact may be slightly antagonist with respect to processed EEG variables, which could be an limitation of modeling an interaction surface with data that is below the EC50 threshold.

Reference:

1 Proc Am Stat Assoc 2004:647–8.

A-512

Cross-simulation of the predicted plasma and effect site concentrations between the two pharmacokinetic models for the target controlled infusion of propofol

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Background and Goal of Study: The pharmacokinetic (PK) parameters determine the infusion rates for the target controlled infusion(TCI) to maintain a stable plasma concentration (Cp). We investigated how differently one PK model predicted the plasma and effect site concentration by the simulation of reproducing a prior infusion data of the TCI system of another PK model of propofol.

Materials and Methods: Sixty female patients were randomly assigned into two groups, and targeted Cp to 6.0 μgml^{-1} of propofol for the induction of anesthesia. Group M was provided with TCI with Marsh PK(1), and Group S with Schnider PK(2). The infusion data of one PK model were analyzed by another PK model with two kinds of simulation for 2 hr infusion targeted to 6.0 μgml^{-1}, and 6.0 to 4.0 μgml^{-1} of Cp. We compared the newly predicted Cp to the prior targets, and the correlation of the difference of these predicted concentrations with the covariates were investigated. And the effect site concentrations (Ce) for the loss of responsiveness (LOR) were also compared.

Results: Initially the simulated C_ps of Marsh PK by Schnider PK and thereafter those of Schnider PK by Marsh PK were overpredicted than the prior target values. And the body weight was well correlated with the difference of the predicted concentrations. The C_es for LOR were not significantly different between groups, but newly predicted C_es were different between groups.

Conclusion(s): We compared the pharmacokinetic models of propofol to determine explicitly the differences by which the PK/PD parameters influenced on the predicted Cp and Ce during TCI.

References:

1 Gepts E, Camu F, Cockshott ID, et al. *Anesth Analg.* 1987;66:1256–63.
2 Schnider TW, Minto CF, Gambus PL, et al. *Anesthesiology*. 1998;88:1170–82.

A-513

The accuracy of two pharmacokinetic data sets for propofol

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Background and Goal of Study: Computer target controlled infusion systems (TCI) for propofol have been implemented in clinical practice. These systems are using different pharmacokinetic models. We investigated the accuracy of two pharmacokinetic data sets for propofol.

Methods: With IRB approval and written informed consent 20 adult male patients were investigated. The patients received 30 mg kg^{-1} h^{-1} propofol for hypnosis using an infusion system (Graseby 3400, Graseby Medical Limited, UK). After loss of consciousness the propofol infusion was reduced to 6 mg kg^{-1} h^{-1}, 45 min later propofol dosage was increased to 20 mg kg^{-1} h^{-1} and later decreased to 1 mg kg^{-1} h^{-1}. Five arterial blood samples were obtained from each patient at different infusion rates. The samples were analysed using a Hewlett Packard HP 6890 Series GC system (Agilent, Germany) combined with an HP 5972 series mass selective detector. Propofol plasma concentrations were calculated with the recorded propofol infusion rates using the propofol data set by Marsh [1] and Schnider [2]. For each arterial blood sample the percentage prediction error (PE) was calculated. In addition, we calculated the median absolute prediction error (MAPE) and the median percentage prediction error (MDPE) for the individual patient and for all measurements. Data are mean ± SD.

Results: The highest measured propofol plasma concentration was 9.7 ± 1.8 μg/ml, the highest calculated propofol plasma concentrations were 7.0 ± 2.0 μg/ml (Marsh) and 8.8 ± 1.1 μg/ml (Schnider).

	Measured conc. μg ml^{-1}	Marsh		Schnider	
		MAPE	MDPE	MAPE	MDPE
T1	2.2 ± 1.8	0.28	22.5	0.43	22.7
T2	7.1 ± 2.2	2.68	40.2	1.49	17.9
T3	9.7 ± 1.8	2.29	38.8	0.85	9.5
T4	1.9 ± 0.8	0.65	26.2	0.34	19.8
T5	2.4 ± 1.5	0.46	17.7	0.86	25.6
	N = 100	0.94	31.1	0.72	18.9

Conclusion: The Schnider model for propofol produced a better performance than the Marsh model.

References:

1 Br J Anaesth 1991; 67: 41–8.
2 Anesthesiology 1998; 88: 1170–82.

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A-514

Modelling the interaction of propofol and remifentanil by means of an adaptive neuro fuzzy inference system (ANFIS)

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Background and Goal of Study: Sedoanalgesia represents nowadays around 30% of anesthetic activity. A relevant part is provided in the gastrointestinal endoscopy area and on an ambulatory basis. Our objective was to study the possibility of synergy for the combination of propofol and remifentanil, administered to patients undergoing ultrasonographic endoscopy (USE), according to the level of sedation achieved.

Materials and Methods: Under IRB approval and written informed consent, 106 patients undergoing USE were randomly assigned to receive a fixed concentration of either propofol (0, 1.5, 2, 3 mcg/mL) or remifentanil (0, 0.5, 1, 2 ng/mL) while the other drug was allowed to change depending on the clinical requirements. BIS, AEP/2, raw EEG, hemodynamic parameters, SpO_2 and respiratory rate, were recorded online (Rugloop II) and stored for posterior analysis. A TCI system targeting the effect site was used to administer Propofol (1) and remifentanil (2). Sedation was quantified by means of the Ramsay Sedation Score (RSS). An Adaptive Neuro Fuzzy Inference System (ANFIS) algorithm was used to characterize the model describing the interaction between propofol and remifentanil with respect to sedative effects. The reason for choosing ANFIS instead of a sigmoid Emax model was that the underlying function governing the relationship between the anesthetics and the RSS was unknown, therefore a data driven approach was more appropriate. A Student's t test was applied to assess statistical significancy. A difference was considered significant when $p \leqslant 0.05$.

Results and Discussions: A total of 1181 RSS measurements were recorded. Isobolograms for RSS 3, 4 and 5 were significantly different form the line of additivity ($p \leqslant 0.05$).

Conclusion(s): Propofol and remifentanil given at low concentrations exhibit a synergistic relation, with respect to sedative effects measured by RSS, in patients undergoing sedoanalgesia for USE.

Reference:

1 Schnider TW. Anesthesiology 1998, Minto CF Anesthesiology 1997.

A-516

A model-independent approach estimating k_{e0} values for isoflurane, sevoflurane, and desflurane

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Background and Goal of Study: The k_{e0} value is the first order rate constant determining the equilibration of drugs between plasma and effect-site (e.g. brain). Fractional sigmoid and bi-sigmoid E_{max} models have been used for estimating individual k_{e0} values. Recently a model-independent method has been introduced to estimate k_{e0} values for increasing and decreasing anaesthetic drug concentrations. In this study we introduce a new model-independent approach calculating k_{e0} values for isoflurane (Iso), sevoflurane (Sevo) and desflurane (Des). The Bispectral index (BIS XP, Aspect, USA) was used as electroencephalographic measure of the drug effect.

Methods: With IRB approval and written informed consent we investigated 45 patients (15 each group) scheduled for a radical prostatectomy. After lumbar epidural catheterisation, patients received remifentanil and propofol solely for induction of anaesthesia. Thereafter, epidural analgesia was initiated, and Iso-, Sevo- or Desflurane were added to maintain unconsciousness. At least 45 min later, end-tidal concentrations were varied between 0.5 and 2 MAC. We estimated an individual k_{e0} value for each patient by minimizing the area within the hysteresis loop. The computations were performed on a spreadsheet using the Excel 2000 software program (Microsoft, USA), the k_{e0} value was optimized to minimize the area within the hysteresis loop to predict EEG indices versus effect site concentrations. Data are mean ± SD.

Results: The new approach identified a single k_{e0} value for each patient leading to a collapse of the hysteresis loop. The k_{e0} value of Des is significantly higher than the k_{e0} values of Iso and Sevo.

	k_{e0} [min^{-1}]
Iso	0.13 ± 0.03
Sevo	0.14 ± 0.07
Des	0.29 ± 0.23

Conclusions: The higher equilibration rate constant for Des may explain the favourable faster pharmacokinetics of this volatile anaesthetic compared to Iso and Sevo.

A-517

Accuracy of propofol TOI in combination with sufentanil

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Background and Goal of Study: Target oriented infusion (TOI) of propofol using computer driven infusion pumps is a new application mode implemented in a variety of commercial intravenous anesthesia systems. Especially, the open use of different propofol preparations provides cost effectiveness and an appropriate suitability also for intensive care patients. The aim of the study was to investigate the accuracy this new application mode with different propofol preparations combined with sufentanil.

Materials and Methods: We investigated the accuracy of this application mode in 56 Patients undergoing major cardiac surgery with consecutive sedation in the ICU for at least 24 h. These patients were randomly assigned to TOI using standard propofol (Disoprivan, Astra Zeneca) or Propofol-Lipuro (B. Braun Melsungen) containing medium chain triglycerides, both groups received sufentanil for analgesia. Arterial propofol plasma concentrations were assessed at 26 scheduled time points and compared to predicted plasma concentrations using pharmacokinetic parameters, that are implemented in commercial TCI systems (1). Median performance error (MdPE) and median absolute performance error (MdAPE) were assessed.

Results and Discussions: During surgery the patients received 3.2 ± 0.94 mg Propofol/kg/h and 1.68 ± 0.72 mg/kg/h for sedation on ICU. In patients receiving Disoprivan MdPE was 20.05 ± 30.99 and MdAPE was 37.97 ± 17.56. In patients receiving Propofol-Lipuro MdPE was 18.85 ± 25.77 and MdAPE was 32.50 ± 15.94.

Conclusion(s): Using the Marsh parameter set for TOI in combination with sufentanil, predictions underestimate the actual plasma concentration and accuracy varies substantially between individuals. However, no difference were seen between propofol preparations.

Reference:

1 Marsh B, White M, Morton N, et al. Br J Anaesth 1991; 67: 41–8.

A-518

The time to peak effect and the CSI Index for estimation of the plasma effect site equilibration rate constant (ke0) for propofol

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Backround: The effect site equilibration rate constant (ke0) for propofol has been incorporated to the two different commercially available infusors (Diprifusor and Primea Orchestra) to perform effect-site target-controlled infusions, both using Marsh kinetics as the pharmacokinetic model. This index results different according to the method utilized for its calculation.

Cerebral state index (CSI) has recently been introduced as an intra-operative monitor of anaesthetic depth. We estimated the value of ke0 for propofol in volunteers using both the time to peak effect (t_{peak}) method and the CSI monitor to evaluate drug effect within the central nervous system.

Methods: Ten ASA I, non-premedicated and consenting volunteers aged 20–44 y, recieved a sub-maximal bolus of propofol (1.8 mg/kg) at 1200 ml/h using the Anestfusor™ software and a Fresenius DPS infusor also simulating the Marsh pharmacokinetic model. The CSI monitor was conected in all patients according to the instructions of the manufacturer. The t_{peak} was the time from the beginning of injection of propofol until the minimum CSI value and was measured directly from the CSI monitor. The Ke0 was then calculated using the Minto method (1).

Results: The average t_{peak} was 2.08 min. The average ke0 was 1.07 (sd 0.65).

Conclusion: The values obtained for ke0 using this method represent a different number in between the values that Diprifusor and Primea have incorporated, because the method for calculating this constant has been different.

Reference:

1 Anesthesiology 99 (2) : 324–333, 2003.

A-519

Modelling the effect of IV drugs on the mean arterial pressure: efficiency of a GARCH model

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Background and Goal of Study: It would be clinically useful to understand the influence of the anaesthetics on the patient arterial pressure, during

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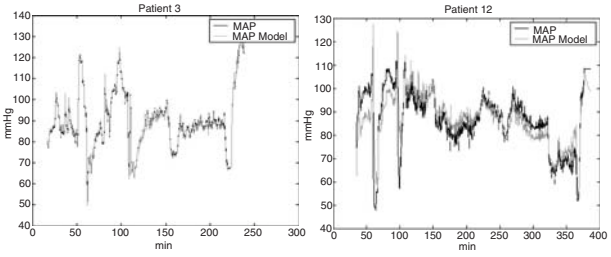
general anaesthesia. A model was developed to describe mean arterial pressure (MAP) using Remifentanil (Remi) and Propofol (Prop).

Materials and Methods: We used data from ASA 1/2 patients, anesthetized with TIVA using effect site TCI Prop (Schnider[1]) and Remi (Minto[2]). Data were collected using RugLoop II® software every 5 s. Induction was performed with Prop at 200 ml/hr until loss of consciousness (LOC). At LOC, Remi started with a plasma target of 2.5 ng/ml. During surgery the Prop and Remi concentrations were manually adjusted. For recovery the Prop target was gradually reduced and Remi adjusted to patient's needs. Data is mean ± sd. A Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model structure was used to model MAP.

Results and Discussions: Data from 16 patients, age 46.3 ± 15 years, body mass index 23.6 ± 4, 10 female was used. At baseline MAP was 89 ± 3 mmHg, and heart rate was 66.9 ± 4 bpm. Remi and Prop mean effect concentrations during surgery were 3 ± 1 ng/ml and 2.7 ± 1 μg/ml. Case time was 482 ± 195 min (minimum 245 min and maximum of 972 min). The GARCH model has the same structure for all 16 patients, but was trained with individual patient data. The average of modelling errors was 17.1 ± 9.



Conclusion(s): This GARCH model describes adequately the patient MAP trend during surgery, considering the influence of Prop and Remi in all patients. It can help the clinician in better controlling a patient MAP variability during surgery. The model can in the future be patient adaptive.

References:

1 Anaesthesiology 1998, 88: 1170–82.
2 Anaesthesiology 1997, 86: 24–33.

A-520

MAC_{BAR} of desflurane with two target controlled concentrations of remifentanil

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Background and Goal of Study: The aim of this prospective, randomized, double-blind study was to determine the effects of two different target-controlled effect-site concentrations of remifentanil (1 and 3 ng/ml) on desflurane requirement for blunting sympathetic responses to surgical incision (MAC_{BAR}).

Materials and Methods: Sixty-seven patients aged 20–50 yr, with ASA physical status I, scheduled to undergo elective abdominal surgery requiring at least a 10-cm-long skin incision were prospectively studied. All patients were anesthetized with propofol, cisatracurium, and desflurane with a mixture of 60% nitrous oxide in oxygen. Then, patients were randomly allocated to receive no remifentanil infusion (Group 0, n = 21) or a target-controlled effect-site concentration of 1 ng/ml (Group 1, n = 24) or 3 ng/ml remifentanil (Group 3, n = 22). Sympathetic responses to surgical incision (presence or absence of an increase in either heart rate or mean arterial blood pressure of 15%) were determined after a 20-min period of stable end-tidal desflurane and target-controlled remifentanil concentrations. Predetermined end-tidal desflurane concentrations and the MAC_{BAR} for each group were determined using an up-and-down sequential-allocation technique. The presence or absence of sympathetic response of a patient, determined the concentration of desflurane given to the following patients in each group.

Results and Discussions: The MAC_{BAR} of desflurane was higher in the group receiving no remifentanil (6.25% [95% confidence interval: 5.9–6.5%], 1.9 MAC) as compared with patients of the groups receiving 1 ng/ml (2.7% [2.6–2.8%], 0.8 MAC $P < 0.01$) and 3 ng/ml remifentanil (2% [1.9–2.2%], 0.6 MAC $P < 0.001$).

Conclusion(s): A target-controlled concentration of 1 ng/ml remifentanil results in a 57% decrease in the MAC_{BAR} of desflurane combined with 60% nitrous oxide. Increasing the target concentration of remifentanil to 3 ng/ml produces a further 26% decrease in the MAC_{BAR} values of desflurane.

A-521

A new approach to remifentanil PK-PD

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Background and Goal of Study: In this study we compare the analgesic effect of Remifentanil with its simulated effect site and plasma concentration during continuous iv infusion in patients undergoing transphenoidal pituitary surgery.

Materials and Methods: 10 patients, ASA physical status I, scheduled to undergo trans-sphenoidal pituitary surgery for non-secreting pituitary adenomas, were recruited. The day before surgery, patients underwent thermal pain threshold assessment. During the test the patient was asked to quantify pain on a VAS. On the day of surgery a spinal catheter (17G) was inserted through the L3–L4 lumbar space. Baseline samples of cerebrospinal fluid (CSF) and arterial and venous blood were drawn after assessment of baseline thermal pain threshold. Remifentanil infusion (0.1 mg/kg/min) was begun through a peripheral vein. Every other 5 min CSF and arterial and venous blood were sampled, MAP, HR, and SpO_2 were registered, and thermal pain threshold was assessed. The study was stopped after 45 min from baseline and the patient underwent induction of anesthesia and surgery.

For each patient, we then simulated a continuous infusion pattern and calculated plasma and effect-site concentrations (Rugloop software, Minto model) which we plotted against the time-thermal response curve.

Results and Discussions: Thermal pain threshold raises up to a level which is comparable with surgical analgesia. It reaches a plateau that is expression of the ceiling effect of opioids and conceptually mirrors the effect site concentration of the drug. The kinetics of this analgesic effect is apparently slower than the kinetics of the effect site concentration as predicted by Minto et al. Our results may contribute to assess new relationships between remifentanil pharmacokinetics and its pharmacodynamic targets, potentially fostering new models of remifentanil administration.

Conclusions: The analgesic effect of remifentanil is apparently delayed compared to the calculated plasma concentration, thus suggesting new targets for the determination of pharmacokinetic-pharmacodynamic relations.

A-522

Predictive performance of Diprifusor® TCI in obese patients

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Background and Goal of Study: The aim of this prospective study was to assess the predictive performance of propofol TCI in morbidly obese patients undergoing bilio-intestinal bypass surgery.

Materials and Methods: 20 patients (ASA Status II–III, aged 32–64 yr) scheduled to undergo elective bilio-intestinal bypass surgery, were prospectively studied. After endotracheal intubation, facilitated by a target controlled effect site concentration of remifentanil set at 2.5 ng/ml, general anesthesia was started by using a TCI for administering propofol with the target plasma concentration initially set at 6 μg/ml. After two minutes this target was reduced to 4 μg/ml then adapted to need of each patient to maintain stable BIS values ranging between 40 and 50. For propofol TCI weight was corrected according to the formula suggested by Servin et al., with ideal body weight (IBW) corrected according as suggested by Lemmens et al. Arterial blood samples for the determination of blood propofol concentrations were collected before starting infusion (T_0), plasma-effect site equilibrium (T_1), opening of peritoneum (T_2), bowel resection (T_3), colecisto-jejunal anastomosis (T_4), ileum-jejunal anastomosis (T_5), closing of peritoneum (T_6), last skin stitch (T_7). The predictive performance of TCI of propofol was evaluated by examining the performance error (PE), the median performance error ($MDPE_i$), the median absolute performance error ($MDAPE_i$), divergence and wobble.

Results and Discussions: MDPEs and MDAPEs ranged from −53.4 to −2.5% and from 10.8 to 53.4%, with median values of −32.6% and 33.1%, respectively. Wobble values ranged from 2.5 to 25.2%, with a median value of 5.9% while divergence values ranged from −7.7 to 33.8% h^{-1}, with a median value of −1.5% h^{-1}.

Conclusion(s): Compared to results reported in previous studies, arterial propofol concentrations revealed significant greater bias. However, the low wobble values obtained from our analysis suggest that, even if real plasma concentrations are lower than those predicted, propofol TCI system is able to maintain stable drug concentrations over time.

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A-523

The pharmacokinetic profile of an extended-release liposomal formulation of bupivacaine administered via a single epidural injection

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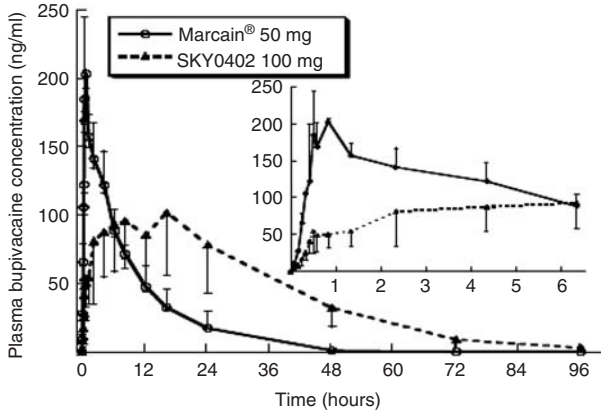
Background and Goal of Study: SKY0402 is a liposomal formulation of bupivacaine intended for the management of post-operative pain. In this study, the pharmacokinetic profile of SKY0402 was compared with that of a commercially-available conventional bupivacaine (CB) solution (Marcain® 0.25%).

Materials and Methods: This is a Phase 1, double-blind study, in which 10 healthy volunteers were randomized in a 4:1 ratio to receive SKY0402 100 mg or Marcain 50 mg, respectively, via a single epidural injection. Plasma samples were collected and analyzed for bupivacaine concentration through 96 hours post-dose. The study has a dose-escalation, sequential cohort design and is currently ongoing. Data from Cohort 1 are reported below.

Results and Discussions: Bupivacaine plasma concentrations peaked lower, later, and took longer to decline in the SKY0402 group compared to the CB group. Systemic exposure to bupivacaine (based on dose-adjusted AUC_{0-last}) was comparable in the two study groups.

	CB (Marcain) 50 mg N = 2	SKY0402 100 mg N = 8
C_{max} (ng/mL)[1]	214 (9)	113 (40)
T_{max} (hr)[2]	0.7 (0.5–0.9)	7.3 (0.5–16.3)
AUC_{0-last} (hr*ng/mL)[1]	1764 (26)	3854 (33)
$T_{1/2}$ (hr)[2]	6.5 (6.1–6.9)	14.9 (9.8–29.6)

[1]Geometric Mean (CV%); [2]Median (min–max).



Conclusion: The pharmacokinetic profile of SKY0402 was consistent to that of a sustained-release formulation.

A-524

Measured context-sensitive half-time of propofol in describing its pharmacodynamic effect offset

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Background and Goal of Study: The aim of this study was to check any correlation between the measured context-sensitive half-time (CSHT) of propofol and the time to the recovery during TIVA, when monitored by SFx.

Materials and Methods: Thirty five patients scheduled for laparoscopic cholecystectomy under propofol TIVA were prospectively and randomly allocated to receive either: remifentanil (1.0 μg/kg followed by continuous infusion in the range from 0.25 to 0.05 μg/kg/min) – group I, or alfentanyl (10 μg/kg followed by continuous infusion range from 2.0 to 0.5 μg/kg/min) – group II. PSM 2000 monitor (Pro Science, Linden, Germany) was used to monitor the SFx (Spectral Frequency index). In this study intravenous propofol was titrated to keep SFx at 70–80%. Blood samples for measurement of propofol concentrations were taken from forearm veins when the propofol infusion has been stopped and then after 1, 3, 5, 10, 15, 30, 60, 120, 180 min. from the end of infusion. Concentrations of propofol in plasma were assayed using high performance liquid chromatography method. Data were analyzed using Student t-tests and are presented as mean ± SD.

Results and Discussion: The measured context-sensitive half-time of propofol was 15.28 ± 3.45 (group I) and 17.48 ± 4.91 min. (group II) and the elimination half-time was 65.5 ± 12.8 (group I) and 71.3 ± 15.4 min. (group II). The mean time to extubation was 5.48 ± 1.37 min. (group I) and 6.38 ± 2.41 min. (group II) and the mean time to orientation for name and place was 8.00 ± 3.98 (group I) and 11.78 ± 3.31 (group II). The plasma propofol concentration at extubation time was lower in patients given remifentanil (1.16 vs 1.69 mg/l), and at the same time point the SFx value showed a significant difference in the hypnotic level between two groups (83 vs 76%, for group I and II, respectivelly).

Conclusion: The measured context-sensitive half-time of propofol was similar to previously computer modeled data and did not depend on the kind of opioid. The results of this study confirm the value of the CSHT in describing anesthetic drug offset.

A-526

Effect of voriconazole on the pharmacokinetics and pharmacodynamics of intravenous and oral midazolam

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Background and Goal of Study: Voriconazole is a new wide spectrum triazole antimycotic, which inhibits cytochrome P450 (CYP) isoenzymes CYP2C9, CYP2C19 and CYP3A4 (1). Midazolam is a short-acting benzodiazepine widely used in anesthesia. Because the hepatic biotransformation of midazolam is mediated mainly by CYP3A, we wanted to study the effects of voriconazole on the pharmacokinetics and –dynamics of oral and intravenous midazolam.

Materials and Methods: We used open, randomized and controlled crossover study design with four phases at interval of one week. Ten healthy male volunteers (23 ± 3 years) were given a single 0.05 mg/kg intravenous dose of midazolam in the first part of the study and 7.5 mg of oral midazolam in the second part of the study. Volunteers were randomly given either no pretreatment (control phase) or voriconazole pre-treatment (voriconazole phase) for two days before midazolam dosing. Voriconazole was given orally 400 mg b.i.d. on the first day and 200 mg b.i.d. on the second day. Plasma was collected and concentrations of midazolam were determined for 24 hours. The effects of midazolam were assessed with the Maddox wing test and three visual analog scales (VAS) at the time of blood sampling up to 12 hours after midazolam administration Pharmacokinetic variables were calculated with usual methods.

Results and Discussions: Voriconazole increased the peak concentration and the area under the plasma concentration-time curve (AUC) of oral midazolam 3.8-fold and 10.3-fold, respectively ($P < .001$). The bioavailability of oral midazolam was increased from 31% to 84% ($P < .001$). Voriconazole reduced the clearance of intravenous midazolam by 72% ($P < .001$) and increased its elimination half-life from 2.8 to 8.3 hours ($P < .001$). Voriconazole profoundly increased the psychomotor effects of oral midazolam ($P < .001$) but increased only weakly the effects of intravenous midazolam.

Conclusion(s): Use of oral midazolam with voriconazole should be avoided or substantially lower doses should be used. Use of large midazolam doses increases the risk of clinically significant interactions also after its intravenous administration.

Reference:

1 Boucher HW. *Drugs* 2004; 64: 1997–2020.

A-527

Gender comparison of the effect-site disequilibrium constant, k_{e0}, of propofol for the blood pressure endpoint under routine anesthesia

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Background and Goals: The aim of this investigation was to study the relationship between blood concentrations and effect of propofol (P), measured as systolic blood pressure (SBP) drop in anesthesized patients, and to evaluate possible gender dependence.

Methods: 58 patients (29 men (M) and 29 women (W)) attending Galdakao Hospital for minor surgery were monitored during routine surgical procedures under P anesthesia. Induction was performed with a rapid infusion (600 ml/h) of P until the same endpoint of 60 on the BIS scale was reached or by a rapid

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infusion of P until loss of standard clinical signs. Anesthesia was maintained with a perfusion pump according to manual infusion scheme proposed by Roberts[1]. Patients had BIS and SBP recorded at all times (including baseline values). Four blood samples (in order to measure blood concentration, Cs) were collected from each subject, at predose, at the end point and at fixed intervals of 15 and 30 min. Reduction in SBP, [(SBP-80)/($SBP_{baseline}$-80)]*100, was used as a measure of P effect and related to Cs using a semicompartmental model in order to obtain k_{e0}. Ce (effect site concentration) was then estimated and a pharmacodynamic (PD) model was used to describe the data (WinNonLin Professional, Pharsight Corp.).

Results: 21 (10 M and 11 W) out of the total 58 patients did not present drop in SBP during the 30 min of data record although BIS values were at most 60. These patients were excluded from analysis. The remaining (37 patients) showed a significant hysteresis (lag-time between Cs and SBP). The first order rate constant k_{e0}, was 0.67 min^{-1} both in M and in W. Estimated Ce at induction was less in W although no statitical differences were found due to large variability (4.50 vs 6.12 mcg/mL W and M respectively). A sigmoid E_{max} model best described the data (Ce vs effect). PD parameters (ECe50 and γ) did not show statistical gender dependence.

Conclusions: No PD differences were found for P routine protocol anesthesia between M and W for the SBP endpoint. SBP is possibly an inadequate surrogate of anesthesic effect during the first 30 min of surgery.

References:

1 Roberts FL. Anaesthesia. 1988; 43:14–7.
2 Kazama T. Anesthesiology. 1999; 90:1517–27.
3 Hoymork SC. Br J Anaesthesia. 2005; 95(5):627–33.

A-528

The influence of the dose on the time to peak effect of propofol: preliminary results

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Background and Goal of Study: Pharmacodynamic (PD) models of propofol are usually described as a first order process with one equilibration rate constant (ke0) and two compartments (plasma and effect-site)[1]. With various results, several studies suggested that propofol PD could not be a first order process[2,3]. The time to peak effect of propofol is a model independent parameter which is known not to vary with the dose, when given as a bolus[1]. But this assertion is valid only if the PD of propofol is a first order process. The present study measures the time to peak effect of propofol with 2 different bolus doses.

Materials and Methods: After approval of local ethical committee and informed and written consent, 16 ASA I/II patients aged less than 50 were randomly assigned to 2 groups in a blinded manner to receive a bolus dose of propofol of either 1 mg/kg (group A) or 3 mg/kg (group B). BIS (Aspect Medical Systems, Nattick, MA) was recorded every 2 seconds and the time between the propofol bolus and the lowest BIS value minus 10 seconds (mean time for BIS processing) was considered as the time to peak effect.

Results and Discussions: There was no significant difference between group A and B regarding age (41 $\pm$ 6 vs 35 $\pm$ 8 yr respectively), sex (2 males and 6 females in both groups), weight (67 $\pm$ 16 vs 68 $\pm$ 20 kg) and height (163 $\pm$ 9 vs 168 $\pm$ 13 cm).

As expected, the minimum BIS value was significantly lower after a bolus dose of propofol of 3 mg/kg (17 $\pm$ 10) than after a dose of 1 mg/kg (47 $\pm$ 13) ($p < 0.05$), but this value was obtained significantly later (113 $\pm$ 41 sec vs 78 $\pm$ 14 sec: $p < 0.05$). This observation cannot be described with a direct PD model. (Values are mean $\pm$ SD).

Conclusion(s): The time to peak effect of propofol varies with the bolus dose suggesting that the PD of propofol may not be a first order process and that the research into a new indirect PD model should be considered.

References:

1 Minto CF, et al. Anesthesiology 2003; 99:324–33.
2 Stokes DN, Hutton P. Anesth Analg 1991; 74:316–17.
3 Doufas AG, et al. Anesthesiology 2004; 101:1112–21.

A-529

Pharmacokinetic/pharmacodynamic modelling of rocuronium in children with Duchenne muscular dystrophy

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Background and Goal of Study: Rocuronium (ROC) shows a prolonged onset and duration of neuromuscular block (NMB) in children with Duchenne muscular dystrophy (DMD).[1] In this study we performed a pharmacokinetic-pharmacodynamic modelling of ROC in DMD and healthy patients.

Materials and Methods: After approval of the local Ethics Committee and signed consent, 20 children with DMD (group DMD, 13 $\pm$ 2 yrs., 56 $\pm$ 11 kg) and 20 healthy children (group CON, 14 $\pm$ 3 yrs., 55 $\pm$ 18 kg) were investigated. After administration of 0.3 or 0.6 mg/kg ROC, NMB was monitored using acceleromyography. According to a standard protocol, twitch response at the adductor pollicis muscle was measured after single twitch stimulation of the ulnar nerve. An input-output model with two pharmacokinetic compartments, an effect compartment and a sigmoid Hill equation was fitted to the individual data. Differences between groups were analysed with the Mann-Whitney-U test.

Results and Discussion: Whereas the half-maximal dose ED_{50} and the Hill exponent γ showed no difference, we found a significant lowered k_{e0} in DMD children compared to healthy subjects. The ratio EC_{50DMD}/EC_{50CON} was 0.71 $\pm$ 0.16 (SE).

	DMD	CON
k_{e0} (1/min)	0.066 $\pm$ 0.028**	0.24 $\pm$ 0.10
Hill exponent γ	3.8 $\pm$ 2.2	6.2 $\pm$ 4.3
ED_{50} (mg/kg)	0.18 $\pm$ 0.10	0.21 $\pm$ 0.09

** $p < 0.01$ DMD vs. CON; data are shown as mean $\pm$ SD.

Conclusion: The prolonged onset and duration of NMB in DMD children can be explained by a slower exchange between plasma and effect site compartment. Moreover, the concentration at the effect site necessary to achieve half maximum effect is less than in healthy patients. This might be due to altered structure of the motor endplate.

Reference:

1 Wick S, Muenster T, Schmidt J, et al. *Anesthesiology* 2005; 102: 915–919.

A-530

Pharmacodynamic modelling of mivacurium in children with Duchenne muscular dystrophy: influence of the progress of the disease

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Background and Goal of Study: Administration of miva-curium (MIV) leads to a prolonged onset and duration of neuromuscular blockade (NMB) in children with Duchenne muscular dystrophy (DMD) compared to controls.[1] In this study we investigated the impact of disease progression on NMB in DMD-children after MIV.

Materials and Methods: After approval of the local Ethics Committee and signed consent, 22 children with DMD were investigated. Group I_{young} (7.9 $\pm$ 1.2 yrs., 27 $\pm$ 6 kg, n = 11) were still ambulatory. Group II_{old} (13.8 $\pm$ 1.5 yrs., 54 $\pm$ 21 kg, n = 11) were wheel chair bound. Patients received 0.2 mg/kg MIV bolus iv. We used acceleromyography at the adductor pollicis muscle after train of four stimulation of the ulnar nerve. Standard variables of time course of NMB were determined.[2] For pharmacokinetic/dynamic modelling we used a two compartment input-output model with effect compartment and Hill equation. Differences between both groups were tested for significance using the Mann-Whitney-U test.

Results and Discussions: Onset and recovery of NMB as well as the equilibration between plasma and effect compartment ($T_{1/2}k_{e0}$) was slower in patients with advanced state of disease. The effective dose to achieve 50% of effect (ED_{50}) was not different (tab. 1). The ratio of the half-maximum concentrations ($EC_{50young}/EC_{50old}$) was 1.50 $\pm$ 0.24 (mean $\pm$ SE).

Table 1. Results (mean $\pm$ SD).

	T_{onset} (sec)	T_{90} (min)	T_{25-75} (min)	$T_{1/2}k_{e0}$ (min)	ED_{50} (mg/kg)
I	142 $\pm$ 33	25 $\pm$ 6.4	7.0 $\pm$ 2.0	2.6 $\pm$ 0.9	0.13 $\pm$ 0.02
II	202 $\pm$ 71*	43 $\pm$ 14**	13.2 $\pm$ 5.4**	6.0 $\pm$ 3.5**	0.13 $\pm$ 0.03

*$p < 0.05$, **$p < 0.01$.

Conclusion: The transfer between plasma and effect compartment becomes slower and the concentration at the effect compartment necessary to achieve half maximum effect becomes less in DMD children with advanced state of disease. This might be due to altered structure of the motor endplate or modified signal transduction of the nicotinic acetycholine receptor.

References:

1 Schmidt J, et al. Br J Anaesth 2005; Sep.
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A-531

Residual paralysis in a cardiosurgical intensive care unit

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Background and Goal: A possible advantage of neuromuscular blocking drugs (NMBD) during cardiac surgery could be that they prevent patient movement. However, long-acting NMBD are associated with postoperative residual curarisation (PORC), delays in tracheal extubation, and symptoms of muscle weakness in the early postoperative period after cardiac surgery. Cisatracurium (CIS) is intermediate of action, has an organ-independent elimination and lacks cardiovascular side-effects. We investigated whether the omission of CIS during cardiopulmonary bypass (CPB) would be associated with less PORC but a higher incidence of intraoperative movements.
Materials and Methods: 30 patients were randomly assigned either to group 1 ($n = 15$) or group 2 ($n = 15$). Those in group 1 were given CIS only at induction (0.15 mg kg^{-1}). Those in group 2 received CIS 0.15 mg kg^{-1} at induction; after 30 min a continuous infusion of CIS was begun at a rate of 1 $\mu g\,kg^{-1}\,min^{-1}$ before CPB, 0.75 during CPB, and 1 $\mu g\,kg^{-1}\,min^{-1}$ after CPB. Anaesthesia was with TCI propofol and remifentanil. Neuromuscular transmission was monitored at 1-min intervals after train-of-four (TOF) stimulation of the ulnar nerve. Bolus 'escape' doses of CIS 0.03 mg kg^{-1} were given if movement occurred. In group 2 the CIS infusion was discontinued when the surgeon began closing the pericardium. Spontaneous recovery from neuromuscular blockade was allowed in the operating theatre or ICU. In group 2, the TOF was measured every 15 min in the ICU.
Results and Discussion: In group 1, 14/15 patients had a TOF > 90% at the end of surgery. In group 2, 13/15 did not reach a TOF >90% in the operating room. A TOF >90% was reached 56 ± 41min [range 5–150 min] after their arrival in the ICU. In groups 1 and 2, no patient recalled any intraoperative phenomena; none had moved or had diaphragmatic contractions and, obviously, none received additional boluses of CIS.
Conclusions: Among patients who did not receive muscle relaxation during CPB, none moved or had diaphragmatic contractions; no PORC was found in 14/15 patients. One must be aware that in cardiosurgical patients who have received a continuous infusion of CIS, neuromuscular recovery in the ICU can take >2 h.

A-532

Assessment of incidence of residual paralysis after a single intubating dose of atracurium using a calibrated acceleromyograph

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Background and Goal of Study: Postoperative, uncalibrated acceleromyographic measurements of Train-of-four-ratio (TOFR) have shown a high incidence of TOFR < 0.9 even 120 minutes after a single intubating dose of a mid-term myorelaxant (1). The aim of this study was to assess the incidence of residual paralysis after a single dose of atracurium (2*ED95) when using a calibrated acceleromyograph (AMG) continuously.
Materials and Methods: IRB-approved observational study in 50 patients receiving a total intravenous anaesthesia with propofol/remifentanil. Before anaesthesia a TOF-Watch SX® AMG with hand adapter (Organon Ireland Ltd., Dublin, Ireland) was placed in typical style (stimulation of the ulnar nerve, probe tip at the thumb). After induction with propofol/fentanyl calibration of the AMG at optimal intensity (CAL2-Modus) followed by injection of a single dose of atracurium (0.5 mg/kg) and intubation. No repetitive doses of atracurium were used. TOFR (2 Hz duration, 4 pulses of 0.2 ms) was monitored in a 15 s-interval continuously until end of surgery.
Results and Discussions: In 4 patients duration of surgery was <60 min (group A), in 15 patients between 60 and 90 min (group B), and in 31 patients >90 min (group C) respectively.

	A (n = 4)	B (n = 15)	C (n = 31)
TOFR < 0.7	3 (75%)	4 (27%)	0
TOFR < 0.9	3 (75%)	5 (33%)	1 (3%)

Conclusion(s): In contrast to previous published data (1) our study shows a lower incidence of residual paralysis after a single intubating dose of atracurium, at least for surgery lasting >90 min. These differences are best explained by recent findings reporting poor accuracy of isolated uncalibrated acceleromyographic measurements (2). We conclude that AMG should be used in a calibrated mode continuously to detect residual paralysis more reliable.

References:

1 Debaene B, et al. *Anesthesiology* 2003; 98: 1042–8.
2 Capron F, et al. *Anesthesiology* 2004; 100: 1119–24.

A-533

The effect of Sugammadex (Org 25969) on profound neuromuscular block as induced by vecuronium in the anaesthetised Rhesus monkey

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Background and Goal of the Study: Sugammadex, a synthetic γ-cyclodextrin, is the first selective relaxant binding agent (SRBA) especially designed to reverse neuromuscular block induced by rocuronium. The present study in Rhesus monkeys investigated the reversal of a profound neuromuscular block induced by vecuronium.
Materials and Methods: Female Rhesus monkeys were sedated with ketamine i.m., followed by intravenous bolus injection of pentobarbitone sodium and a subsequent infusion. The lungs were ventilated with a mixture of oxygen and nitrous oxide (2:3). Heart rate and blood pressure were monitored and body temperature was kept at 37–38°C. Contractions of the adductor pollicis muscle were induced by supramaximal train-of-four stimulation of the median nerve of the right arm. After a bolus of ED_{90} of vecuronium (8–10 $\mu g\,kg^{-1}$) the animal was allowed to recover spontaneously. After reaching a steady state an extra recovery of 60 minutes was allowed. Then an injection of vecuronium 5 x the first dose was followed by administration of either saline 0.9% or sugammadex 2.5 mg kg^{-1} i.v.
Results and Discussions: The recovery variables of the experiments are presented in the table 1. The recovery by sugammadex of a vecuronium induced neuromuscular block to a TOF ratio of 50% was significantly faster than the spontaneous recovery, but recovery to TOF of 75% and 90% was not. Haemodynamic changes were not observed. All animals recovered completely without any side effects. Signs of residual blockade or re-curarization were not observed over a period of 60 minutes.

Table 1. Neuromuscular recovery times (min). Values are mean and (SEM); n = 4 in each experiment.

TOF ratio (%)	Recovery after saline 0.9% (min)	Recovery after Sugammadex 2.5 mg.kg^{-1} (min)
50	37.2 (3.7)	24.1* (4.5)
75	43.5 (4.4)	37.1 (6.7)
90	49.0 (4.7)	48.6 (8.3)

*p < 0.05 vs spontaneous recovery after saline 0.9%.

Conclusions: Full reversal of neuromuscular block in Rhesus monkeys will most likely require doses higher than the 2.5 mg kg^{-1} dose used in this study.

A-534

Reversal of rocuronium-induced neuromuscular block by pyridostigmine in patients with Duchenne muscular dystrophy

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Background and Goal of Study: In patients with Duchenne Muscular Dystrophy (DMD) non-depolarising muscle relaxants have been found to induce a prolonged neuromuscular block (NMB)[1,2]. The use of reversal agents is controversial[3]. The aim of this study was to evaluate the effect of reversal agents in DMD
Materials and Methods: With IRB approval and parental informed consent 14 patients with DMD were included. Neuromuscular monitoring was performed with train-of-four (TOF) sequence by acceleromyography at the adductor pollicis muscle. A bolus of rocuronium 0.6 mg kg^{-1} was given and time course of NMB recorded. At recovery of T1 twitch height to 25% of control value 7 patients (Group I) received pyridostigmine 0.1 mg kg^{-1} together with

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glycopyrrolate 0.01 mg kg^{-1}, the other 7 patients (Group II) no reversal agent. For statistics the Mann-Whitney U-test was used, $p < 0.05$ considered significant.

Results and Discussions: Following pyridostigmine complete recovery (TOF ratio to ⩾ 90%) was achieved in all patients. Recovery to TOF_{90} and recovery time (T_{25} to TOF_{90}) were significantly shortened in Group I compared to Group II. Individual recovery characteristics varied widely (table). We found no signs of recurarisation or any adverse effects during the recording period.

Conclusion(s): These results suggest that reversal of rocuronium induced NMB by pyridostigmine is possible and shortens the recovery time in patients with DMD.

Group	T_{25} (min)	T_{90} (min)	TOF_{90} (min)	Recovery time (T_{25}–TOF_{90})
I (n = 7)	53 (42–116)	107 (62–135)	84** (57–141)	15** (8–49)
II (n = 7)	73 (40-139)	168 (61–208)	147 (84–240)	76 (43–143)

**$p < 0.01$.

References:
1 Wick, et al.: Anesthesiology 2005; 102:915–9.
2 Schmidt, et al.: Br. J. Anaesth. 2005; 95:769–72.
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A-535

Rapid reversal of vecuronium induced block with sugammadex in three species

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Background and Goal of Study: Sugammadex is a selective relaxant binding agent originally designed to encapsulate rocuronium[1]. The steroidal neuromuscular blocking agent vecuronium has a slightly lower affinity for sugammadex. Since vecuronium is more potent, a lower dose is required for muscle relaxation, so fewer molecules need to be captured by sugammadex. This study evaluated the effect of sugammadex on vecuronium-induced block.

Materials and Methods: In deeply anaesthetised animals, single twitch contractions were blocked with vecuronium. Bolus injection of vecuronium (0.8 mg/kg rat; 0.4 mg/kg guinea pig) caused complete block. In the monkey, 90% block was induced with an infusion (0.6 μg/kg/min).

Results and Discussions: Sugammadex administration (4 mg/kg rat; 1 mg/kg guinea pig, monkey) had a marked effect on the speed of recovery (see Table).

	Spontaneous recovery	After sugammadex
Recovery index (min)		
Rat	2.9 ± 0.6	0.7 ± 0.2#
Guinea pig	13.8 ± 4.0	0.4 ± 0.1#
Rhesus monkey	7.8 ± 1.1	2.2 ± 1.1#
Time to 90% recovery (min)		
Rat	9.1 ± 2.0	1.6 ± 0.6#
Guinea pig	40.3 ± 5.7	1.4 ± 0.1#
Rhesus monkey	20.7 ± 3.4	7.1 ± 4.5#

Mean ± SEM; n = 4 (rat & monkey); n = 5 (guinea pig).
Recovery index: time between 25% and 75% recovery.
#: $p < 0.05$ unpaired t-test.

Conclusion(s): Sugammadex caused fast, effective and complete reversal of vecuronium-induced neuromuscular block in all three species. This was achieved despite the lower affinity of vecuronium for sugammadex.

Reference:
1 Gijsenbergh F., Anesthesiology, 2005; 103(4): 695–703.

A-536

The influence of the induction techniques on intubation conditions with low dose of rocuronium bromide 0.3 mg/kg

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Background and Goal of Study: The low dose of rocuronium bromide (0.3 mg/kg) may be useful for short time surgery provided acceptable tracheal intubation conditions for most of the patients. The goal was to evaluate the influence of the induction techniques on intubation conditions and the duration of action obtained using low dose of rocuronium.

Materials and Methods: 102 patients ASA I–II, equally divided in three groups, have been enrolled in an epidemiological, observational, randomized and double blinded clinical study. Induction techniques used have been: group A-fentanyl 2 μg/kg, thiopental 4 mg/kg, rocuronium; group B-fentanyl 2 μg/kg, propofol 2 mg/kg, rocuronium; group C (timing principle)-rocuronium, fentanyl and after 30 sec thiopental[1]. Neuromuscular blockade was monitored using TOF-WATCH®SX Organon Teknika accelerometer in train of four stimulation, recording trends on an IBM computer[2]. We assessed the quality of the intubation conditions at T1 < 20% (Copenhagen Consensus Conference), the onset time and the time of surgical block (T1–T2).

Results and Discussions: The intubation conditions were acceptable (good and excellent) for 85–88% patients. Excellent intubation conditions have been obtained especially for females ($p < 0.002$), in propofol ($p < 0.005$) and thiopental ($p < 0.01$) groups. All female patients from the propofol group have obtained acceptable intubation conditions. Moreover the time allowing the intubation is significantly shorter for female patients in propofol (131.5 ± 53.3 sec) and thiopental (166.1 ± 83.6 sec) groups. The time of surgical block insignificantly differs between groups, excepting female from group B (1071.6 ± 571.7 sec) where it is significantly higher than that of male patients (744.4 ± 504.4 sec).

Conclusions: Low dose of rocuronium bromide allows acceptable intubation conditions for 9 of 10 patients, the technique being recommended especially for female patients with propofol induction. The time of action permits the use of this dose in short duration surgery.

References:
1 Kwan WF, et al. Anesth Analg 1998, 86(2S): 475S.
2 Lambert M, et al. Anesthesiology 2003, 99: A1124.

A-537

Neuromuscular recovery of rocuronium and cisatracurium after early, late or no reversal with neostigmine

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Background and Goal of Study: To evaluate the time-course of recovery of neuromuscular block of 2 different potency drugs (rocuronium and cisatracurium) after reversal or no reversal with neostigmine, and to investigate the influence of timing of neostigmine administration on the neuromuscular recovery.

Materials and Methods: 60 ASA physical status I–II adult patients were randomised, with a double blind design, to receive 0.6 mg/Kg rocuronium or 0.1 mg/Kg cisatracurium during propofol/remifentanil/N_2O anaesthesia. Neuromuscular block was assessed by acceleromyography (TOF-GUARD) after train-of-four (TOF) stimulation of the ulnar nerve. Further randomisation was made to reversal with neostigmine 30 μg/Kg plus atropine 10 μg/Kg given at first twitch (T1) recovery of 5% (Rev 5%) or 25% (Rev 25%), or to no reversal (No Rev). We measured the times from relaxant administration to T1 recovery of 5% and to TOF ratio (TR) recovery of 80%, the recovery index ($T1_{25\%}$–$T1_{75\%}$) and the complete recovery time ($T1_{25\%}$–$TR_{80\%}$). ANOVA was used for statistical analysis.

Results and Discussions: Data in minutes (Mean ± S.E.)

	Rocuronium			Cisatracurium		
	No Rev	Rev 5%	Rev 25%	No Rev	Rev 5%	Rev 25%
Time to$T1_{5\%}$	30.01 ± 2.1*	31.32 ± 1.4*	25.78 ± 2.2*	39.68 ± 3.7	44.29 ± 3.8	39.07 ± 1.1
Time to$TR_{80\%}$	55.82 ± 8.4	39.59 ± 2.5*#	37.22 ± 2.6*#	62.22 ± 8.8	53.39 ± 3.6#	53.99 ± 2.0#
$T1_{25\%}$–$T1_{75\%}$	15.00 ± 1.5	4.68 ± 1.0#	3.53 ± 0.3#	12.95 ± 1.4	5.28 ± 0.5#	4.25 ± 0.5#
$T1_{25\%}$–$TR_{80\%}$	21.93 ± 4.2	6.63 ± 1.0#	5.75 ± 0.8#	18.72 ± 2.5	7.13 ± 0.6#	7.00 ± 0.6#

*$p < 0.05$ vs. cisatracurium. #$p < 0.05$ vs. no reversal.

Conclusion(s): 1) Rocuronium has a shorter duration of clinical blockade than cisatracurium, but recovery pattern of rocuronium is similar to that of cisatracurium. 2) The acceleration in the recovery when neostigmine is used is independently of the timing of neostigmine administration for both relaxants. 3) We do not observe differences between rocuronium and cisatracurium in the time from administration of the relaxant to TOF ratio 0.8 when reversal is not used.

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A-538

Haemodynamic effects of rocuronium or mivacurium during fentanyl/midazolam anaesthesia

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Background and Goal of Study: Haemodynamic stability is vital for successful anaesthetic management of myocardial revascularization procedures. The aim of our study was to evaluate the cardiovascular effects of rocuronium (R) and mivacurium (M) during fentanyl/midazolam induction of anaesthesia in patients undergoing coronary artery bypass grafting (CABG).

Materials and Methods: After obtaining written informed consent and approval from the Ethics Committee, we studied 20 adult patients ASA III–IV randomized in two groups. Haemodynamic variables were measured following administration of R (n = 10) 0.6 mg kg^{-1} (during 10 s) or M (n = 10) 0.2 mg kg^{-1} (during 60 s) in patients anaesthetized with fentanyl 6 μg kg^{-1} and midazolam 0.15 mg kg^{-1}. Heart rate (HR), mean arterial pressure (MAP), central venous pressure (CVP), pulmonary capillary wedge pressure (PCWP) and cardiac index (CI) were assessed at 1 min after induction of anaesthesia (baseline) and at 3 and 5 min after administration of the relaxant. Data were analyzed using Student's t-test. Statistical significance was assumed for $p < 0.05$.

Results: The groups were comparable for all measured variables (Table, mean ± SEM).

	Baseline	+ 3 min	+ 5 min	p
HR (beat min^{-1})				
Rocuronium	73 ± 3.3	74 ± 3	69 ± 1.8	ns
Mivacurium	73 ± 3.5	71 ± 5	69 ± 4.1	ns
MAP (mmHg)				
Rocuronium	79 ± 3	76 ± 2.6	81 ± 2.4	ns
Mivacurium	76 ± 3	76 ± 2.8	78 ± 3.7	ns
CVP (mmHg)				
Rocuronium	4.3 ± 0.9	4.5 ± 0.8	5 ± 0.9	ns
Mivacurium	4.8 ± 1	5.6 ± 2	5.5 ± 2	ns
PCWP (mmHg)				
Rocuronium	11 ± 1.2	11 ± 1.5	10.6 ± 0.8	ns
Mivacurium	11 ± 3	12 ± 3.8	11 ± 3	ns
CI (l min^{-1} m^{-2})				
Rocuronium	2.7 ± 0.4	2.7 ± 0.4	2.7 ± 0.4	ns
Mivacurium	2.8 ± 0.2	2.8 ± 0.2	2.8 ± 0.1	ns

Conclusions: Rocuronium (during 10 s) and mivacurium (during 60 s) did not induce any adverse haemodynamic effects and, thus, proved to be safe for use during induction of anaesthesia in patients undergoing CABG.

A-539

Continuous intravenous anaesthesia vs. intermittant intravenous anaesthesia in coronary artery by-pass grafting surgery

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Background and Aim of Study: The purpose of this study was to compare and investigate the advantages of continuous (CIVA) vs. intermittant (IIVA) intravenous anaesthesia in coronary artery by-pass grafting (CABG) surgery (1).

Material and Methods: On approval of the local authorities, clinical randomised study included 60 patients (pts) with coronary artery occlusive diseases, ejection fraction – EF >30%: Group C: 30 pts – CIVA and Group I: 30 pts – IIVA. All patients had comparable antropometric, demographic and comorbidity characteristics. After introduction into general anaesthesia and monitoring placement, both groups got intravenous bolus of sufentanil-forte, midasolam and pancuronium-bromid according to body weight. CIVA started 5 min after that. At beginning infusion rate was: sufentanil-forte 0.15 mg/h, midasolam 5 mg/h, pancuronium-bromid 4 mg/h. CIVA was manual-controlled, IIVA by boluses with targeted BIS 40–60 and hemodynamic stability. The drug consumption was calculated before, during and after extracorporeal circulation (ECC). The time of awaking, spontaneous muscle recovery and extubation was noted in the intensive care unit (ICU). The statistical analysis was performed by t-test with statisticaly significant differences of $p < 0.05$.

Results and Discussion: There were significant differences between groups drug consumption and postoperative recovery times ($p < 0.001$ for all data).

		Group C	Group I	C < I
Sufentanil-forte	Before ecc	0.41250	0.64275	36%
mg/ptc	During ecc	0.22350	0.33960	34%
	After ecc	0.07275	0.14475	50%
Midazolam	Before ecc	14.02	17.5	20%
mg/ptc	During ecc	5.78	10.33	44%
	After ecc	2.20	3.83	43%
Pancuronium-bromid	Before ecc	11.6	21.23	45%
mg/ptc	During ecc	3.7	4.23	13%
	After ecc	1.79	2.53	29%
Awaking time (h)		2.2	5.07	57%
Muscle recovery time (h)		3.9	6.8	43%
Extubation time (h)		8.7	14.5	40%

Conclusion: Results suggested that continuous intravenous anaesthesia in coronary artery by-pass grafting surgery is multibeneficial for a patient and cost-effective.

Reference:

1 Viviand X, Leone M. *Best Practice & Research Clinical Anaesthesiology.* 2001;15: 1:19–33.

A-540

Recovery from neuromuscular blockade after prolong infusions of cisatracurium using either desflurane and propofol-based anesthetics (TIVA)

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Background and Goal of Study: We examined the recovery characteristics of cisatracurium infusion under either desflurane or total intravenous anesthesia with propofol–remifentanil (TIVA) anesthesia in patients operated for intracranial lesions.

Material and Methods: Following the approval of hospital ethics committee, 30 patients aged 18–70, ASA Group I–III, who were undergoing intracranial surgery were randomly selected into two groups. After premedication, both groups were given intravenous remifentanil (1 μg kg^{-1}), propofol (2 mg kg^{-1}) plus cisatracurium (0.2 mg kg^{-1}) for induction. The single twitch stimulation (0.1 Hz) was applied. When 95% block (baseline block) occurred, onset time was recorded and the patients were intubated. In the maintenance, Group I was given 3–6% desflurane and Group II was given propofol (75–150 μg kg^{-1} min^{-1}) and remifentanil (0.2–0.25 μg kg^{-1} min^{-1}) in % 50 O_2–N_2O. After recording clinical duration time ($T1_{25}$); cisatracurium infusion was initiated and titrated 1–3 μg kg^{-1} min^{-1} to maintain a 90–95% neuromuscular blockage. Sixty minutes before the end of the surgical procedure, the infusion of cisatracurium was stopped and the patient was allowed to spontaneously recover from neuromuscular blockade. After the infusion was stopped; clinical duration time 2 ($T2_{25}$); and recovery index were recorded. Spontaneous recovery time (T_{70}) was also recorded. The Student t was used for statistical analysis.

Results and Discussion: There were no significant difference between T_{95} (137.73 ± 33.39/133.3 ± 29.56), $T1_{25}$ (61.73 ± 20.72/50 ± 11.44), $T2_{25}$ (48.13 ± 4.10/49.46 ± 5.33), T_{25-75} (13.2 ± 6.24/12.13 ± 2.95), T_{70} (63.13 ± 16.75/61.3 ± 7.83) times ($p > 0.05$).

Conclusion: Desflurane or TIVA are suitable anaesthetic agents for cisatracurium infusion in prolonged neurosurgical procedures.

References:

1 Jellish SW, et al. Anesth Analg 2000; 91: 1250–5.
2 Ortiz GJ, Percaz BJ. Rev Esp Anestesiol Reanim 2001; 48 (3): 117–21.

A-541

The effects of propofol bolus/titration on the loss of single twitch and the quality of tracheal intubation of rocuronium

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Background and Goal of Study: Propofol can be administered either through a single bolus or titration method. This study is to assess the effects of propofol bolus/titration on the time of 90% loss of single twitch response and the quality of intubation with rocuronium blockade 0.6 or 0.9 mg/kg.

Materials and Methods: 100 ASA I/II adult patients were included and monitored with standard equipments, plus bispectral index (BIS) and TOF-Watch. All patients would be randomly assigned into 4 groups. Group T6: propofol

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titration and 0.6 mg/kg rocuronium; T9: propofol titration and 0.9 mg/kg rocuronium; B6: propofol bolus 2 mg/kg and 0.6 mg/kg rocuronium; B9: propofol bolus 2 mg/kg and 0.9 mg/kg rocuronium. Propofol was titrated with 40 mg bolus every 10 seconds until the clinical signs of the patients displayed the onset of anesthesia. Anesthesia was induced with fentanyl and lidocaine, followed by the proposed administration method of propofol and rocuronium to each group. The same anesthesiologist performed the intubation and assessed the intubation conditions when the degree of muscle relaxation approached 90% loss of single twitch response. The quality of intubation was evaluated according to a scoring system[1]. According to each variable, we score the quality: excellent = 1, good = 2, poor = 3. The data were analyzed with Student's t-test.

Results and Discussions: Doses of propofol were significantly smaller in the titration compared with the bolus groups. BIS values immediately before intubation for all groups were all under 60. The time interval for reaching 90% loss of single twitch response seems longer in titration compared with bolus groups, but the difference was statistically insignificant. The difference of intubation conditions between group T6 and B6 was statistically significant.

Conclusion(s): Adequate hypnosis could still be reached[2] despite lower propofol dosage was used in the titration groups**.** When administrating propofol with titration method, a higher dose of rocuronium (0.9 mg/kg) is recommended to ensure more satisfactory intubation quality.

References:

1 Acta Anaesthesiologica Scandinavica 1996: 40: 59–74.
2 Anesthesiology 1997: 86: 836–847.

A-542

Study of the plasma's total antioxidant capability in healthy volunteers treated with bemiparine

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Background and Goals: A protective antioxidant capability has been reported previously in animals treated with low-molecular weight heparins (LMWH). We want to check the possible antioxidant action of LMWH in humans by determining the plasma's total antioxidant capability (PTAC) and oxidative stress markers as oxidized glutathione (GSSG) and Malondialdehyde (MDA).

Material and Methods: Fasting healthy volunteers who receive subcutaneous (s.c.) bemiparine, 3500 u.i. Blood samples (six time points, 20 ml each). T1 = baseline, fasting; T2 = 2 h after heparin administration; T3 = 4 h after; T4 = 6 h after; T5 = 8 h after; T6 = 10 h after. The PTAC was determined according to the method of Rice-Evans et al (1). The results are expressed in antioxidant capability units (Trolox equivalents Mm). GSSG and MDA levels have been measured by High Performance Liquid Cromatography method (HPLC).

Results: Mean ± SD (n = 20). Wilcoxon rank test was used for statistical analysis. The level of significance was taken as $p \leqslant 0.05$.

Time Course	PTAC (Trolox eq.)	GSSG (nmol/ml)	MDA (nmol/ml)
T1	2.318 (0.736)	44.42 (17.77)	1.41 (0.62)
T2	2.806 (0.819)*	40.71 (19.10)	1.41 (0.50)
T3	2.889 (0.844)*	40.33 (25.21)	1.53 (0.72)
T4	2.769 (0.748)*	54.87 (19.35)	1.71 (0.65)
T5	2.525 (0.603)	81.23 (39.35)**	1.66 (0.64)
T6	2.013 (0.493)	88.90 (30.95)**	2.09 (0.73)*

(*) $p \leqslant 0.05$ (**) $p \leqslant 0.01$.

Conclusions: Bemiparine (3500 u.i., s.c.) increases PTAC at 2, 4 and 6 hours after its administration. GSSG levels increase after 8 hours of bemiparine administration. MDA levels increase after 10 hours of bemiparine administration.

Reference:

1 Rice-Evans C, et al. Methods Enzymol. 1994; 234:279–293.

A-543

Comparison between two regimens for general anesthesia in gynecological surgery using auditory evoked potentials (AEPs)

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Background and Goals: Monitoring the mid-latency auditory evoked potentials (AEPs) has been proposed as a measure to ascertain the adequacy of the hypnotic state during surgery. The study aimed to compare the costs of Propofol (Astra-Zeneca) versus Sevoflurane (Abbott Laboratories) for the maintenance of anaesthesia guided by AEPs for gynaecological operations.

Material and Methods: After institutional approval 20 ASA I class patients, undergoing elective gynaecological operations, were randomized in two groups, similar in age, weight, type and duration of operations. All patients received the same induction of anaesthesia. In the Group I (n = 10) anaesthesia maintenance was made by propofol in the dose regimen adapted according to AEPs, (latency of the wave Nb: 60–70 ms; Datex-Ohmeda AS/3, Module M-EEG/EP), fentanyl 3–5 mkg/kg and pipecoronium 0.08–0.1 mg/kg. In group II (n = 10) anaesthesia maintenance was with sevoflurane in inspiratory concentrations adjusted by AEPs, (latency of the wave Nb: 60–70 ms; Datex-Ohmeda AS/3, Module M-EEG/EP) in fresh gas flow – 3 l/min (O_2/air – 2:1), fentanyl 3–5 mkg/kg and pipecoronium 0.08–0.1 mg/kg.

The statistical analysis was performed by ANOVA.

Results and Conclusions: The good quality of anaesthesia was achieved in all studied patients. The recovery was fast and smooth. Score of Aldrete & Kroulik was 9.8 and 9.7 for group I and II, respectively.

In group I – 6.5 mg/kg/h propofol and in group II – 0.2 ml/kg/h liquid sevoflurane were used for maintenance. The cost of maintenance was higher when using propofol (35.4 lv.) than sevoflurane (26.9 lv.) ($p < 0.05$). According to the interview of the patients for both groups, 24 hours after the surgery, there were not data of awareness and memories which might be connected with the events during operation.

A-544

The effects of perioperative dexmedetomidine infusion on hemodynamic, neuroendocrine and recovery parameters

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Bacground and Goals: The aim of the study was to examine the hemodynamic, neuroendocrine effects and recovery profile of two different infusion doses of dexmedetomidine (DEX) that is a specific and selective agonist of α_2-adrenereceptor.

Material and Methods: 40 ASA I–II patients scheduled for elective surgery were included into the study. Patients were randomly divided into two groups to receive 0.45 $\mu g\,kg^{-1}\,hr^{-1}$ in group I or 0.6 $\mu g\,kg^{-1}\,hr^{-1}$ DEX group II. DEX infusion was initiated 10 min before anaesthesia induction. Anaesthesia was induced with 7 $mg\,kg^{-1}$ thiopenthal and intubated after 0.1 $mg\,kg^{-1}$ vecuronium. The scores of tracheal intubations were recorded. Ejection fractions (EF), end-diastolic indexes (EDI), cardiac indexes (CI), stroke indexes (SI) were recorded with noninvasive thoracic electrical bioimpedance (TEB) for after DEX inf (1), thio (2), intubation (3) and 10 min intervals. Anesthesia was maintained (2 $L\,min^{-1}$ 50% $N_2O + O_2$) with 4–6% desflurane according to BIS value 40–60. Venous blood samples were collected prior intubation (I), at 30th min intraoperatively (II) and after extubation (III) to determine adrenaline(A) and noradrenaline (NA) levels. Postoperative Aldrete Recovery Score (ARS) was recorded. Student-t test and repeated measures of varience were used to statistical analysis. $P < 0.05$ was accepted statistical significant.

Results: The concentrations of end-tidal desflurane in groupI were significantly higher than group II at the 20th, 50th and 60th min. The EDI at the 1, 2, 3 stage and at the 10th min in group I significantly higher than in group II. The CI and SI at 20th min in group I significantly grater than in group II. Data are shown as mean ± SD in the table.

	Group 1	Group 2	P values
A-I	63.9 ± 28.7	50.5 ± 15.2	0.158
A-II	45.1 ± 22.6	30.6 ± 16.3	0.034*
A-III	80.4 ± 23.3	34.5 ± 15.7	0.092
P values		I–II = 0.026*	
		I–III = 0.017*	
NA-I	482.4 ± 173.5	389.8 ± 153.9	0.074
NA-II	355.3 ± 193.8	233.3 ± 155.7	0.018*
NA-III	314.5 ± 158.5	198.7 ± 139.5	0.035*
P values	I–III = 0.021*	I–II = 0.003*	
		I–III = 0.01*	

Conclusion: The study showed that the use of perioperative 0.6 $\mu g\,kg^{-1}\,hr^{-1}$ DEX infusion has been shown to decreased the neuroendocrine and hemodynamic response to anaesthesia and surgery.

Reference:

1 Anesthesiology 2000;93:382–94.

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A-545

Anesthetic management in patients with myasthenia gravis in video assisted thoracic surgery

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Background: Myasthenia gravis (MG) is an otoimmune disease of neuromuscular junction. Many patients with MG are treated by video-assisted thymectomy which is less invasive than conventional. Its anesthetic management requires some precaution and standard anesthetic agents should be carefully titrated to avoid prolonged mechanical ventilation[1]. Sensitivity to non-depolarising neuromuscular blocking agents is increased and neuromuscular monitorisation seems especially suitable in myastenic population.

Material and Method: 66 patients diagnosed as MG undergoing thoracoscopic thymectomy were included in the study. Anethesia was maintained with propofol, fentanyl and mivacurium. Intubation was performed after a dose of ED_{95} of mivacurium with neuromuscular monitorisation. Intubation time and conditions, first diaphragma movement, increase in train of four ratio, mivacurium requirement were all noted.

Results: Only one patient was operated with partial sternotomy. Even in low dose of mivacurium intubation quality was excellent after 151 ± 68.5 seconds. First diaphragma movement was observed at 57 ± 28.8 minute. Only one patient in 66 (not the one with partial sternotomy) required mechanical ventilation, she was extubated 12 hours later in ICU. In 64 patients, additional doses of mivacurium (0.3 ED_{95}) were necessary.

Conclusion: Thymectomy with video-assisted thoracic surgery has become first choice for many centers for myastenic patients. In MG patients short acting neuromuscular blocking agents with neuromuscular monitorisation provide not only excellent intubation condition, but also safe recovery.

Reference:

1 Krucylak PE, Naunheim KS. Preoperative preparation and anesthetic management of patients with myasthenia gravis. Semin Thorac Cardiovasc Surg 1999 11:47–53.

A-546

Evaluation of the rocuronium cardiovascular effects and consumption in bolus administration compared to continuous infusion

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Background and Goal of Study: We have conducted a study aimed at evaluating the cardiovascular effects of rocuronium administered in continuous infusion versus bolus administration. We have also evaluated the consumption of rocuronium for those types of administration.

Materials and Methods: 172 ASA I–III patients undergoing elective abdominal surgery were enrolled in this study. Anaesthesia was induced with thiopental 4 mg/kg and tracheal intubation was facilitated with rocuronium 0.6 mg/kg. Anaesthesia was maintained with isoflurane and opioid. Patients were randomly divided into two groups: one group of 67 patients received rocuronium in continuous infusion started at a rate of 10 micrograms/kg/min, and the other group of 105 patients received rocuronium 0.1 mg/kg at every 15 minutes. The rocuronium doses were adjusted to maintain T1/T0 at 15%, increasing the rocuronium infusion with 2–5 micrograms/kg/min, and the rocuronium bolus with 0.05 mg/kg. Mean arterial blood pressure and heart rate were noted at every 5 minutes. Neuromuscular transmission was monitored electromyographically at every 5 minutes. Recovery of neuromuscular function was monitored by single twitch stimulation of the ulnar nerve.

Results and Discussions: Rocuronium bolus affected the heart rate statistically significant in the first 5 minutes after the administration (initially 78 ± 20 bpm, after rocuronium bolus 111 ± 25 bpm with $p \leqslant 0.03$). No differences ($p > 0.085$) in the mean arterial pressure were observed after the administration of rocuronium in bolus. Patients who received rocuronium in continuous infusion showed a more constant hemodynamics response during the anaesthesia. The medium rocuronium consumption was 0.91 mg/patient/minute of anaesthesia for continuous infusion (109.2 mg/patient) and 0.56 mg/patient/minute of anaesthesia (67.3 mg/patient) for bolus administration, with $p < 0.005$. Recovery was much faster for the group who received rocuronium in bolus.

Conclusion(s): Rocuronium in continuous infusion offers a more constant hemodynamics response, but bolus administration offers less consumption and a better recovery.

A-547

A comparison of the cost-effectiveness of remifentanil versus fentanyl in combination with isoflurane and sevoflurane for inpatient gynecologic surgery

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Background and Goal of Study: In general anaesthesia the combination of isoflurane (Iso) and fentanyl (Fen) provides a well accepted and inexpensive regiment for balanced anaesthesia. However, other anaesthetic drugs with preferential pharmacokinetic properties such as remifentanil (Rem) and sevoflurane (Sev) exist leading to a faster recovery from anaesthesia. We investigated the cost effectiveness of either changing the volatile anaesthetic from Iso to Sev in comparison to changing the opioid from Fen to Rem with respect to accelerated extubation and recovery times.

Materials and Methods: Eighty patients (20 patients per group) undergoing gynecologic laparoscopy or breast surgery were prospectively and randomly assigned to 4 different groups: (1) Fen [1.6 ng/ml]/Iso [0.9 Vol%], (2) Fen [1.6 ng/ml]/Sev [1.4 Vol%], (3) Rem [6 ng/ml]/Iso[0.6 Vol%], and (4) Rem [6 ng/ml]/Sev [0.9 Vol%] with drug concentrations calculated according to previously published pharmaco-economical modelling leading to the fastest recovery times. We investigated extubation times, recovery profiles using White's fast-tracking criteria Score (14/14), and drug costs. Data are mean ± SD with $P < 0.05$ indicating statistical significance.

Results and Discussions: Extubation times were significantly accelerated by changing the anaesthetic gas from Iso to Sev ($P < 0.05$) in combination with Fen while a sole change from Fen to Rem showed no significant difference in extubation times. Drug costs for Rem/Iso exceeded drug costs for Fen/Sev by 40%. Patients in the Fen groups showed significantly lower recovery scores compared to the Rem groups when extubated. This difference however did not postpone discharge of the patient from the OR to a post surgical ward in the Fen/Sev versus Rem/Iso group (data not shown).

Group	Extubation time [min]	Drug Costs [€/h]	White's score
Fen/Iso	10.1 ± 5.5	1.0 ± 0.1	8 ± 2
Fen/Sev	7.0 ± 3.2	4.8 ± 0.7	7 ± 1
Rem/Iso	8.6 ± 3.2	7.9 ± 2.1	11 ± 3
Rem/Sev	7.2 ± 2.3	11.0 ± 3.0	11 ± 3

Conclusion(s): Changing the volatile anaesthetic from Fen/Iso to Fen/Sevo significantly accelerates the extubation time and is more cost effective than changing the opioid from Fen/Iso to Rem/Iso.

A-548

Isoflurane vs Sevoflurane: does it matters in renal transplantation?

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Background and Goal of Study: To compare the effect of two halogenated anesthetic (Sevoflurane vs. Isoflurane) on the graft outcome.

Material and Methods: We made a retrospective study of 200 patients submitted to renal transplantation from the years of 2000 to 2004 in our Hospital.

Arterial hypertension and diabetes mellitus were the most frequent coexisting diseases. In the great majority, the duration of dialysis was 1 to 5 years.

All patients were submitted to balanced general anesthesia with an endovenous anesthetic, muscle relaxant, opioid and halogenated agent in an O_2/air mixture using an open circuit.

We divided these patients in two groups according the halogenated used: **I**soflurane (n = 103) and **S**evoflurane (n = 97). The average of age on the **I** group was 42.8 ± 13.9 and on the **S** group was 42.4 ± 13.0. The average of weight on the **I** group was 65.13 ± 14.12 and on the **S** group was 65.07 ± 15.56.

We studied the patients outcome based on the values of creatinine (1st, 3rd and 6th months), the need of dialysis (yes or no), the rejection (yes or no) and the beginning of diurese (immediate or latter). We define immediate diurese the one that starts until the end of 4th post-operative hour.

Results and Discussions: Results are expressed as average ± stand deviation.

We verified a tendency to better creatinine values at the 1st and 6th months with Isoflurane (**S** 1st m = 1.89 ± 1.20; **S** 6th m = 1.59 ± 0.93; **I** 1st m = 1.76 ± 1.13; **I** 6th m = 1.54 ± 0.64), and at the 3rd month the results were better with Sevoflurane (**S** 3rd m = 1.66 ± 1.13; **I** 3rd m = 1.72 ± 1.19).

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The beginning of diurese was immediate in 80 patients of the **I** group (80%) and in 68 of the **S** group (70%) ($p = 0.138$).

Nine patients of the **I** group (8%) and 13 of the **S** group (13%) needed dialysis after the transplant ($p = 0.367$).

There was graft rejection in 5 patients of the **I** group (4.85%) and 9 of the **S** group (9.2%) ($p = 0.22$).

We did not found statistically significant differences between the two groups.

Conclusion: We verified, according to our study, that the halogenated anesthetic choice does not influence the outcome of the renal transplant.

A-549

The effect of lidocaine, metoclopramide and lidocaine plus metoclopramide pretreatment on reducing pain on injection of rocuronium

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Background and Goal of Study: Intravenous rocuronium causes intense discomfort at the site of injection, even after loss of consciousness during induction of anesthesia (1). The goal of study was to determine the effect of lidocaine and/or metoclopramide pretreatment on reduction of this pain in patients scheduled for elective surgery.

Materials and Methods: 100 ASA I–II adults were assigned to 4 groups ($n = 25$) in a double-blind, placebo-controlled study. After 100 μg of fentanyl, patients iv. received either lidocaine 2% 40 mg (Group L), metoclopramide 10 mg (Group M), lidocaine 2% 40 mg plus metoclo-pramide 10 mg (Group LM) or saline (Group C), all into a 4 ml solution, with venous occlusion for 60 sec, followed by rocuronium, 0.6 mg/kg over 10 sec. Pain was assessed on a four-point scale and then propofol 2.0 mg/kg was given.

Statistics: ANOVA, χ^2 and U- test ($P < 0.05$ sigificant).

Results and Discussions: The age, gender, height and weight were comparable in all groups. The distribution of pain scores is shown in the Table.

	Group L (n = 25)	Group M (n = 25)	Group LM (n = 25)	Group C (n = 25)
No pain [0]	18*†	10*	19*†	1
Mild [1]	7	9	6	7
Moderate [2]	0*	3	0*	8
Severe [3]	0*	3	0*	9

*$P < 0.01$ vs. Group C; †$P < 0.05$ vs. Group M.

Pain on rocuronium injection had 96% Group C patients compared to 60%, 28% and 24% Group M, Group L and Group LM patients, respectively, $P < 0.01$.The pain score (median) was 2 in Group C compared to 1 in Group M, 0 in Group L and 0 in Group LM, $P < 0.01$. The difference in analgesic efficacy between Group LM and Group M, or Group L and Group M was significant, $P < 0.05$. No difference between Group L and Group LM was found, $P = 0.81$.

Conclusion(s): Pretreatment with lidocaine or metoclopramide both reduced rocuronium injection pain, with lidocaine being more effective. Combination of lidocaine and metoclopramide was not found to be more effective than lidocaine alone.

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A-550

Unique pharmacological properties of neuromuscular blocking agents on human neuronal nicotinic acetylcholine receptors – a possible explanation for the train-of-four fade

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Background and Goal of Study: Non-depolarizing neuromuscular blocking agents (NMBAs) target the postsynaptic nicotinic acetylcholine receptor (nAChR) in the neuromuscular junction (NMJ). Recent data indicate that the train-of-four fade is due to an inhibition of presynaptic neuronal $\alpha3\beta2$ nAChRs in the NMJ (1,2), however this has not been tested at a molecular level. Furthermore, adverse effects from non-depolarizing NMBAs might originate from an interaction with neuronal nAChRs and their action on other neuronal nAChRs has not been fully evaluated. The aim of this study was to examine the effect of clinically used non-depolarizing NMBAs including d-tubocurarine on muscle and neuronal nAChR subtypes.

Materials and Methods: *Xenopus laevis* oocytes were injected with mRNA coding for the human $\alpha1\beta1\delta\varepsilon$, $\alpha3\beta2$, $\alpha3\beta4$, $\alpha4\beta2$ and $\alpha7$ nAChR subunits. The interaction with each of these nAChR subtypes by atracurium, cis-atracurium, d-tubocurarine, mivacurium, pancuronium, rocuronium and vecuronium were studied using Opus Xpress 6000A, an eight-channel two-electrode voltage clamp setup. Both ACh activation curves with NMBAs and inhibition curves at two ACh concentrations were studied.

Results and Discussions: All non-depolarizing NMBAs tested inhibited both muscle and neuronal nAChRs. The neuronal nAChRs were reversible and concentration-dependently inhibited in the lower micromolar range.

The inhibitory mechanism(s) (i.e. competitive *vs* non-competitive) of the neuronal nAChRs was dependent both on subtype and the NMBA tested. We did not observe activation of the nAChR subtypes by any of the NMBAs tested.

Conclusion: We conclude that non-depolarizing NMBAs concentration-dependently inhibit human neuronal nAChRs. The inhibition of the presynaptic $\alpha3\beta2$ nAChR subtype at the motor nerve ending provides a molecular explanation for the tetanic and train-of-four fade seen during a non-depolarizing neuromuscular block.

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A-551

Pharmacokinetics of high doses of the selective relaxant binding agent sugammadex, administered shortly after profound rocuronium-induced neuromuscular block

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Background and Goal of Study: Sugammadex (Org 25969), a synthetic γ-cyclodextrin, is the first selective relaxant binding agent (SRBA) especially designed to bind the steroidal neuromuscular blocking drug rocuronium. An objective of this phase II study was to explore the pharmacokinetics of both rocuronium and sugammadex in ASA I–II patients who received sugammadex or placebo 5 minutes after 1.2 mg kg^{-1} rocuronium.

Materials and Methods: Following Ethics Committee approval, 46 ASA I–II male (23) and female (23) patients (18–64 year) consented to participate in a multicenter, randomized, double blind, parallel and dose escalating dose-finding trial. Standard anesthesia procedures (propofol/remifentanil/O_2/air) were followed. Neuromuscular block was measured acceleromyographically (TOF-Watch® SX). Rocuronium 1.2 mg kg^{-1} was given for intubation. Five minutes later, placebo or a single dose of 2.0, 4.0, 8.0, 12.0 or 16.0 mg kg^{-1} sugammadex was given. Rocuronium and sugammadex in plasma and urine were determined using validated liquid chromatography assay methods with mass-spectometric detection. These essays do not discriminate between complexed and non-complexed sugammadex and rocuronium.

Results and Discussions: Pharmacokinetic analysis was performed with data from 41 of 45 included subjects. Plasma concentrations of rocuronium were elevated after administration of sugammadex as compared to placebo. In the placebo group 23% (median) of rocuronium was recovered in urine within 24 hours. When rocuronium dosing was followed by sugammadex, this percentage of the rocuronium dose excreted renally increased to 44–68%. Plasma concentrations of sugammadex increased with the dose of sugammadex. The median amount of sugammadex excreted in urine up to 24 hours varied between 73 and 106% of the administered sugammadex dose. There was no apparent relationship between the sugammadex dose and the percentage of that dose excreted in urine.

Conclusion(s): Sugammadex was eliminated renally. Administration of sugammadex leads to altered distribution and elimination of rocuronium as indicated by elevated plasma concentrations and increased renal excretion of rocuronium.

A-552

Sugammadex: an alternative to neostigmine-glycopyrrolate and edrophonium-atropine for reversal of neuromuscular blockade

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Background and Goal: Sugammadex (ORG 25969) is a modified cyclodextrin that encapsulates and thereby inactivates rocuronium and has the

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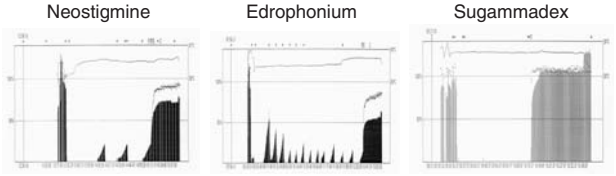
potential to rapidly reverse a "deep" neuromuscular block. We are conducting an open-label clinical study to evaluate sugammadex for reversal of a rocuronium-induced block. We compared these data to similar data from a parallel study involving patients reversed with neostigmine or edrophonium.

Materials and Methods: Patients will be anesthetized with a combination of propofol (2 mg kg^{-1}), desflurane (4% ET), remifentanil (0.1 $\mu g\,kg^{-1}\,min^{-1}$) and rocuronium 0.6 mg kg IV. Sugammadex 4 mg kg IV (n = 10) is to be administered at least 15 min after the last dose of rocuronium under stable anesthetic conditions (all subjects in this analysis will receive sugammadex upon return of T1 in a train-of-four [TOF]). Neostigmine (70 μg kg IV) + glycopyrrolate (14 $\mu g\,kg^{-1}$) or edrophonium (1 mg kg IV) + atropine (10 $\mu g\,kg^{-1}$) will be administered upon return of T1 under stable anesthetic conditions. Neuromuscular function is assessed using the TOF-Watch.

Results: Sample TOF recordings for patients receiving sugammadex, neostigmine-glycopyrrolate, or edrophonium-atropine are shown below. To date (n = 26 total), recovery times for reappearance of T_2 and T_3, as well as recovery of T_4/T_1 ratio to 0.7 and 0.8 are consistently shorter after sugammadex (1 to 1.5 min) compared to neostigmine (3 to 23 min) or edrophonium (2 to 8 min). A T_4/T_1 ratio of 0.9 was usually achieved in <2 min when sugammadex was administered (compared to 20 to 40 min with edrophonium and neostigmine, respectively). There have been no acute hemodynamic changes in sugammadex patients.



Conclusions: In contrast to neostigmine and edrophonium, reversal of rocuronium-induced blockade during general anesthesia with sugammadex appears to allow the T_4/T_1 ratio to rapidly recover to the baseline values ($T_4/T_1 \geqslant 0.9$).

A-554

Intravenous rocuronium infusion for endotracheal intubation for general anesthesia

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Background and Goal of Study: Through rocuronium is preferred for the intubation in general anesthesia, intravenous bolus injection cause pain and a withdrawal movement in some patients. As one method to reduce these adverse reactions, rocuronium was infused intravenously and its side effect to withdrawal movement and intubation condition was compared in different doses.

Materials and Methods: One hundred and twenty patients, aged 18 years to 60 years, ASA physical status 1–2 undergoing general anesthesia for elective surgery were randomly enrolled in the study. All patients then received 5 mg/kg of 2.5% thiopental sodium and 0.6 mg/kg rocuronium (B2, I2) or 0.9 mg/kg rocuronium (B3, I3). The methods of injection were two types. One was a bolus injection (B2, B3) and the other was infusion injection during 1 minute (I2, I3). Muscle relaxation was monitored by single twitch stimulation after losing consciousness. The degree of pain and withdrawal movement after injection were assessed using 4-grade scales (0–3) and the intubation condition was assessed using the criteria of Cooper and colleagues by an anesthesiologist blind to injection technique.

Results and Discussions: The single twitch stimulation fade out time were not significant difference between groups. The withdrawal movement score in infusion group (I2, I3 = 0) were significantly reduced compared to bolus group (B2 = 1.0 ± 0.6, B3 = 1.2 ± 0.7). The intubation condition in B3 (7.9 ± 0.5) was better than I3 (8.4 ± 0.5). The intubation condition in B2 and I2 did not show difference.

Conclusion(s): The infusions of rocuronium for general endotracheal anesthesia effectively reduced the withdrawal movement without influencing the muscle relaxation and provide even better intubation condition in high dose.

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A-555

In vitro dialysability of sugammadex (Org 25969), a selective relaxant binding agent for reversal of neuromuscular block induced by rocuronium

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Background and Goal of Study: Sugammadex (Org 25969), a selective relaxant binding agent, forms a complex with rocuronium, thereby reversing neuromuscular block. Sugammadex and its rocuronium complex are almost exclusively cleared via the kidney so decreased clearance is expected with renal impairment. We investigated the dialysability of sugammadex.

Materials and Methods: An in vitro bicarbonate haemodialysis set-up was used with a 900 mL pool of heparinized human plasma and a bicarbonate buffer as dialysate. Plasma flow was 200 mL/min and was recirculated. Temperature was 37°C. High- and low-flux membranes were used. Sugammadex and rocuronium were added to the plasma pool to concentrations of 100 μg/mL and 30 μg/mL, respectively, for a molar stoichiometry of 1:1. Plasma samples were taken before entering the membrane at 0, 5, 10, 15, 30, 60, 120 and 180 mins. Sugammadex and rocuronium concentrations were determined using validated liquid chromatographic assays with mass spectrometric detection. A control experiment without dialysate flow evaluated adsorption of the drugs to the polysulfone membrane.

Results and Discussions: Clearance of sugammadex and rocuronium was higher with the high-flux membrane than the low-flux membrane. Negligible clearance was observed in the absence of dialysate flow.

Experiment	N	Analyte	CL, mean (range), mL/min
High-flux	3	Sugammadex	86.3 (79.3–94.8)
		Rocuronium	89.0 (83.5–95.0)
Low-flux	3	Sugammadex	3.9 (2.4–4.9)
		Rocuronium	6.3 (5.6–7.2)
Low-flux	3	Sugammadex	6.0 (5.4–6.7)
High-flux, no dialysate flow	1	Sugammadex	0.2
		Rocuronium	0.2

Conclusion(s): Sugammadex in the presence of rocuronium can be efficiently removed from plasma by dialysis using a high-flux membrane, but not a low-flux membrane.

A-556

Does preemptive use of Gabapentin for postoperative analgesia attenuates the haemodynamic response to laryngoscopy and endotracheal intubation?

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Background and Goal of Study: Gabapentin(G) is an anticonvulsant structurally related to the neurotransmitter γ-aminobutyric acid (GABA).The aim of the study was to evaluate the effect of G in the cardiovascular response after administering the drug for the use of preemptive analgesia. The hypothesis tested was that premedication with Gabapentin attenuates the cardiovascular response.

Materials and Methods: Forty (40) patients, ASA I–II, aged 24–56 who were scheduled to undergo major reconstructive orthopaedic surgery after traumatic injury using the Ilizarov method, were recruited in this randomized double-blind controlled trial. They were assigned into two groups. They either received 800 mg of Gabapentin per os (Group A) or placebo (Group B) 60 minutes prior operation. Hemodynamic data [mean arterial blood pressure (MAP), and heart rate (HR)] were recorded at six time points: prior to the administration of G or placebo in the surgical department , awake state before induction in the theater,after induction in anaesthesia, immediately after and 3 and 5 minutes subsequent to intubation.

Results and Discussions: The variable in the analysis was the percentage changes from baseline of these measures. The statistical method used was repeated measures ANOVA. The p-value for the comparison of MAP percentage change between the 2 groups was than 0.0005 and p-value for the comparison of the rate of change of MAP percentage change between the groups was 0.003. The p-value for the comparison of HR percentage change between the 2 groups was 0.0272 and p-value for the comparison of the rate of change of HR percentage change between the groups was 0.0245.

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Conclusion(s): In conclusion, the administration of gabapentin attenuates the hemodynamic response that follows the intubation and seems to decrease the mean arterial blood pressure 60 minutes after the administration.

A-557

The effect of Gabapentin on preoperative anxiety in patients undergoing lumbar discectomy

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Background and Goal of Study: Gabapentin (G), an anticonvulsant drug which posses antihyperalgesic and antiallodynic properties, recently has been used for postoperative pain. The aim of this study was to investigate its effects on preoperative anxiety when G has been used for preemptive analgesia. We tested the hypothesis that premedication with Gabapentin would decrease preoperative anxiety.

Materials and Methods: With approval of the ethics committee and written informed consent, 40 patients ASA I–II physical status, age 24–70 who were scheduled to undergo lumbar discectomy, were enrolled in a randomized, double-blind study to receive 1200 mg G or placebo 60 minutes before surgery. Exclusion criteria included history of chronic pain, regular medication with analgesic, psychiatric disorders, medication. On the day of the surgery an anaesthetist interviewed the patient and asked about the anxiety score (Verbal Rating Scale was used, 0 = no anxiety, 10 = worst imaginable anxiety). No other sedative premedication was used.

Results and Discussions: Forty patients, twenty per group enrolled in the study. No patient was excluded. Demographic data were comparable in both groups. Wilcoxon test was used for statistical analysis. $P < 0.05$ was considered statistically significant. Results are expressed as mean ± standard deviation (S.D).

The mean ± SD in group G were 5.05 ± 1.67 and in the placebo group 5.15 ± 1.73 before giving the premedication. The mean ± SD in group G were 3 ± 1.86 and in the placebo group 4.4 ± 1.57 after giving the premedication. The P value was less than 0.0001. No adverse effects were noted.

Conclusion(s): We conclude that premedication with G improved preoperative anxiolysis. G seems anxiolytic without exerting anamnesis effects. Reducing preoperative anxiety may contribute to the improvement of postoperative pain. This could be another possible mechanism of the action of G in postoperative pain. Further study is necessary to validate this aspect on G pharmacology.

Reference:

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A-558

Influence of sex and weight on time course of neuromuscular blockade after rocuronium administration

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Background and Goals: The purpose of this study was to investigate the effects of over-weight and sex on the onset time, the duration of action and the recovery time from neuromuscular blockade after the administration of one single dose of rocuronium bromide.

Methods: After Ethical Committee approval and written consent, 64 patients undergoing open gynaecological surgery were assigned to four groups based on male or female sex and normal or over weight (BMI ranged from 25 to 29.9): group NWM (normal-weight male); group NWF (normal-weight female); group OWM (over-weight male); group OWF (over-weight female). Anaesthesia was induced with thiopental sodium and maintained with sevoflurane. Fentanyl was used for analgesic purpose. All the patients received 0.6 mg/kg of rocuronium bromide to facilitate tracheal intubation. Neuromuscular transmission was monitored by using acceleromyography of the pollicis adductor muscle (TOF-Watch, Organon Teknika). We registered the following parameters: onset time (OT), clinical recovery (T1 > 25%), recovery index (T1 25–75), and spontaneous recovery (TOF ratio > 0.90). Kruscal-Wallis and Mann-Whitney tests were used for the statistical analysis.

Results: Clinical recovery and recovery index were greater in OWF compared with the other three groups ($p < 0.05$). OT and TOF ratio tended to be longer in OWF group without achieving a statistical significant difference.

Conclusions: In conclusion, sex and weight together seems to affect pharmacodynamic effects of rocuronium. In over-weight female patients, the duration of action of rocuronium was significantly prolonged. Remain to establish if the dosage could be adjusted on the basis of ideal rather than on real body weight in clinical practice similar to that it should be done in morbidity obese patients.

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A-559

Safety of propofol infusion for maintenance of anesthesia in morbidly obese patients

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Background: Morbid obesity has become a serious problem for the contemporary anesthetic practice. Maintenance of anesthesia as well as fast and safe recovery of morbidly obese patients undergoing bariatric procedures is a challenge. Our goal was to study if propofol is a suitable agent for maintenance of anesthesia in obese patients.

Material and Methods: In this clinical study we randomly selected 254 morbidly obese patients (Body Mass Index > 35 kg/m^2), scheduled for laparoscopic gastric band placement or gastric by-pass. The only reason for excluding a patient from the study was known allergy to egg or propofol itself. We assessed the rates of recovery and the pharmacokinetics of propofol infusions. Induction of anesthesia was with midazolam-propofol-fentanyl, tracheal intubation facilitated with succinylholine and rocuronium was given for paralysis. Continuous infusion of propofol was given for maintenance of anesthesia with the infusion regimen (mg/kg) calculated according to the ideal body weight, with adjustments (increase or decrease of the dosage) according to each patient's intraoperative needs. The rule was to keep BIS between 40 and 60 and the hemodynamic parameters ± 20% of basic values. Pharmacokinetic parameters of propofol were calculated from blood sampling during the infusion, at the time of eye opening at the end of the operation and 8 hours after its completion.

Results: The initial volume of distribution was the same in both obese and lean patients but volume of distribution at steady state was correlated with body weight (1.75 ± 0.5 l/kg).Total body clearance was increased with increased weight (30 ± 7 ml/kg min) and propofol concentration at the time of eye opening (and response to verbal commands) was 1 ± 0.30 mg/l).

Conclusions: Propofol is a safe drug for morbidly obese patients since it does not accumulate in blood if a rational dosing scheme is used.

Reference:

1 Servin F, Farinotti R, Haberer JP, Desmonts JM. Propofol infusion for maintenance of anesthesia in morbidly obese patients receiving nitrous oxide.

A-560

The brain distribution and memory alteration of propofol under epidural anesthesia combined propofol sedation by EEG non-linear analysis

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Background and Goal of Study: To study the perioperative brain distribution and memory effect of propofol under epidural anesthesia combined propofol sedation with EEG non-linear monitor, and analyse the critical values of EEG non-linear parameter approximate entropy without implicit memory.

Materials and Methods: 20 patients, undergoing expected abdomen and limb operations, were randomly divided into 2 groups: propofol: 5 mg kg^{-1} · h^{-1} and propofol: 6 mg kg^{-1} · h^{-1} Group (n = 10). The EEG non-linear parameter: approximate entropy (ApEn) and topographic map of approximate entropy were recorded. The patients' explicit and implicit memory were estimated by Process Dissociation Procedure (PDP) after patients were awake.

Results and Discussions: Without implicit memory, the EEG non-linear parameter (approximate entropy) critical value was: 0.55. Under the guidance of approximate entropy topographic map observation, the propofol brain distribution sequences were: parietal and occipital area → frontal and temporal area → all brain cortex. The propofol brain clearance sequence were: frontal and temporal area → : parietal and occipital area → all brain cortex.

Conclusion(s): Without implicit memory, the EEG approximate entropy should be below 0.55. The propofol brain distribution and clearance sequence were orderliness.

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A-561

Total intravenous anesthesia in morbidly obese patients

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Background and Goal of Study: Drug pharmacokinetics differ in obese compared to non-obese patients, depending on factors related both to obesity and to the drug used. The aim of this prospective study was to determine the effect site concentrations of remifentanil blunting sympathetic responses to surgical stimuli during BIS-guided propofol anesthesia in morbidly obese patients.

Materials and Methods: 22 patients, ASA physical status II–III, aged 29–69 yr, BMI 54.5 ± 12, undergoing major open bariatric surgery, were enrolled to receive a propofol-remifentanil total intravenous anesthesia. After endotracheal intubation, anesthesia was started with a target controlled infusion of propofol initially set at 6 mcg/ml, then adjusted to maintain a Bispectral Index (BIS) value between 40 and 50. The mean effect site concentration of remifentanil blocking the sympathetic responses to surgical stimuli (defined as an increase in either heart rate or mean arterial blood pressure >15%) was recorded at different interval times during surgery: skin incision-opening of peritoneum (T1), bowel resection (T2), colecisto-jejunal anastomosis (T3), ileum-jejunal anastomosis (T4), closing of peritoneum (T5).

Results and Discussions: The mean plasma concentrations of propofol required to maintain a BIS value between 40 and 50 were 4 ± 0.55, 3.8 ± 0.64, 3.8 ± 0.63, 3.8 ± 0.65 and 3.8 ± 0.63 mcg/ml at T1, T2, T3, T4 and T5 interval times, respectively. The mean values of remifentanil target effect site concentration were 5.2 ± 1.3, 7.7 ± 1.7, 9.1 ± 1.8, 9.7 ± 2.2 and 9.9 ± 2.5 ng/ml at T1, T2, T3, T4 and T5 interval times, respectively suggesting a rapid development of acute tolerance to this opioid.

Conclusion(s): This study suggests that tolerance to remifentanil infusion is profound and develops very rapidly in morbidly obese patients undergoing open bariatric surgery during BIS guided propofol anesthesia. The administration of opioids during anesthesia based on target-controlled infusion should include corrections for the development of tolerance.

A-562

Effects of low-dose midazolam and diazepam on sevoflurane consumption and anaesthesia recovery time – a blind, randomized, placebo controlled study

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Background and Goal of Study: Midazolam and diazepam had a widespread use in anaesthesia pre-medication and pre-induction. Effects of low doses of these drugs on the consumption of anaesthetics and time of recovery are not determined with precision. Our aim was to perform these evaluations in conditions similar to current anaesthetic practice.

Materials and Methods: In a double blind, randomized, placebo controlled study, with institutional and patient approval, 33 ASA I–II patients, aged 44 ± 13 years, elected for herniorraphy or hydrocele surgery, without other premedication, were randomized to receive midazolam 0.05 mg/kg (M, n = 11); diazepam 0.1 mg/kg (D, n = 11) or saline (C, n = 11) iv, 2 minutes before induction with fentanyl 2.5 μg/kg and propofol 2.5 mg/kg. Maintenance was performed with sevoflurane (in O_2/air) adjusted according to clinical criteria (1) by an anaesthetist blinded to the group of the patient. We weighted the vaporizer before and after each anaesthesia with a precision equipment (accuracy = 0.1 G). The primary outcome was sevoflurane consumption. Comparisons were done with ANOVA followed by LSD test. Data as mean ± SD.

Results and Discussions: Groups were not different in age, sex and weight. We found (p in Table is ANOVA p):

Group	*M*	*D*	*C*	p
Surgical time (min)	39 ± 12	32 ± 10	36 ± 11	0.36
Anaesthesia time (min)	57 ± 12	49 ± 9	50 ± 10	0.16
Sevoflurane (dg/min)	4.0 ± 1.6	4.0 ± 1.1	4.4 ± 1.2	0.69
Lost eyelash refl. (sec)	36 ± 10	44 ± 6	46 ± 11	0.02*
Eyes opening (min)	12 ± 5	9 ± 4	7 ± 3	0.01#
Leaving OR (min)	16 ± 4	14 ± 3	12 ± 5	0.06
Pain VAS at 4th hour	3.0 ± 1.9	3.5 ± 1.2	2.9 ± 1.8	0.66
Pain VAS at 24th hour	1.8 ± 2.0	2.0 ± 0.9	2.5 ± 1.7	0.63
Satisfaction VAS	9.1 ± 1.0	8.9 ± 1.1	9.1 ± 0.9	0.94

Post-ANOVA p values: *M/D p = 0.053, M/C p = 0.015, D/C p = 0.567; #M/D p = 0.195, M/C p = 0.008, D/C p = 0.145.

Conclusions: Administration of the studied doses of midazolam or diazepam before general anaesthesia did not reduce sevoflurane consumption. Midazolam but not diazepam increased significantly recovery time. This study did not detect any advantage for those utilizations.

Reference:

1 Boldt J, et al. *Anesth Analg* 1998;86:504–9.

A-563

Effect of hypotensive anaesthesia on cognitive functions: a comparison of Esmolol and Remifentanil during tympanoplasty

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Background and Goals: Our aim was to compare Esmolol and Remifentanil for their effectiveness in hypotensive anesthesia for tympanoplasty and effects on short-term cognitive functions.

Material and Methods: 40 patients were randomized into two groups. In Group E, Esmolol infusion of 50–250 μg/kg/min was started after a bolus of 0.5 mg/kg. In Group R, Remifentanil infusion of 0.2–0.5 μg/kg/min was started. Drugs' infusion rates were adjusted to keep mean blood pressure between 60 and 70 mmHg. Both groups received Desflurane 7%, N_2O and O_2 for anesthesia maintenance. Cognitive function assessment was made with Mini Mental State Test (MMS), performed 30 min. before the operation, 30 min., 60 min. and 24 hours after the recovery. Intraoperative surgical field evaluation was recorded every 10 minutes.

Results: Surgical field scores were lower in Group R, which meant better control of intraoperative bleeding. 4 patients in Group R (20%) and 1 patient in Group E (5%) showed cognitive function decline between MMS preoperative score and postoperative 30th min. score but this was not statistically significant. In both groups, there was a statistically significant difference between MMS3 and MMS1, MMS4 and MMS1, MMS3 and MMS2, MMS4 and MMS2.

Conclusion: Remifentanil was found to be more suitable for maintaining hypotensive anesthesia during tympanoplasty. Hypotensive anesthesia, using either Remifentanil or Esmolol, did not cause cognitive dysfunction.

A-564

The effects of remifentanil and alfentanil on the concentration of propofol and SFx values required for adequate anaesthesia

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Background and Goal of Study: Based on the pharmacokinetic and pharmacodynamic simulations it has been found that the optimal concentration of propofol co-administered with alfentanil is about 3.5 mg/l as compared to about 2.5 mg/l for remifentanil.

The Spectral Frequency Index (SFx) indicates the relationships among some particular EEG frequencies and provides objective percentage values about the state of consciousness of a person during anaesthesia.

We studied the influence of remifentanil and alfentanil on the concentration of propofol and SFx values required for adequate anaesthesia.

Material and Methods: Thirty five patients scheduled for laparoscopic cholecystectomy and conforming to ASA grades I or II were prospectively randomized either to one of two groups. In group I anaesthesia was induced with a bolus of propofol (2 mg/kg) and remifentanil (1.0 μg/kg) and continuous infusion of remifentanil 0.25 to 0.05 μg/kg/min. In group II alfentanil was used (10 μg/kg bolus dose followed by continuous infusion from 2.0 to 0.5 μg/kg/min.). PSM 2000 monitor (Pro Science, Linden, Germany) was used to monitor the SFx. During maintenance of anaesthesia therapeutic drug monitoring was followed and propofol infusion rate was adjusted to the SFx values (70–80%). Blood samples for measurement of propofol concentrations were taken from forearm veins at the following intervals: 1, 3, 5, 10, 15, 30 min., and later each 30 min. until the end of anaesthesia. Propofol was assayed using liquid chromatography. Data were analyzed using Student t-tests and are presented as mean ± SD.

Results and Discussion: Mean plasma propofol concentration required for adequate level of hypnosis during maintenance of anaesthesia was 2.17 ± 0.53 mg/l in remifentanil group and 3.20 ± 0.46 mg/l in alfentanil group.

Conclusion: In both groups, the mean plasma propofol concentrations corresponding to the required SFx values were a bit lower than the modelled values and significant intraindividual variability was observed.

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A-565

Clinical effects of two distinct remifentanil infusion techniques for induction of anaesthesia

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Background and Goal of Study: Haemodynamic stability during remifentanil (Remi) induction is important for safe TIVA. We compared 2 induction techniques: Remi plasma control versus Remi effect-site control, followed by a propofol (Prop) constant infusion until loss of consciousness (LOC).
Materials and Methods: 32 neurosurgical patients ASA 1/3, received TIVA. Data were collected every 5 s from Datex AS3 (HR and MAP) and A2000XP (BIS). Patients were allocated to 2 induction techniques: Group 1 - Remi plasma concentration target of 2.5 ng/ml (Minto[1]); Group 2 - Remi effect-site concentration (Ce) target of 2.5 ng/ml. After the target was reached, both techniques were followed by a Prop constant infusion of 200 ml/hr until LOC. Data were collected until LOC. Data as mean ±SD, statistical significance with *$p < 0.05$.
Results and Discussions: 8 patients were excluded due to technical problems. Group 1: 9 patients, age 41 ± 18, body mass index 23 ± 3, 5 female. At awake: MAP 104 ± 15 mmHg, HR 71 ± 17 bpm, BIS 95 ± 3. Group 2: 15 patients, age 57 ± 15, body mass index 25 ± 4, 7 female. At awake: MAP 102 ± 12 mmHg, HR 71 ± 13 bpm, BIS 93 ± 5. MAP, HR and BIS at awake did not differ between groups. Between awake and LOC, MAP and HR significantly decreased only in Group 2.

Data at LOC	Group 1	Group 2
PropCe (μg/ml)[2]	3.5 ± 1.4	3.7 ± 1.2
RemiCe(ng/ml)	2.46 ± 0.06*	2.5 ± 0.01*
Time to LOC (min)	7.5 ± 2.2*	5.3 ± 1.1*
Total Prop (mg)	81 ± 33	81 ± 29
Total Remi (μg)	74 ± 16	72 ± 12
MAP (% awake value)	97.5 ± 9.7	90.3 ± 15.5
HR (% awake value)	94.7 ± 17.5	91.6 ± 13.2
BIS	77.9 ± 6.3	73.8 ± 13.9

Conclusion(s): There was a significant decrease in HR and MAP in Group 2. This was not present in Group 1, which had more stable values. The RemiCe at LOC showed a small, but significant, difference between groups, maybe influencing the time to LOC, which was significantly shorter in Group 2, for similar PropCe at LOC.
References:
1 Anesthesiology 1997, 86:24–33.
2 Anesthesiology 1998, 88:1170–82.

A-566

Comparative assesment of clinical efficacy of commercial propofol preparations

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Background and Goal of Study: Many anaesthetists believe that generic formulas are less effective than the original emulsion of the drugs (1). Aim of the present study was to compare the hypnotic effects (using Bispectral Index (BIS)), haemodynamical parameters, injection pain and quality of anaesthesia during induction of anaesthesia of the three commercial propofol preparations (Abbott Laboratoires, Dongkook Pharm. Co. Ltd., Fresenius Kabi).
Materials and Methods: After Ethics Committee approval, a prospective, randomized, double blind study was designed in Hacettepe University Hospitals Operating Theatres. The patients were aged 18–65 years, ASA I–II, scheduled for elective surgery under general anaesthesia with orotracheal intubation. 90 patients were randomized into three groups with 30 patients in each group. Propofol at an infusion rate of 2.5 mg·seconds^{-1} was administered for induction of anaesthesia. Abbott Propofol (Abbott Laboratoires), Pofol (Dongkook Pharm. Co. Ltd.) and Propofol 1% Fresenius (Fresenius Kabi) were used for induction respectively for groups 1, 2, 3. The time of induction and induction doses to reach Bispectral index levels of 50 ± 10, injection pain, BIS values and haemodynamical parameters were recorded every one minutes for the first seven minutes and than every two minutes for 15 minutes. Chi-square, Annova test, Kruskall-Wallis tests were used for statistics. 95% confidence interval.
Results and Discussions: Three study groups were similar in age, weight, height, body-mass index and ASA Physical status. There were no significant differences in time of induction and induction doses, injection pain, BIS values and haemodynamical parameters.
Conclusion: Abbott Propofol, Pofol and Propofol 1% Fresenius have similar clinical efficacy on anaesthesia induction and cost should be taken into consideration when choosing the propofol emulsion.
Reference:
1 Weksler N. J of Clin Anesth 2001; 13: 321–324.

A-567

Clinical pharmacodynamics of AQUAVAN® injection – a water soluble prodrug of propofol – compared to lipid formulated propofol for cardiac anaesthesia

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Background and Goal of Study: AQUAVAN® (fospropofol disodium) is a novel watersoluble prodrug of propofol with a unique pharmacokinetic/-dynamic profile (1). Compared to lipid formulated propofol (Diprivan®), hydrolysis of AQUAVAN® increases time to maximum propofol concentration and reduces its peak. This study compared pharmacodynamics, safety and tolerability of AQUAVAN® with Diprivan® during cardiac anaesthesia.
Materials and Methods: After written informed consent 16 patients scheduled for coronary vascular surgery were randomized to receive either a target controlled infusion (TCI) of AQUAVAN® or Diprivan®. Alfentanil was used for analgesia. Anaesthesia was introduced with a propofol target concentration of 2.5 μg/ml for AQUAVAN® and 3.0 μg/ml for Diprivan®. During surgery, propofol target concentrations were adjusted to maintain BIS® values in the range 40 to 60. Times, side effects, propofol concentrations, haemodynamics, and BIS® were compared using unpaired t-test, MWU-test or Fisher´s exact test.
Results: Reported as mean and [95% confidence interval]

	AQUAVAN®	Diprivan®
LOC (min)	3.3 [2.1,4.4]	2.5 [1.2,3.9]
MAP (%) phase 1	−18 [−25, −12]	−16 [−20, −11]
HR (%) phase 1	−17 [−20, −15]*	−13 [−16, −10]
MAP (%) phase 2	−13 [−16, −11]	−13 [−14, −12]
HR (%) phase 2	−7 [−10, −5]*	−12 [−15, −9]
Cardiac index (L/min/m^2)	2.5 [2.2, 2.7]	2.2 [1.9, 2.5]
BIS phase 1	54 [53, 55]*	45 [44, 47]
BIS phase 2	45 [44, 45]*	44 [44, 45]
Propofol conc. (μg/ml)	1.5 [1.0, 2.0]*	3.9 [0.8, 7.0]
Pain on injection	0	3
Paraesthesias on injection	6*	0

MAP, HR: relative changes to baseline, phase 1: induction to skin incision, phase 2: skin incision to bypass,* $p < 0.05$.

Conclusions: AQUAVAN® and Diprivan® were similarly well tolerated for cardiac anaesthesia. Propofol from AQUAVAN® showed a higher potency than propofol from Diprivan®. No clinically relevant haemodynamic differences were detected.
Reference:
1 Fechner J et al. *Anesthesiology* 2004;101: 626–639.

A-568

Effects of propofol combined with fentanyl, sufentanil or remifentanil in mice ananesthesia by intraperitoneal route

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Background and Goal of Study: The combination of propofol and a fast acting opioid, like fentanyl, sufentanil or remifentanil is a safe and common TIVA technique used in humans and has been under research in laboratory animals. The objectives of these studies were to test the possibility to use these combinations to anaesthetise mice by intraperitoneal (i.p.) route since the intravenous (i.v.) route is not available.
Materials and Methods: Sixty-seven mice divided in groups of 4 and 28 combinations of propofol alone and propofol with fentanyl, sufentanil or remifentanil were administered i.p. The loss of righting reflex (RR-) and the loss of pedal withdrawal reflex (PWR-) were recorded along with the time and quality of recovery. Doses of propofol varied from 50–200, fentanyl from 0.2–0.4, sufentanil from 0.05–0.1 and remifentanil from 0.2–1 mg/kg.
Results and Discussions: The results obtained in these studies were unpredictable. The same dose combinations of propofol and opioids were

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associated with different effects. Higher doses didn't show the expected responses and were related with high mortality rates. Combinations, which showed surgical anaesthesia in some animals, failed to induce the RR- in others. An adequate hypnotic level was only observed with higher doses of propofol. The synergistic effect of propofol and the opioids used in these studies was not enough to allow surgical procedures. Animals, which reached a PWR-, showed tail rigidity, limb shaking, head scratching with forefeet movements, and with higher doses of the opioids breathing difficulties associated with higher death rates. The inconstancy between and within groups may be associated with the i.p. route. Drugs administered by this route are subject to a high degree of first pass hepatic metabolism since they are absorbed into the portal system.

Conclusion(s): The results from these studies showed that the i.p. route is not a viable way to anaesthetise mice using propofol alone or a combination between propofol and fentanyl, sufentanil or remifentanil.

A-569

Clinical effects of two distinct TIVA infusion techniques for induction of anaesthesia with propofol and remifentanil

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Background and Goal of Study: Haemodynamic stability during induction is important for safe TIVA. We compared two induction techniques: TCI remifentanil (Remi) followed by a constant propofol (Prop) infusion versus constant Prop infusion.

Materials and Methods: 32 neurosurgical patients ASA 1/3, received TIVA. Data were collected every 5 s from Datex AS3 (HR and MAP) and A2000XP (BIS). Patients were allocated to 2 induction techniques: Group 1- Remi effect-site concentration (Ce) target of 2.5 ng/ml (Minto[1]) and then later followed by a Prop constant infusion of 200 ml/hr until loss of consciousness (LOC); Group 2- Prop constant infusion of 200 ml/hr until LOC followed by Remi. Data were collect until LOC. Data as mean ± SD, statistical significance with $^*p < 0.05$.

Results and Discussions: 2 patients were excluded due to technical problems. Group 1: 15 patients, age 57 ± 15, body mass index 25 ± 4, 7 female. At awake: MAP 102 ± 12 mmHg, HR 71 ± 13 bpm, BIS 93 ± 5. Group 2: 15 patients, age 52 ± 14, body mass index 28 ± 6, 10 female. At awake: MAP 101 ± 10 mmHg, HR 67 ± 10 bpm, BIS 94 ± 4. Demographics, MAP, HR and BIS at awake did not differ between groups. Between awake and LOC, MAP decreased in both groups, HR only in Group 1.

Data at LOC	Group 1	Group 2
PropCe (μg/ml)[2]	3.7 ± 1.2*	4.8 ± 1.2*
RemiCe (ng/ml)	2.5 ± 0.01	0
Time to LOC (min)	5.3 ± 1.1*	3.5 ± 0.8*
Total Prop (mg)	81 ± 29*	114 ± 26*
Total Remi (μg)	72 ± 12	0
MAP (% awake value)	90.3 ± 15.5	91.1 ± 11.8
HR (% awake value)	91.6 ± 13.2	98.9 ± 8.2
BIS	73.8 ± 13.9*	54.9 ± 15.4*

Conclusion(s): There was a decrease in MAP in both groups, but the use of Remi seems to have more influence on HR. The difference between LOC PropCe shows the synergism of Remi. Remi given before Prop reduced the Prop requirements for LOC and total consumption, while providing haemodynamic stability. The lower BIS values at LOC for Group 2 maybe due to the higher PropCe.

References:

1 Anesthesiology 1997, 86:24–33.
2 Anesthesiology 1998, 88:1170–82.

A-570

Use of fenoldopam to preserve renal blood flow in ovarian cancer patients undergoing intraoperative intraperitoneal heated chemotherapy

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Background and Goal of Study: A current approach to peritoneal carcinomatosis from GI and gynecologic cancers is intraoperative intraperitoneal heated chemotherapy (IIHC). Effects of heat (blood retention in the splanchnic circulation and decreased cadiac preload) and increased intrabdominal pressure significantly affect renal perfusion with risk of acute failure. Common measures to improve renal function include fluid supplementation, furosemide and low-dose dopamine infusion. Fenoldopam (Corlopam®, Elan Pharma, Rome, Italy) is a selective DA_1 receptor agonist under evaluation as a renoprotective agent. Main goal of this study was to determine the incidence of postoperative renal failure in pts undergoing surgery and IIHC comparing fenoldopam and low-dose dopamine infusion.

Materials and Methods: From Jan 2003 to Dec 2005 the Authors selected 16 ♀ pts (Age: 34–62, ASA II–III, preop CRE < 1.4 mg/dl, no CAD, previous MA or pulmonary disease) undergoing cytoreductive surgery and IIHC with mitomycin for ovarian cancer randomized, after informed consent, to receive IV infusion (24 hrs) of Dopamine 2 μg/kg/min or Fenoldopam 0.1 μg/kg/min, starting at time of abdominal closure (before IIHC) with ITBV 800–1000 ml/m^2 and EVLWI > 7 ml/kg (no vasopressor or inotropic agents) measured with a femoral arthery Pulsiocath™ (PiCCO, Pulsion Medical Systems, Munich Germany).

Results and Discussion: Variables considered at preop, final-IHHC and POD3 (CreCl, CRE and BUN), demographics, hemodynamic parameters and anesthetic management were similar in both groups. Renal data were analyzed by repeated measures ANOVA. $P < 0.005$ was taken to indicate statistical significance. Fenoldopam pts reported significative CRE ($P = 0.004$) and median BUN ($P = 0.01$) changes from preop to POD3; ourine output was similar in the two groups with fenoldopam pts requiring significantly lower furosemide than dopamine pts ($P = 0.003$).

Conclusions: These results, despite the lack of large controlled randomized trials, seem to confirm the efficacy of fenoldopam in preserving renal blood flow and CRE clearance during and after intraperitoneal heated chemotherapy in ovarian cancer patients with normal preoperative renal function.

References:

1 Mathur VS. *Rev Cardiovasc Med*, 2003; 4(S1):35–40.
2 Dishart MK, Kellum JA. *Drugs* 2000; 59:79–91.

A-571

Antibacterial activity of tramadol: preliminary study

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Background and Goal of Study: Tramadol, a synthetic opioid agent, has local anesthetic properties and is beginning to be used to extend the duration of analgesia of peripheric nerves blocks (1). In a recent study, we showed the antibacterial activity of some local anesthetics (2). So it was interesting to know if tramadol as others local anesthetics has or not an antibacterial activity.

Material and Methods: Two separate standardized bacterial suspensions of *Escherichia coli* (*E. coli* CIP 7624) and *Staphylococcus aureus* (*S. aureus* ATCC 9144) were each exposed to two different concentrations of tramadol prepared in sterile 0.9% saline. After incubation for 20 h at 37°C, successive dilutions into physiological saline were processed, to inactivate the potential antibacterial effect of tramadol and perform microorganisms counting. From these diluted suspensions, 100 μl were transferred to tryptic soy agar plates and incubated for 24 h. Results are expressed as $\log_{10}$ values of colony counts and compared to controls (without tramadol).

Results and Discussion:

Table 1. Tramadol effect on *E. coli* and *S. aureus* growth.

	Number of bacteria, 10^4–10^6 CFU/mL, mean ± SD		
		Tramadol	
Bacteria	Control	12.5 mg/ml	25 mg/ml
E. coli	$5.2 \times 10^5 \pm 0.2$	$2.4 \times 10^3 \pm 0.04$*	$2.75 \times 10^1 \pm 0.25$* [a]
S. aureus	$1.6 \times 10^4 \pm 0.1$	$6.2 \times 10^3 \pm 3$*	$1.2 \times 10^2 \pm 0.04$* [b]

*Significantly different from control ($p < 0.05$).
[a,b]Significantly different from 12.5 mg/ml ($p < 0.05$).

Tramadol at a concentration of 12.5 mg/ml had an inhibitor effect by reducing ~2.5 $\log_{10}$ and ~1 $\log_{10}$ the *E. coli* and *S. aureus* growth respectively. At 25 mg/ml, this inhibitory effect was increased for *S. aureus* (>2 $\log_{10}$), but tramadol induced a bactericidal effect in case of *E. coli* (~4 $\log_{10}$ bacteria were killed).

Conclusion: The present findings indicate that tramadol an opioid agent with local anesthetic properties, has an inhibitory and/or bactericidal effect against both Gram$^-$ and Gram$^+$ strains, and this action is dose-dependent.

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1 Hanife A et al. Anesth. Analg, 2004; 99: 1461–1464.
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A-572

Oral intake of amino acid reduces hypothermia during anesthesia in rats

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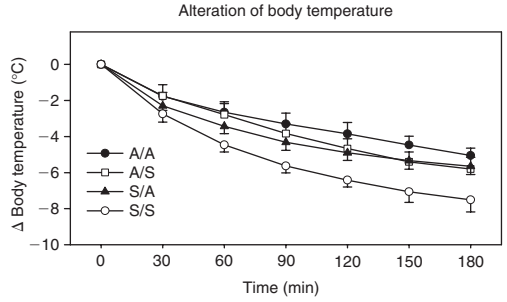
Background and Goal of Study: Intravenous amino acid infusion prevents postoperative hypothermia. However, amino acid infusion is usually not appropriate during surgery because of low electrolytes and high osmotic pressure. In this study, we examined the effect of oral intake before anesthesia with or without i.v. infusion of amino acids for prevention of hypothermia in rats.
Materials and Methods: Male Wistar rats (250–270 g) were used. Thirty minutes before anesthetic induction, rats were orally administered 10.5 mL of amino acid solution (100 g/L, 400 kcal), Amiparen™ (Otsuka, Japan) or saline. Anesthesia was induced with 5% sevoflurane and maintained by propofol. Rats then received either 3.5 ml/hr i.v. of amino acids or saline (A/A; rats received amino acids intake and infusion, A/S; amino acids intake and saline infusion, S/A; saline intake and amino acid infusion, S/S; saline intake and infusion). Room temperature was kept constant at 24°C, and body temperature was measured rectally every 30 min for 3 h after anesthetic induction.
Results and Discussion: Body temperature decreased in all groups during 3 h of anesthesia. However, the body temperature decrease was significantly less in all groups that received amino acids (A/A, A/S, S/A) than the groups that received saline. The body temperature decrease was less in the group that received A/A when compared to the group that received S/A ($p < 0.003$). However, there was no significant difference between A/S and S/A, or A/A and A/S.



Conclusion: Amino acid oral intake or intravenous infusion decreases hypothermia during anesthesia for at least 3 h. This result suggests that oral intake of amino acid before anesthesia may be useful for prevention of hypothermia in patients.

A-573

Effect of recombinant human erythropoietin on wound healing

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Background and Goals: Angiogenesis is an essential component of the physiological wound-healing response. Previous studies have shown the ability of Erytropoietin (EPO) to stimulate angiogenesis. The aim of this study is to assess the effect of recombinant human erythropoietin on wound healing.
Material and Methods: 4-cm long skin incisions were made on the backs of 28 Sprague-Dawley rats and then closed primarily at equal intervals. The subjects were then divided into 4 groups. Group 1 and 3 were administered 400 IU/kg sc rhEPO for 7 days, Group 2 and 4 were administered 1 cc sc 0.9% NaCl for 7 days. In groups 1 and 2, 0.5 × 0.5 mm of the wound was excised and examined for angiogenesis under electron microscope and a 2 × 2 cm sample of the middle of the wound was tested for tension strength on postoperative 8th day. The same procedures were repeated for groups 3 and 4 on postoperative 14th day.
Results: Microangiogenesis was increased in the EPO treated groups compared to the control groups. No angiogenesis was seen in the control group on the 8th day. On the 14th day, angiogenesis was seen in the control group but it was less than the EPO treated group. The breaking strength of wounds of rats treated with rhEPO was higher than saline group at day 14 ($p < 0.05$).
Conclusions: Our results suggest that one week treatment of rhEPO is able to improve wound healing by stimulating revascularization.

A-574

A RCT of N-acetylcysteine to reduce neutrophil ischemia/reperfusion injury in hepatectomies

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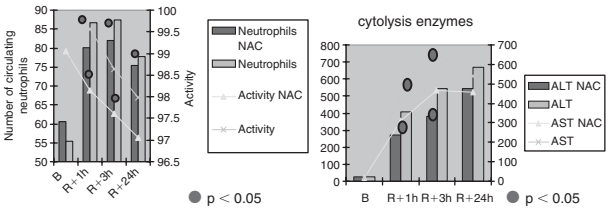
Background and Goal of Study: One of the most important factors in the pathophysiology of liver dysfunction after hepatic surgery is the cellular damage derived from the interruption of blood flood with reperfusion of the organ (1). Ischemia/reperfusion injury is a leukocyte-mediated event and neutrophils play a major role (2). N-acetylcysteine (NAC) has proved beneficial in several conditions involving oxidative damage (3). This study investigates the effects of NAC on neutrophils activity.
Materials and Methods: 40 ASA II–III patients scheduled to undergo liver resection where randomised to receive NAC (initial dose: 150 mg/kg; and infusion of 50 mg/kg, from 30 minutes before the ischemia up to 60 min later to the reperfusion) or placebo in a phase IV clinical trial. The number of circulating neutrophils and their activity, and cytolysis enzymes were obtained at basal status and 60 min, 180 min and 24 h post-reperfusion.
Results and Discussions: The graphics show the beneficial effects of NAC administration on number of circulating neutrophils and their activity, and cytolysis enzymes.



Conclusion(s): NAC has protective effect on liver ischemia/reperfusion injury. One possible mechanism is the ability to reduce the number and activity of neutrophils. This response may play a vital role in decreasing organ injury. The administration of NAC reduced liver injury as indicated by ALT and AST levels.

References:

1 Banga NR. *Br J Surg* 2005; 92: 528–538.
2 Sawaya DE. *J Surg Res* 1999; 85: 163–170.
3 Glantzounis GK. *Br J Surg* 2004; 91: 1330–1339.

A-575

Influence of alprostadil infusion during AAA surgery for antioxidative system

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Background and Goal of Study: The aorta cross clamping is connected with possible reperfusion injury and oxidative stress of many vital organs. The aim of the study was assessing the result of alprastodil infusion to antioxidative system during abdominal aorta reconstruction surgery.
Materials and Methods: Prospective randomized study of 42 patient planed for elective AAA surgery. The patients were divided into two groups: I – 24 patients were given the alprostadil infusion 10 ng/kg/min during surgery; II – 24 patient without such infusion. All patients were taken 10 ml of blood before cross clamping (A) and 5 minutes after reperfusion (B). The following parameters were measured: glutathione concentration (GSH), superoxide dismutase activity (SOD), catalase (CAT), glutathione peroxidase (GPx), glutatione S-transferase (GST).

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Results and Discussions: The results are displayed in Table.

	Group I		Group II		
	x	SD	x	SD	p
SOD A	1542.29	684.2	1487.27	341.9	0.7524
SOD B	1343.39	348.9	1402.18	321.2	0.5721
CAT A	5311.99	767.4	5140.36	934.1	0.3416
CAT B	55.41.41	936.9	5542.71	1048.6	0.7936
GPx A	2.27	1.31	2.13	1.01	0.9619
GPx B	1.99	1.14	1.97	0.94	0.8606
GST A	2.89	2.24	3.79	1.78	0.0645
GST B	3.51	2.25	4.10	2.36	0.4649
GSH A	0.0285	0.008	0.0331	0.013	0.2162
GSH B	0.0294	0.006	0.0351	0.011	0.0480

The GST growth was higher in the group I and it was statistically significant ($p < 0.01$), GSH after unclamping was lower in group I ($p < 0.05$). The differences between other parameters were not statistically significant.
Conclusion(s): The results suggest that the alprostadil infusion during AAA surgery seems be harmful.

A-576

Prostaglandin I_2 release following mesenteric traction during abdominal surgery is not COX-2 dependent

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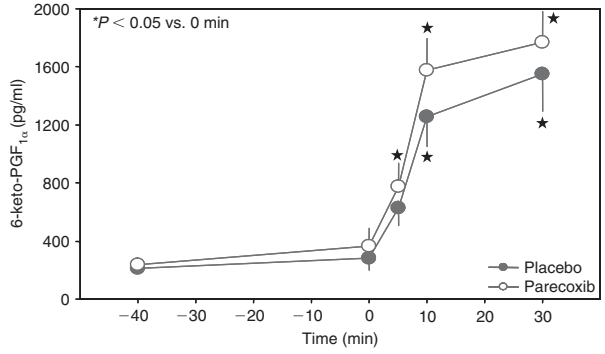
Background and Goal of Study: Mesenteric traction during abdominal surgery often is associated with the release of the vasodilatory prostaglandin-(PG)-I_2 resulting in hemodynamic changes, decreased arterial pO_2 and facial flushing (1). We determined the role of cyclooxygenase-2 in the release of (PG)-I_2 induced by mesenteric traction during abdominal surgery.
Materials and Methods: In a prospective double-blind, randomized, placebo-controlled study, 40 patients electively scheduled for non-laparoscopic abdominal surgery, were pretreated with the cyclooxygenase-2 inhibitor parecoxib (n = 20) or placebo (n = 20). Plasma concentrations of the stable PGI_2-metabolite 6-keto-$PGF_{1\alpha}$ were compared between groups before injection of parecoxib (−40 min), immediately before mesenteric traction (0 min), and 5, 10, and 30 min thereafter. In addition, plasma concentrations of valdecoxib, the active metabolite of the prodrug parecoxib, were determined.
Results and Discussions: Plasma concentrations of 6-keto-$PGF_{1\alpha}$ increased in both groups after mesenteric traction with no significant differences between both groups. Plasma concentrations of valdecoxib revealed therapeutic values.



Conclusion(s): PGI_2 release following mesenteric traction is not mediated by cyclooxygenase-2. Therefore, pretreatment of patients with the cyclooxygenase-2 inhibitor parecoxib does not prevent the mesenteric traction syndrome.
Reference:
1 Seeling W. *Anaesthesist* 1986; 35:738–43.

A-577

Propofol antioxidant capacity in vivo and in vitro

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Background and Goals: There are a lot of studies about the antioxidant capacity (AC) of the propofol. We have studied the total antioxidant capacity of plasma (TACP) in patients anaesthesied with propofol.
Material and Methods: In vivo, blood extractions were realized from a peripheral vein in four times: 1ª basal without propofol; 2ª after induction with 2 mg/kg propofol; 3ª maintenance 15 min with propofol (5 mg/kg/min); 4ª maintenance 15 min with propofol (10 mg/kg/min). TACP was measured with Rice-Evans C, et al method (1) based in the H_2O_2-metamyoglobin reaction and the AC of the Trolox (vitamin E water-soluble analogue). In times 1, 2, 4 MDA was also measured. In vitro, was measured the AC of propofol solutions in this concentrations: 1 mg/ml, 0.5 mg/ml, 0.1 mg/ml, 0.05 mg/ml, 0.01 mg/ml. Calibrating line of the Trolox:
Trolox (mM): 0, 0.5, 1, 1.5, 2, 2.5 y = 20.102 x
Absorption (734 nm): 0, 9.1, 20, 29.7, 42.1, 51 R2 = 0.9876
Results: Are expressed in mM of Trolox.
Study in vivo TACP: mean ± DS (n = 11):

1 Without propofol = 2.55 ± 0.53
2 After induction = 2.51 ± 0.62
3 Maintenance (5 mg/kg/min) = 2.36 ± 0.59.
4 Maintenance (10 mg/kg/min) = 2.32 ± 0.65

1 vs 3 y 4 significant $p < 0.05$ with the Wilcoxom test.
Results of the MDA were not significant.
Study in vitro: mean ± DS (n = 10).

1 1 mg/ml = 7.03 ± 0.21
2 0.5 mg/ml = 2.8 ± 0.6
3 0.1 mg/ml = 1.12 ± 0.41
4 0.05 mg/ml = 0.3 ± 0.25
5 0.01 mg/ml = 0.19 ± 0.19

Significant differences $p < 0.05$ between all groups with U Mann Whitney test.
Conclusions: In vitro, propofol showed AC related with concentration, but didn't in vivo with this technique.
Reference:
1 Rice-Evans C, Miller N. Methods Enzymol (1994); 234: 279–293.

A-578

Xenon preconditions against neuronal injury produced by trophic deprivation in organotypic hippocampal slice cultures

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Background and Goal of Study: A brief exposure to xenon, several hours before hypoxic-ischaemic injury, is sufficient to limit apoptotic neuronal death in an *in vivo* model (1); this phenomenon whereby tolerance to a subsequent injury is enhanced by a prior intervention is referred to as preconditioning (1). In order to explore the molecular mechanisms involved in the preconditioning effect of xenon, we have sought an appropriate *in vitro* model in which neural pathways are maintained; depriving cultured brain slices of trophic factors reliably produces apoptotic neuronal cell death (2). We aimed to investigate whether preconditioning by xenon can also be demonstrated in an *in vitro* trophic deprivation (TD)-induced organotypic hippocampal slice culture model.
Materials and Methods: Hippocampal slices were harvested from the brains of 7 to 10 day-old postnatal C57Bl6 mouse pups. Hippocampal slices were exposed to xenon 75% preconditioning or air for 2 h. Twenty-four h after exposure, cultured slices were subjected to neuronal injury provoked by TD. Cell death was quantified by assessment of propidium iodide (PI) uptake analysed by fluorescence in the CA1 and Dentate Gyrus (DG) subfields of the hippocampus.
Results and Discussions: Xenon 75% preconditioning resulted in a significant reduction in PI uptake after TD in the CA1 region, PI intensity was 49 ± 7% against 82 ± 6.5% in control ($p < 0.05$). Xenon preconditioning attenuates TD-induced neuronal death, especially in the most vulnerable CA1 region of the hippocampus.
Conclusion: TD-induced apoptotic injury is thought to be due to a lack of synaptic transmission and may be akin to the neonatal apoptotic neurodegeneration produced by most anaesthetics, apart from xenon. Establishment of this *in vitro* model facilitates the use of specific perturbants, including SiRNA, toxins and antagonists, with which to dissect the putative molecular components involved in xenon preconditioning.
References:
1 Ma D, et al. *J Cereb Blood Flow Metab.* 2005; 20: [Epub ahead of print].
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A-579

Thiopentone reduces neutrophil receptor expression

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Background and Goal of Study: Intravenous anaesthetics influence activity of phagocytes (1). Upon stimulation with lipopolysaccharide (LPS),

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neutrophils rapidly increase the amount of receptors presented on the cell surface. We investigated the influence of thiopentone (Thio) on LPS-stimulated complement and immunoglobulin receptor expression using a whole blood flow cytometric assay.

Materials and Methods: The study was approved by the local ethics committee. 100 μl blood from 12 healthy donors was treated with thiopentone for 15 minutes and stimulated with LPS. Samples were incubated with fluoresceine isothiocyanate (FITC) labelled antibodies against receptors CD11b, CD35 and CD16 and median fluorescence intensities were measured. Statistical analysis was performed using Friedman's test followed by Wilcoxon-Wilcox procedure.

Results and Discussions: Incubation of whole blood with LPS for 15 minutes increased expression of all neutrophil receptors significantly. Pretreatment with thiopentone inhibited CD11b, CD35 and CD16 expression in a time and concentration dependent manner:

	Control	Thio 400 μg/ml	LPS 100 ng/ml	Thio 40 μg/ml + LPS	Thio 400 μg/ml + LPS
CD11b	177 ± 56	171 ± 57	602 ± 118#	554 ± 89*	427 ± 63*
CD35	65 ± 17	63 ± 16	225 ± 45#	222 ± 47*	155 ± 35*
CD16	500 ± 13	507 ± 21	772 ± 65#	759 ± 60*	697 ± 53*

#$p < 0.05$ compared to control, *$p < 0.05$ compared to LPS.

Thiopentone reduces LPS-induced activation of intracellular signalling pathways (2) and reduces functional activity of phagocytes (1).

Conclusion: Our data suggest that immunoinhibitory effects of thiopentone are at least partly mediated by reduced surface receptor expression.

References:

1 Heine J, Leuwer M, Scheinichen D, et al. *Br J Anaesth*. 1996;77(3):387–92.
2 Loop T, Humar M, Pischke S, et al. *Anesthesiology*. 2003;99(2):360–7.

A-580

Comparison of fentanyl and remifentanil for painful local procedures

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Background and Goal of Study: The aim of this study was to examine the safety and efficacy of sedation and analgesia with using remifentanil during the percutaneous endoscopic lumbar discectomy (PELD).

Materials and Methods: Eighty ASA physical status 1 or 2 patients who underwent a PELD were enrolled in this study. They were randomized to receive, either fentanyl: bolus 0.7 μg/kg 5 min before the procedure and bolus 0.7 μg/kg during the procedure (n = 40, group F) or remifentanil: titration of infusion rate 0.1–0.3 μg/kg/min throughout the procedure according to appeal of pain, level of sedation and side-effects (n = 40, group R). The observer's assessment of alertness/sedation (OAA/S) scale, blood pressure, heart rate, respiratory rate, SpO_2, and end tidal CO_2 were assessed and measured during and/or after the procedures. The visual analogue scale of pain (VAS), the patient's and endoscopist's satisfaction scale were assessed after the procedures.

Results and Discussions: There were no significant differences between the two groups in terms of the recovery characteristics, incidence of complications and the satisfaction score of patients. In 92.5% cases among remifentanil group, a spine surgeon made uniform judgements that remifentanil group worked better than usual fentanyl used procedure and in 7.5% cases, the effects are indifferent. The VAS score of remifentanil group is significantly lower than fentanyl group ($P < 0.01$).

Conclusion(s): We conclude that the sedation and analgesia with remifentanil is very useful for the painful local procedure such as PELD.

A-581

Intravenous lidocaine reduces propofol requirements during propofol–remifentanil anaesthesia for thyroid surgery

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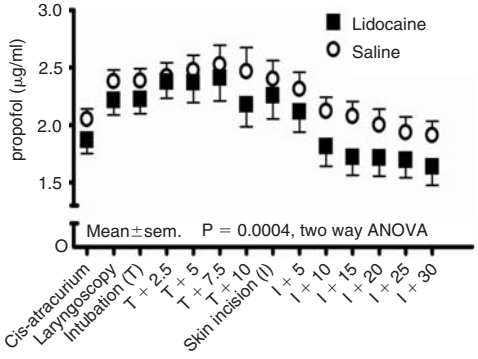
Background and Goal of Study: Intravenous (iv) lidocaine (LIDO) was shown to reduce sevoflurane requirements.[1] We tested the hypothesis that iv LIDO also reduces propofol requirements during total iv anaesthesia.

Materials and Methods: After institutional ethic committee approval, 40 consenting ASA I–II patients scheduled for thyroidectomy were enrolled in this randomised double-blind placebo-controlled study. A target-controlled infusion (TCI) of remifentanil (3 ng · ml^{-1}, Minto model) was started. Patients were then randomly given either iv LIDO (bolus = 1.5 mg kg^{-1}, then 2 mg kg^{-1} h^{-1}) or an equal volume of saline. After 5 min, propofol TCI was started (Schnider model) using step increases of 0.5 μg ml^{-1} every 2.5 min until loss of consciousness. Cis-atracurium 0.2 mg kg^{-1} was injected to facilitate tracheal intubation. Subsequently propofol TCI was adjusted to keep the bispectral index (BIS) value around 50. BIS values, heart rate, arterial pressure, propofol and remifentanil effect-site concentrations were continuously recorded up to 30 min after skin incision. Data were analysed by ANOVA. $P \leq 0.05$ = statistically significant.

Results and Discussion: Patient data, haemodynamic parameters and BIS values were similar in the two groups. Propofol effect-site concentrations were significantly lower in the LIDO group (Fig).



Conclusions: Intravenous lidocaine reduces BIS-guided propofol dose requirements during propofol–remifentanil anaesthesia.

Reference:

1 Nafeh et al., Eur. J. Anaesth. 22 (34): A493,2005.

A-582

Levobupivacaine pharmacokinetics after caudal block in children under 3 years of age

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Background and Goal of Study: Levobupivacaine has been recently incorporated for clinical use. Data on levobupivacaine pharmacokinetics after caudal administration in children are scarce. We performed this study to describe levobupivacaine pharmacokinetics after a single shot into the caudal space in children less than 3 years of age and to asses the effect of covariates on the pharmacokinetic parameters in this population

Materials and Methods: We studied children ASA I–II scheduled for subumbilical surgery. A caudal injection of 0.25% levobupivacaine (2.5 mg kg^{-1}) was performed. Serial blood samples were taken for 180 minutes after caudal block. Pharmacokinetic population analysis was performed using nonlinear mixed effects models. The effect of age, gender and weight as covariates of the pharmacokinetic parameters were explored. Data are summarized as median (range).

Results: We studied 10 children, age 10 (1–32) months and weight 9 (4.5–15) kg. Levobupivacaine C_{max} and t_{max} were 1.42 (0.62–2.41) μg · ml^{-1} and 37.5 (30–60) minutes respectively. No signs or symptoms suggesting toxicity to levobupivacaine were reported. Pharmacokinetic parameters estimated are shown in the Table:

Parameter	Typical value	CV (%)
Cl (l · h^{-1} · kg^{-1})	0.39	55
V (l · kg^{-1})	1.94	54
Ka (h^{-1})	6.49	51

CV: Coefficients of variation

There was a tendency (NS) towards higher C_{max} values and higher t_{max} values in small children. A significant Age effect on volume of distribution was found: 0.98*Weight (kg) +0.87*Age (months).

Conclusion: Single shot caudal administration of levobupivacaine 2.5 mg kg^{-1} in children less than 3 years of age produced a wide variability in the C_{max} values. The population analysis, demonstrated an age-dependency on levobupivacaine pharmacokinetics, with infants being at higher risk of reaching toxic concentrations.

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A-583

Specific effects of cannabinoids and their interaction with sedation in anesthetised mice

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Background and Goal of Study: Δ9-Tetrahydrocannabinol (THC) binds to the cannabinoid receptor CB1 and CB2. It has been reported that THC interacts with propofol reducing its sedation. We therefore combined the selective CB1 agonist ACEA for a possible reduction of propofol sedation in the combination of both drugs. Our results might bring further understanding into the pharmacologic interaction of THC and propofol.

Materials and Methods: SV 129 mice received i.p. injection of 50 μg/g THC, 5 μg/g ACEA and 50 μg/g propofol with permission and according to the state laws of animal safety. Analgesia was determined by tail flick and sedation was monitored by a rota-rod.

Results and Discussions: Propofol sedation showed a maximum 2.5 min post injection with 27 s on the rota-rod. Sedation was completely abolished in combination with THC. Propofol sedation was augmented in combination with ACEA. Rota-rod times fell below 9 s between 2.5 and 7.5 min post injection and a longer onset of sedation was observed up to 45 min compared to 15 min using propofol by it self. THC analgesia was reduced by propofol. In combination of ACEA with propofol the analgesic effect by ACEA was not significantly altered; tail-flick-latencies 6.9 to 8.2 s both drugs compared to 7.7 to 8.8 s ACEA within the first 20 min post injection

ACEA is a CB1 receptor agonist that augments propofol sedation. Considering the location of the CB1 receptor in the CNS (1) both drugs interact either in a common central pathway or have different mechanisms of action leading to central sedation. In the combination of THC and propofol sedation was abolished. It can be speculated that THC binds to other central receptors, which have not been described, or peripheral non CNS receptors. The THC receptor effects might be powerful enough to compromise central CB1 sedation which is induced by THC and propofol. Propofol reduced THC analgesia, which was not observed when propofol was combined with ACEA. Central CB1 stimulation induced analgesia was therefore probably not altered by propofol.

Conclusion: We showed indirect evidence that THC does probably not interact with propofol at the CB1 receptor.

Reference:

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A-586

Neurotoxicity of lidocaine in compartmented primary sensory neuron cultures

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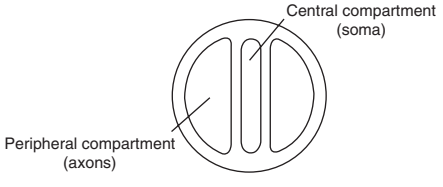
Background and Goal of Study: *In vitro* investigations into local anesthetic-induced neurotoxicity have until now been carried out in dissociated neuron cultures, immersing the entire neuron (cell body and axon) in local anesthetic. This, however, may not accurately mimic the clinical situation, during which local anesthetic is predominantly applied to the axon, but not the neuronal cell body. We investigated the hypothesis that local anesthetic-induced axonal neurotoxicity is a process that is confined to the neuron's axon.

Materials and Methods: We used compartmentalized primary sensory neuron cultures, which allow for selective incubation of axon or cell body (1). We incubated neuronal axons or cell bodies independently with the local anesthetic lidocaine (40 mM/~1%) with or without inhibitors of the p38 mitogen-activated protein kinase (MAPK), known to be neuroprotective. Neuronal survival and axonal outgrowth were used as outcome measures.

Results and Discussions: Incubation with lidocaine in the "central" compartment containing cell bodies (see Figure) resulted in neurotoxicity, reflected by reduction in neuron number, and axonal outgrowth length. Conversely, incubation in the "peripheral" compartment (containing axons) resulted in severe axonal degeneration, without affecting survival of cell bodies. When lidocaine was applied to axons, p38 MAPK inhibitors applied at the axon, but not at the cell body, attenuated neurotoxicity.



Conclusion(s): We describe compartmental primary sensory neuron cultures as potentially useful to determine in greater spatial detail pathways involved in local anesthetic-induced neurotoxicity. Moreover, we conclude that local anesthetic-induced axonal neurotoxicity seems to be a localized process that does not necessarily involve the neuronal cell body.

Reference:

1 Campenot RB. Local control of neurite development by nerve growth factor. Proc Natl Acad Sci USA 1977; 74: 4516–9.

A-587

Tramadol, fentanyl and sufentanil but not but morphine block voltage-operated sodium channels

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Background and Goal of Study: Opioids may exert local anaesthetic-like inhibitory effects on the generation and conduction of nerve action potentials which are not reversed by opioid receptor antagonists (1). However, drug binding to resting and inactivated sodium channel conformations has been studied systematically only in the case of meperidine (2). The aim of this in-vitro study was to investigate the effects of four currently used opioids on neuronal sodium channels.

Materials and Methods: Rat neuronal ($NaV_{1.2}$) voltage-gated sodium channels were stably expressed in HEK293 cells. Block of sodium inward currents was studied at hyperpolarized holding potentials and at depolarized potentials inducing either fast or slow inactivation using standard whole-cell voltage-clamp protocols (3).

Results and Discussions: Sufentanil, fentanyl and tramadol but not morphine reversibly suppressed sodium inward currents at high concentrations (half-maximum blocking concentrations (IC_{50}) 44, 123, and 112 μM) when depolarizations were started from hyperpolarized holding potentials. Short depolarizations inducing fast inactivation increased the blocking potency only for tramadol and fentanyl by 7- and 2-fold, respectively. Long prepulses inducing 15% slow inactivated channels substantially reduced the respective IC_{50} values to 6.4, 20, and 23 μM.

Conclusion(s): 1. Sufentanil, fentanyl and tramadol block voltage-gated sodium currents with half-maximum inhibitory concentrations similar to the IC_{50} reported for meperidine (2). Apparently, this non-specific effect is independent from the opioid receptor potency of these compounds. 2. Prolonged depolarization increases binding affinity of sufentanil, fentanyl and tramadol. 3. Morphine has no such effects.

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1 Frank GB. *Can J Physiol Pharmacol* 1985; 63:1023–1032.
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A-588

Ketamine and fentanyl prevents pain and hypotension due to propofol induction

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Background and Goal of Study: Propofol has a high incidence of pain and hypotension associated with intravenous injection. The aim of this study was to investigate whether pretreatment with ketamine and fentanyl would reduce infusion line pain and hypotension due to propofol induction.

Materials and Methods: Seventy-five healthy patients (aged 25–55 years) scheduled for general anesthesia were randomly divided into two groups. Group 1 (n = 38) received ketamine 0.5 mg kg^{-1} and fentanyl 1 mcg . kg^{-1} 2 min before propofol infusion. Group 2 (n = 37) received 5 ml normal saline solution 2 min before propofol was infused. Propofol infused via 18 G angiocatheter inserted in the dorsal vein of hand in both groups.

The assessment of pain was made when the 1/4 of the calculate dose of propofol was given; the severity of pain was classified as none, mild and severe. Mean arterial blood pressure and heart rate recorded before induction to anaesthesia, 1 min after propofol injection, before intubation and 1, 2 and 3 min after propofol injection.

Results and Discussions: The incidence of pain from the infusion was significantly lower in patients pretreated with ketamine and fentanyl 71% in Group 1 and 21% in Group 2 did not experience any pain. The p value was less than 0.0001. The mean arterial blood pressure values in Group 1 (94 ± 21 mmHg) before intubation were significantly higher than that of

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Group 2 (74 ± 19 mmHg). There was no significant difference in the mean heart rate values in both groups.

Conclusion(s): Pretreatment with ketamine (0.5 mg . kg^{-1}) and fentanyl 1 mcg . kg^{-1} is very effective in preventing propofol infusion pain. Low dose ketamine may prevent hypotension due to propofol induction.

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A-589

Fentanyl modulates NMDA receptor function through direct PKC mediated phosphorylation of receptor subunits

a study using double point mutants of NMDAR subunits

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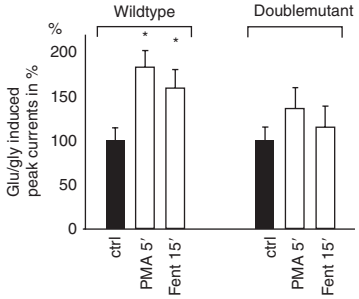
Background: NMDA receptor signalling appears to play a pivotal role in inducing prolonged postoperative pain and hyperalgesia. NMDA receptors are highly regulated by protein kinase C (PKC), which enhances signalling indirectly through downstream systems or directly by phosphorylating segments of NMDA receptors (1). Opioids have been shown to produce hyperalgesia through NMDA receptor modulation by means of PKC (2). We hypothesized that PKC activation through opioids leads to direct phosphorylation of NMDA receptor subunits.

Methods: Wildtype (WT) and doublemutant (SS) mouse NMDA receptor subunits NR1/2B (3) were expressed recombinantly in Xenopus laevis oocytes. In SS receptors serines 1303 and 1323 of the NR2B subunit had been mutated. Inward currents induced by glutamate/glycine (G/G, 10/10 μM) were measured by 2-electrode voltage clamp, and recorded as μA (mean ± SEM). Cells were either incubated in 10^{-6} M phorbolester (PMA, PKC activator) for 5 min, in 10^{-5} Fentanyl for 15 min or measured without incubation.

Results: Our preliminary results show that PKC activation through incubation with phorbolester resulted in increased currents of WT receptors (182 ± 20%) while SS receptors responses remained unaffected. Incubation with Fentanyl evoked significantly higher currents in WT cells (160 ± 21%) and showed no effect in SS cells.



* = p < 0.05 (Anova on ranks, Dunn's correction)

Conclusion: Activation of PKC by phorbolester leads to direct phosphorylation of NR2B subunits at serines 1303 and 1323 rather than through activation of further downstream pathways. Mutated receptors devoid of these target sites show no activation through phorbolester nor through fentanyl. We conclude that opioid modulation of NMDA receptors is mediated by direct phosphorylation of the NR2B subunit by PKC.

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A-590

Effects of intrathecal metabotropic glutamate receptors agents on a rat incisional pain and interaction with morphine

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Background and Goal of Study: Spinal metabotropic glutamate receptors (mGluRs) and opioid receptors are involved in the modulation of nociception. The aim of this study was to clarify the role of spinal mGluRs to postoperative pain. In addition, the nature of pharmacological interaction was determined between mGluRs compound and morphine.

Materials and Methods: Catheters were inserted into the intrathecal space of male SD rats. For induction of postoperative pain, an incision was done in the plantar surface of the hindpaw. A fixed-dose analysis was done to evaluate properties of drug interaction between mGluRs compounds and morphine.

Results and Discussions: All of intrathecal mGluRs compounds did not alter the withdrawal threshold in the incisional pain. Intrathecal morphine resulted in an increase of the withdrawal threshold in a dose dependent manner. A fixed-dose analysis revealed that both mGlu1a antagonist (LY 367385) and group III mGluRs agonist (ACPT-III) increased the antinociceptive action of morphine. But, other mGluRs compounds did not affect the antinociception of morphine.

Conclusion(s): These results suggest that mGluRs may not play a modulatory role in the processing of postoperative pain directly at the spinal level. But blockade to mGlu1a receptor and agonizing group III mGlu receptors in the spinal cord may be indirectly contributable to the potentiation of morphine's antinociception. Thus, spinal combination of morphine with either mGlu1a antagonist or group III mGluRs agonist may be useful in the management of the postoperative pain.

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A-591

The role of adrenergic receptors on the antinociception of intrathecal zaprinast in the formalin test of rats

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Background and Goal of Study: Spinal zaprinast, phospodiesterase inhibitor, has been shown to have an antinociception through an increase of cGMP (1). Spinal alpha adrenergic receptors have been participated in the modulation of nociception (2).The aim of this study was to examine the role of spinal adrenergic receptors on the antinociceptive action of intrathecal zaprinast.

Materials and Methods: Rats were implanted with lumbar intrathecal catheters. After formalin injection, formalin-induced nociceptive behavior (flinching response) was observed for 60 min. After observing the effect of intrathecal zaprinast, antagonism of intrathecal prazosin and yohimbine for the effect of zaprinast were evaluated.

Results and Discussions: Intrathecal zaprinast produced a dose-dependent suppression of formalin-induced flinches in phase 1 (acute phase) and 2 (facilitated state). Intrathecal prazosin reversed the antinociception of zaprinast in phase 2, but not phase 1. Intrathecal yohimbine reversed the antinociception of zaprinast in both phases.

Conclusion(s): Intrathecal zaprinast is against the nociceptive state evoked by formalin stimulus. Both spinal alpha 1 and alpha 2 adrenergic receptors may be involved in the analgesic action of zaprinast on the facilitated state. Alpha 2, but not alpha 1, adrenergic receptors may not contributable to the action of zaprinast on acute nociception.

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A-592

Intra-articular injection of lornoxicam in rats; local effects on the articular cartilage and synovium

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Background and Goal of Study: The study investigated the possible local adverse effects of intraarticular administration of lornoxicam in the rat knee joint.

Materials and Methods: A total 25 rats were given 0.25 ml of lornoxicam by injection into the right knee joint and 0.25 ml of 0.9% saline solution by injection into the left knee joint as a control. Groups of 5 rats were killed by a lethal injection of ketamine 24 h, 48 h, 7 days, 14 days and 21 days after lornoxicam

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administration. After the knee joints were detached and fixed in 10% buffered formalin, decalcified in "De Castro" solution. Serial sections of 5 μm were stained with haematoxylin-eosin and evaluated with Olympus BH-2 light microscope. The knee joint samples were evaluated for the presence of inflammation in the articular and periarticular regions and synovium. Inflammatory changes in the joints were graded according to a five-point scale.

Results and Discussions: There was no significant difference belongs to inflammation and cartilage degeneration between control and lornoxicam received knees. Grade 3 inflammatory changes had occurred only one knee at 24 h after injection. No pathological changes were observed in 24 h, 48 h, 7 days, 14 days and 21 days speciemens or in the control joints.

Conclusions: Caution should be exerted in its i.a. administration until further studies demonstrate that it is safe to use in human articulates.

A-593

Expression and role of the adenosine A2a receptor in the dorsal horn of rat spinal cord

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Background and Goal of Study: Adenosine is an endogenous neuromodulator that acts on 4 different subtypes of G-coupled protein receptors (A1, A2a, A2b, A3). The presence of A2a receptor is well established in the central nervous system, predominantly in the striatum where A2a receptor activation was described as a modulator of the NMDA receptor (1,2). In contrast, the distribution and the role of A2a receptor in the spinal cord remain unclear. The goal of this study is to explore the presence and the role of A2a receptor in the spinal cord pain pathways.

Materials and Methods: Total RT-PCR was first performed to assess the expression of the adenosine A2a receptor gene in the lumbar enlargement of the rat spinal cord. Second, single-cell RT-PCR was performed on acute slices in order to identify cells expressing A2a receptor mRNA and to quantify the proportion of lumbar dorsal horn neurons that express it. Third, we investigated whether the activation of A2a receptor has any modulatory effect on the activity of NMDA receptor by using the whole cell patch clamp technique on projection neurons from lamina II.

Results and Discussions: RT-PCR performed on the entire lumbar spinal cord revealed the presence of the adenosine A2a receptor transcript. RT-PCR performed on single cell identified as projection neurons revealed the presence of the adenosine A2a receptor transcript in 5 out of 32 cells. Electrophysiological recordings did not show a significant difference between the current induced in presence of 10 μM NMDA and the one induced in presence of 10 μM NMDA plus 0.1 μM CGS 21680, the A2a receptor agonist (-118.17 ± 18.24 pA vs -95.74 ± 14.72 pA, $n = 8$, student's *t*-test, $p > 0.05$).

Conclusion(s): Adenosine A2a receptor is present in the dorsal horn of the lumbar spinal cord. The receptor is expressed on 15% of the lamina II projection neurons. A2a receptor agonists seem not able to modulate the NMDA receptor activity.

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A-594

Xenon prevents tumor necrosis factor alpha induced ICAM-1 expression in human umbilical vein endothelial cells

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Background and Goal of Study: Xenon induces preconditioning of the rat heart in vivo (1). Moreover, it was shown that Xenon modulates neutrophil adhesion molecule expression in vitro (2). Cell adhesion molecules (CAM) are involved in the pathophysiology of ischaemia-reperfusion injury. As a proinflammatory cytokine, TNF-α is known to induce CAM expression and to modulate the adhesive properties of the endothelium. Therefore, we aimed to determine whether Xenon prevents TNF-α-induced expression of intracellular adhesion molecule 1 (ICAM-1) in vitro.

Materials and Methods: Human umbilical vein endothelial cells (HUVEC) were isolated from 3 different preparations and identified by von Willebrand factor staining. The cells were either left untreated for 45 minutes (Con) or pretreated with Xenon 70% during 3×5-min periods interspersed with 2×5-min and one final 10-min washout period in a special gas chamber. After treatment, cells where stimulated with 10 ng/ml TNF-α (1 h for mRNA, 5 h for protein expression). After the incubation periods, western blot and reverse transcription PCR of ICAM-1 were performed. Statistical analysis: One-way ANOVA followed by Bonferroni's correction for multiple comparisons. Data are expressed as arbitrary units of average light intensity (AVI), means ± SD.

Results and Discussions: TNF-α significantly induced mRNA and protein expression of ICAM-1 after the respective time period (mRNA: 1.3 ± 0.7 vs. 0.6 ± 0.2 in controls; protein: 0.6 ± 0.2 vs. 0.1 ± 0.1 in controls, both $p < 0.05$) Xenon pretreatment of HUVEC completely blocked both effects and ICAM-1 expression returned to control levels (mRNA: 0.7 ± 0.3 vs. TNF-α treatment; protein: 0.2 ± 0.1 vs. TNF-α treatment, both $p < 0.05$). Xenon alone had no effect on ICAM-1 expression (mRNA: 0.5 ± 0.2; protein: 0.2 ± 0.1).

Conclusion(s): Intermitted Xenon pretreatment of endothelial cells completely abolished the TNF-α -induced expression of ICAM-1. These results suggest an anti-inflammatory potential of the noble gas Xenon.

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A-595

IKs (slowly activating delayed rectifier potassium channel current) plays a main role on sevoflurane induced action potential prolongation

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Background and Goal of Study: Long QT syndrome can cause fatal arrhythmia and ion channel dysfunction is responsible to this syndrome. Sevoflurane is known to prolong QT interval. We hypothesized that the inhibition of delayed rectifier potassium channel currents (IK) by sevoflurane has an important role in this QT prolongation. In the present study, the effect of sevoflurane on the cardiac AP and on IK were investigated.

Materials and Methods: Myocytes were enzymatically obtained from adult guinea pigs. Patch clamp technique was used. The effects of sevoflurane (0.3 mM) on the cardiac action potential (AP), slowly activating delayed rectifier potassium channel current (IKs), rapidly activating delayed rectifier potassium channel current (IKr) were determined. IKs was elicited during 2-sec depolarizing test-pulses to +60 mV from a holding potential of −40 mV. IKr was elicited during 250-msec depolarizing test-pulses to +60 mV from a holding potential of −40 mV. Statistical analysis was performed using paired Student's t-test and $p < 0.05$ was considered significant. All experiments were conducted at physiological temperature (35–37°C).

Results and Discussions: Results are reported as means ± SEM. Under control condition, APD90, which corresponds to time to 90% repolarization, was 280 ± 18 msec. Sevoflurane at 0.3 mM significantly prolonged the APD, increasing APD90 by 31 ± 5% ($p < 0.05$). Sevoflurane attenuated IKs by 61 ± 4%, whereas attenuated IKr by 19 ± 6%.

Conclusion(s): Sevoflurane prolonged the cardiac action potential duration (APD) at a clinically relevant concentration (0.3 mM). The mechanism underlying this APD prolongation involves the inhibition of the delayed rectifier K channel (IKdr) by sevoflurane. This APD change would lead to a prolonged QT interval in the ECG. Our results suggest that both IKs and IKr, but mainly IKs, plays a major role during anesthetic-induced QT prolongation.

A-596

Sodium ATP as multimodal protector for rapid naloxone detoxification in heroin addicts

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Background and Goal of Study: Though rapid detoxification with naloxone (N) seems to be effective in opioid physical dependency treatment [1], some reports suggested caution due to N algogenic and direct vasoconstrictor activity [2]. We tried to prevent N side effects with sodium ATP (Na-ATP) – preparation of purinergic agonist adenosine, known as systemic analgesic and potent vasodilator [3].

Material and Methods: 45 heroin overdosage patients, aged 16–46, were admitted to the ICU with severe hypoventilation (mean $P_{ET}CO_2$ 67 ± 5 mmHg). Under standard monitoring (ECG, NIBP, SpO_2) tracheal tube, cava- and urinary catheters were placed in all cases. In the first 10 patients Swan-Ganz catheter was inserted to assess PWP, CI, PVR and SVR. With institutional approval, Na-ATP infusion (25.3 ± 4.7 mkg kg^{-1} min^{-1}) began 20 min before N infusion (1.4 ± 0.8 mkg kg^{-1} min^{-1}, up to the total dose of 226 ± 30 mkg kg^{-1})

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and terminated 1 h after N infusion had finished. Neuromuscular block was performed with pipecuronium (mean 2.5 ± 0.8 mg $kg^{-1}h^{-1}$, providing TOF level below 15%). CMV ventilation with nitrous oxide + oxygen 2:1 mixture during all the procedure was adjusted to reach $P_{ET}CO_2$ 32–36 mmHg.

Results: No patient demonstrated HR, MAP, CI, PVR or SVR shifts exceeding 20% above or below the base level. PWP never exceeded 15 mmHg, PVR poor correlated with N infusion rate ($P = 0.47$) and significantly depended upon Na-ATP infusion rate ($r^2 = 0.45$, $P = 0.006$). Diuresis in all the patients was >1 ml $kg^{-1}h^{-1}$. Mean time interval between detoxification completion and extubation was 65 ± 12 min, ICU bed day averaged 2.2 ± 0.5. No complication which could be contributed to N or Na-ATP administration was observed.

Conclusion: Sodium ATP infusion effectively protects heroin addicts against stress-related and hemodynamic complications during rapid naloxone detoxification.

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A-597

Effects of propofol with EDTA on cell damage induced by oxygen and glucose deprivation (OGD) in PC12 cell cultures and middle cerebral artery (MCA) occlusion in mice

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Background and Goals: Propofol (lipid emulsion) has anti-oxidative and neuroprotective effects in a number of animal models. There are several formulations of propofol with and without disodium edetate (EDTA-2Na). EDTA is added to retard bacterial and fungal growth. Recently, EDTA has been reported to have neuroprotective effects by several researchers. Therefore, the purpose of the present study was to examine whether propofol with EDTA has higher neuroprotective effects than that without EDTA.

Material and Methods: In Exp. 1, PC12 cells were plated on 24 well plate for 7 days. To initiate OGD, cell culture media was removed and cells were washed twice with glucose-free DMEM. Cells were then incubated in the glucose-free medium in an oxygen-free incubator (94% N_2, 5% CO_2, 1% O_2) for 4 h. Following OGD, glucose was added to normal levels and cells were incubated under normal growth conditions for additional 18 h (Reoxygenation). Propofol (10 and 20 μM) and EDTA were added into glucose-free medium before OGD treatment. The rate of surviving cell was evaluated by resazurin assay. In Exp.2, a filament occlusion of the left permanent MCA was carried out as previously described (1). The infarction and swelling were measured at 24 h after ischemia and neurological deficits were measured. Propofol with or without EDTA was intravenously administered at 10 min before ischemia.

Results: Propofol alone inhibited OGD-induced cell damage. EDTA also inhibited the cell damage. Co-treatment of propofol and EDTA was more potent than each individual treatment of propofol and EDTA. Propofol with EDTA decreased infarction, brain swelling, and neurological deficits after MCA occlusion in mice. The potency was higher than that of propofol alone.

Conclusions: These findings suggest that propofol with EDTA exerts a higher neuroprotection than that of propofol without EDTA.

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A-598

The μ-agonist DAMGO exerts a biphasic and concentration dependent effect on recombinantly expressed human NMDA receptors

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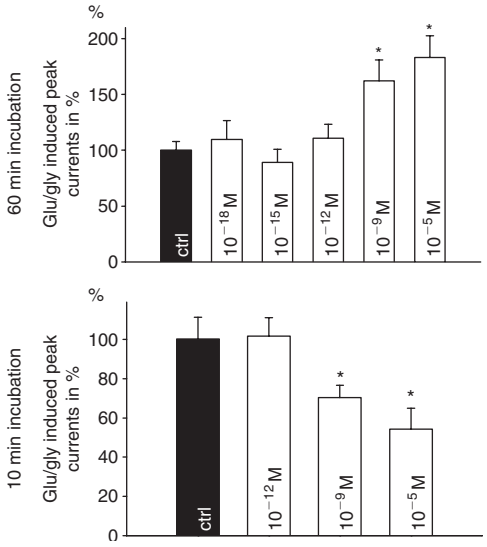
Background and Goal of Study: Opioids are the mainstay of treatment of pain. However, opioids produce paradoxical pain and hyperalgesia under many circumstances. A pivotal role in inducing opioid-associated hyperalgesia has been attributed to the NMDA receptor signalling system (1). Electrophysiological studies using the μ-agonist DAMGO yielded contradictory results how opioids affect NMDA receptor signalling. Inhibition as well as potentiation of NMDA receptors has been published (2). This study was undertaken to clarify in more detail DAMGO's modulatory effects on NMDA receptor responses.



Methods: Human NR1/2B NMDA receptors were expressed recombinantly in *Xenopus laevis* oocytes. Inward currents induced by glutamate/glycine (G/G, 10/10 μM) were measured by 2-electrode voltage clamp, and are reported as μA (mean ± SEM). For time dependency experiments cells were incubated in DAMGO 10^{-5} M for 10 min and 60 min. Concentration dependence was studied for 10^{-18} M–10^{-5} M for 60 min incubation and 10^{-12} M–10^{-5} M for 10 min incubation time.

Results: Modification of NMDA receptor responses by DAMGO is biphasic and time dependent. 10 min incubation in DAMGO 10^{-5} M leads to an inhibition to 54 ± 11%; whereas responses after 60 min are increased to 183 ± 19%. Both, stimulation and inhibition is concentration dependent (see Figure).

Conclusion(s): DAMGO exerts different mechanisms of actions, dependent on the time of incubation. Our study supports the view that μ-agonists might produce hyper-algesic pain states by stimulating NMDA receptor responses.

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A-599

The antinociceptive effects of local injections of propofol are mediated by cannabinoid CB_1 and CB_2 receptors

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Background and Goal of the Study: Propofol has been shown to inhibit fatty acid amidohydrolase (FAAH), the enzyme responsible for the metabolism of anandamide (an endocannabinoid). To study the potential analgesic effect of propofol, different doses of the intravenous general anesthetic were administered locally in the hind paw of animals in order to obtain a dose-response curve and to determine an effective dose 50 (ED_{50}). To further investigate the mechanisms by which propofol produced its analgesic effects, we used specific antagonists for the cannabinoid CB_1 (AM251) and CB_2 (AM630) receptors.

Materials and Methods: All procedures were conformed to the guidelines of the Canadian Council for Animal Care. Formalin tests were performed on 66 Wistar rats allocated to 6 different groups: (1) control (Intralipid™ 10%); (2) propofol (0.005-0.08-0.05-0.5-5 and 500 μg); (3) AM251; (4) AM251 + propofol (0.08 μg); (5) AM630; (6) AM630 + propofol (0.08 μg). Drugs were injected subcutaneously on the dorsal surface of the right hind paw (50 μl) 15 min before 2.5% formalin injection into the same paw. Nociceptive behavior was quantified using the composite pain score-weighted scores technique. The area under the curve was calculated for the acute and inflammatory phases of the formalin test using the trapezoidal rule. The critical level of significance was set at $P < 0.05$.

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Results and Discussions: Propofol produced a dose-dependent antinociceptive effect for the acute and inflammatory phase of the formalin test with an ED_{50} of 0.08 μg ± 0.061 for the latter phase. This effect was antagonized by AM251 and AM630. It was locally mediated since a higher dose of propofol (500 μg) given in the contralateral paw produced pain behavior not statistically different from the control group.
Conclusions: Locally (paw) injected propofol decreased pain behavior dose-dependently in the formalin test. This analgesic effect was mediated by CB_1 and CB_2 receptors.

A-600

Buccal versus intramuscular dexmedetomidine premedication for arthroscopic knee surgery under spinal anesthesia

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Background and Goals: Dexmedetomidine (Dex) has been used for premedication by intramuscular or intravenous route (1). Buccal bioavailability of Dex is shown to be high (2). We aimed to compare sedative and analgesic effects of buccal Dex with intramuscular Dex and buccal saline solution.
Materials and Methods: Seventy-five patients undergoing arthroscopic knee surgery under spinal anesthesia were randomly allocated into three groups: 1) Group B: Buccal Dex 2.5 μg kg^{-1}, 2) Group IM: Intramuscular Dex 2.5 μg kg^{-1}, 3) Group P: Buccal 0.9% NaCl 2 ml. Sedation level were assessed with Ramsay sedation score before premedication (SS1), before spinal anesthesia (SS2), at the end of the surgery (SS3), 2 h (SS4), 4 h (SS5) and 8 h (SS6) after surgery. Postoperative visual analogue pain scores are recorded 0 h (VAS1), 4 h (VAS2), 8 h (VAS3) after surgery and on the next morning (VAS4). Consumption of analgesics (cons analg) were also registered.
Results:

	Group B	Group IM	Group P
SS1	1.95 ± 0.22	1.86 ± 0.36	2.00 ± 0.00
SS2	3.33 ± 0.86*&	2.71 ± 0.78*	2.05 ± 0.23
SS3	2.81 ± 0.87*	3.10 ± 0.83*	2.21 ± 0.54
SS4	2.19 ± 0.60	2.43 ± 0.87	2.00 ± 0.00
SS5	2.05 ± 0.23	2.00 ± 0.00	2.00 ± 0.00
SS6	2.09 ± 0.30	2.14 ± 0.35	2.00 ± 0.00
VAS1	0.00 ± 0.00	0.22 ± 0.28	0.00 ± 0.00
VAS2	0.90 ± 1.61*	1.71 ± 2.17	2.73 ± 2.58
VAS3	1.52 ± 1.94*&	3.62 ± 2.22	4.22 ± 2.65
VAS4	1.00 ± 2.07	1.16 ± 1.77	2.00 ± 2.22
Cons analg	46.2 ± 64.2*	75.0 ± 67.1	118.3 ± 78.4

* $p < 0.05$ versus placebo, & $p < 0.05$ versus group IM.

Conclusion: Buccal use of Dex for premedication in arthroscopic knee surgery provided equipotent (higher before spinal anesthesia) level of sedation and more evident analgesia compared to intramuscular use of the drug.
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A-601

Dexmedetomidine-ketamine for surgical treatment of burned patients

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Background and Goal of Study: Dexmedetomidine is indicated for sedation of ventilated ICU patients, but may be suitable for anaesthesia during surgery. As we have already used successfully combination of another alpha-2-mimetic, clonidine, with ketamine for sedation, we decided to evaluate the combination of dexmedetomidine and ketamine.
Materials and Methods: After ethic committee approval and written consent 11 patients scheduled for repeated changing of dressings were randomly divided in 4 groups. D2K2 were administered 2 μg · kg^{-1} dexmedetomidine and 2 mg · kg^{-1} ketamine i.m., group D2K3 were administered 2 μg · kg^{-1} dexmedetomidine and 3 mg · kg^{-1} ketamine i.m., group D2.5K2 were administered 2.5 μg · kg^{-1} dexmedetomidine and 2 mg · kg^{-1} ketamine i.m. and group D2.5K3 were administered 2.5 μg · kg^{-1} dexmedetomidine and 3 mg · kg^{-1} ketamine i.m. Vital functions, Glasgow coma scale (GCS), quality of anaesthesia (1best – 5 insufficient) and analgesia were measured. In case of insufficient effect propofol was administered. The patients were questioned in the afternoon and next day about side effects and amnesia.
Results and Discussions: There were total 25 cases of anaesthesia administered. The effect started in 6–10 min. and lasted 25–30 min.

Group	GCS > 13	Insuff. effect	Quality (1–5)	Psychomimetic effects
D2K2	80%	60%	2.3	30%
D2K3	90%	25%	1.4	25%
D2.5K2	100%	30%	1.3	0
D2.5K3	40%	20%	1.6	0

Conclusion(s): The intramuscular combination of dexmedetomidine and ketamine can be used for minor surgery in burned patients. It provides good analgesia with possibility of retained consciousness and has no effect on ventilation. The optimal dose needs further evaluation.

A-602

Dexmedetomidine in otorhinolaryngologic operations

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Background and Goal of Study: The purpose of this study was to determine the efficacy of dexmedetomidine (dex) in achieving controlled hypotension in otorhinolaryngologic operations.
Materials and Methods: After approval by the Hospital Ethical Committee, 40 patients undergoing septoplasty (Group SD, Group S) and 30 patients undergoing tympanoplasty operations were randomly divided into 4 groups. Dex was administered to the SD and TD groups first at a dose of 1 μg/kg via IV infusion in 10 min, and then intraoperative maintenance was supplied by 0.7 μg/kg/hr continuous infusion. Group S and T were given identical amounts of saline instead. Intubation was performed 2 min after the induction with thiopental 6 mg/kg and rocuronium 0.6 mg/kg. Anesthesia was maintained with 50%:50% O_2/N_2O and 1.5% sevoflurane. Systolic (SBP) and diastolic blood pressure (DBP) and heart rate (HR) measurements were recorded. When the SBP measurements were 20% higher than the preoperative values fentanyl doses were given as 1 μg/kg bolus. Intraoperative blood loss was determined with suction volumes and gauze counting. Additionally, the bleeding was rated according to From 5 point scale. Mann-Whitney U and X^2 tests were used for statistical analysis.
Results: The amount of bleeding were 52.7 ± 39.0 ml and 130.0 ± 73.1 ml in Group SD and S, respectively ($P = 0.02$). The bleeding according to the Fromm Scale were 1.7 ± 1.2 and 3.3 ± 1.0 in Group SD and S, respectively ($P = 0.006$). The amount of intraoperative fentanyl administered were 22.2 ± 35.2 μg and 155.6 ± 113.0 μg in Group SD and S, respectively ($P = 0.001$). The only significantly difference between TD and T groups was the amount of intraoperative fentanyl administered (35.4 ± 58.8 μg and 110.0 ± 81.0 μg, respectively; $P = 0.03$). When groups with and without dex administration were compared, SBP and DBP were lower from intraoperative 30th min to postoperative 40th min and the HR was lower from intraoperative 50th min to postoperative 40th min in patients with dex administration ($P < 0.05$).
Conclusion: Dex is concluded to lower intraoperative bleeding and fentanyl need in otorhinolaryngologic operations performed under controlled hypotension.

A-603

Does dexmedetomidine premedication have an effect on stress response?

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Background and Goals: The aim of our study was to investigate the effect of dexmedetomidine premedication on hemodynamic parameters, plasma cortisol, noradrenaline and glucose levels.
Materials and Methods: 57 patients (ASA I–II, aged 20–55 years) were included in the study. On the day of surgery, all patients received oral diazepam 10 mg and 40 mg famotidine 120–150 minutes before induction of anesthesia. Patients were divided into two groups; Group I (Dexmedetomidine Group) and Group II (Control Group). Group I patients (n = 30) received 1 μg/kg dexmedetomidine in saline (total volume 3 ml) in the deltoid muscle. No other premedication was given to the control group (n = 27). Mean arterial pressures (MAP), heart rates (HR), peripheric oxygen saturation (SpO_2) were recorded

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before operation, 1, 5, 10, 15, 20, 30, 40, 60, 90, 120 minutes after intubation, while extubation and 5, 10, 20, 30 minutes after extubation. Blood was drawn to check the plasma cortisol, noradrenaline (NA) and glucose levels 1 hour before induction, 1 and 30 minutes after skin incision, 1 minute after skin closure. If preoperative arterial pressure was above 169/90 mmHg, 1 μg/kg fentanyl was administrated, and dose was recorded. Postoperative complications (nausea-vomiting, hypo/hypertension, shivering, pain) were recorded.
Results: Patient characteristics and duration of anesthesia are shown in Table I. In control group, HR and MAP increased after intubation and extubation compared to baseline values ($p > 0.05$). However, in dexmedetomidine group HR, MAP were similar to baseline values. During surgery, HR was lower than baseline values in both groups ($p < 0.01$). There were no significant differences between groups in the cortisol and glucose levels. In control group, NA level 1 min. after skin incision was lower than the dexmedetomidine group.
Conclusions: We found that intramuscular dexmedetomidine premedication reduced only NA level after surgical incision without any changes in haemodynamic parameters, cortisol and glucose levels.

Table I. Patient characteristics and duration of anesthesia and surgery in all groups (mean ± SD).

	Group I	Group II
Age (yr)	45.3	49.6
Gender (F/M)	16/14	26/1*
Weight (kg)	68.4 ± 2.8	69.5 ± 2.3
Duration of anesthesia (min)	132.1 ± 12.5	95.3 ± 7.0*

*$p < 0.05$ vs. Group I.

A-604

Preclinical pharmacology of fadolmidine, a novel alpha$_2$-adrenoceptor agonist with potential as a spinal analgesic

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Background and Goal of Study: Fadolmidine (F) is an alpha$_2$-adrenoceptor agonist being developed as a spinal analgesic. We examined the primary pharmacology of F *in vitro* and in rodent models.
Materials and Methods: Agonism was studied at CHO cells expressing human alpha$_2$-receptor subtypes and promiscuous Galpha 16 protein with intracellular Ca^{2+} fluorescence detection. Activity at alpha$_{2D}$-receptors was studied in rat vas deferens. Male Sprague-Dawley rats were anesthetized and instrumented for monitoring responses to i.v. F (0.3–10 mcg/kg) or dexmedetomidine (D; 1, 3 or 10 mcg/kg) on heart rate (HR) and mean arterial pressure (MAP). Peripheral vasopressor and sympatholytic effects were studied in pithed rats. CNS-mediated effects of F or D (1–300 mcg/kg i.v.) were studied by mydriasis model in rats. Effects of s.c. F (10–3000 mcg/kg) and D (3 or 10 mcg/kg) on spontaneous locomotion (SL) were studied in mice.
Results and Discussions: F showed full agonist efficacy in all human alpha$_2$-adrenoceptor subtypes with EC_{50}s (nM) of 1.0, 1.2, 0.7 at alpha$_{2A}$-, alpha$_{2B}$-, alpha$_{2C}$-receptors, respectively. F was a full agonist also at alpha$_{2D}$-receptors, pD2 value 8.2. *In vivo*, F (1, 3 or 10 mcg/kg i.v.) dose-dependently increased MAP (max. +53% at 10 mcg/kg) and reduced HR (max. −21% at 10 mcg/kg). Minimum i.v. dose to increase MAP by 50 mmHg in pithed rats was F 0.23 mcg/kg (D 0.84 mcg/kg). ED_{50} was F 0.10 mcg/kg (D 0.47 mcg/kg) for inhibition of tachycardia. As signs of CNS-mediated effects, ED_{50}s for mydriasis were F 45.6 mcg/kg i.v. and D 1.8 mcg/kg i.v. F substantially reduced SL only at ⩾300 mcg/kg s.c. (cf. D ⩾ 10 mcg/kg).
Conclusion(s): (1) F is a potent full agonist at human alpha$_2$-adrenoceptors. (2) F penetrates the blood-brain barrier poorly after peripheral injection.

A-605

Preclinical pharmacology of intrathecal fadolmidine, a novel alpha$_2$-adrenoceptor agonist with potential as a spinal analgesic, in a rodent model

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Background and Goal of Study: Fadolmidine (F) is a potent alpha$_2$-adrenoceptor agonist being developed as a spinal analgesic. We examined analgesic and some supraspinal and peripheral *in vivo* pharmacological effects after intrathecal (i.t.) administration of F in rats.
Materials and Methods: Effects of single i.t. bolus injections of F (0.3, 1, 3, 10 or 30 mcg), clonidine (C; 0.3, 1, 3, 10 or 30 mcg), dexmedetomidine (D; 0.1, 0.3, 1, 3 or 10 mcg) or saline on: nociception (tail flick assay); sedation/motor performance (Rota-rod test plus automated spontaneous movement survey); body temperature; mydriasis; hemodynamics; GI motility were studied in conscious or anesthetized male Sprague-Dawley rats.
Results and Discussions: *Nociception:* all drugs induced dose-dependent analgesia. ED_{50}s (mcg, 95% CI) were: F 0.73 (0.24–2.2); C 6.4 (4.6–9.0); D 2.2 (1.1–4.3). *Sedation/coordination:* only D exhibited a significant effect in the Rota-rod test ($P < 0.0001$ vs controls). All compounds caused dose-dependent sedation; ED_{50}s were (mcg): F 19; C 4.0; D 0.63. Thus, ED_{50}sedation/ED_{50}analgesia ratios were: F 26; C 0.6; D 0.3. *Body temperature:* the lowest doses causing a statistically significant ($P < 0.05$) decrease in body temperature (vs controls) were (mcg): F 10; C 3; D 3. *Mydriasis:* a response to F was elicited only at 30 mcg (cf. meaningful effects of C from 3 mcg and D 1 mcg). *Hemodynamics:* the lowest dose for a statistically significant reduction in mean arterial pressure (MAP) vs control was (mcg): F 3 ($P < 0.05$), C 0.3 ($P < 0.05$); D 0.1 ($P < 0.01$). F ⩾ 3 mcg induced a brief initial increase in MAP, then a long-lasting decrease; HR decreased during both phases of the pressure change. *GI motility:* ED_{50}s for inhibition of GI motility were (mcg): F 18; C 4.9; D 1.3.
Conclusion(s): The effects of F are consistent with its characterization as a potent full agonist at alpha$_2$-adrenoceptors. The high ratio of ED_{50} for sedation:antinociception suggests F can be expected to confer analgesia without supraspinal adverse effects after i.t. administration.

A-606

Synergic effects between alpha2 agonist (medetomidine) and fentanyl with dissociative (tiletamine) and zolazepan in rats anaesthesia

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Background and Goal of Study: The synergistic effects between alpha2 receptor agonists and opioids may allow reducing the doses of all anaesthetic drugs, provide better analgesia and a more stable and safer anaesthesia. In this study we used a combination of tiletamine with zolazepam (Zoletil®), associated with medetomidine (alpha2 agonist) and fentanyl. This combination may increase their analgesic proprieties and reduce the Zoletil doses, providing an anaesthetic combination with good hypnosis, muscle relaxation and fast recovery.
Materials and Methods: 24 inbred rats, divided in 6 groups of 4. Each group received an intraperitoneal (i.p.) dose of one of six Zoletil, medetomidine and fentanyl combinations, respectively (I – 5/0.15/0.05; II – 5/0.15/0.1; III – 10/0.1/0.01; IV – 10/0.1/0.02; V – 20/0.1/0.01; VI – 20/0.1/0.02 mg/kg). The loss of righting reflex and the pedal withdrawal reflex were recorded along with the time and quality of recovery from the anaesthesia. The animals received atipamezole (alpha2 antagonist) 20 minutes after the loss of the pedal withdrawal reflex; the dose was 5 times superior to the medetomidine i.p. dose.
Results and Discussions: All animals reached surgical anaesthesia. The times (average/standard deviation in seconds) for induction, attainment of surgical anaesthesia (AofSA) and recovery were respectively: group I – 408/70, 1353/161, 130/73; group II – 342/50, 641/288, 504/113; group III – 273/63, 676/288, 504/113; group IV – 414/91, 1003/108, 1206/622; group V – 191/58, 389/84, 2288/808; group VI – 230/38, 565/69, 1659/644. The recoveries in groups I and II were excellent, while in groups V and VI the recoveries were very slow and with poor quality, however they reached surgical anaesthesia sooner. AofSA was very slow in the other groups, expressing weak analgesia. Variations within groups were large. Groups with higher fentanyl doses, showed no advantage for AofSA compared to the groups that received lower doses, however group II had a faster induction than group I.
Conclusion(s): The combination of medetomidine and fentanyl in low doses reduces the anaesthetic dose of Zoletil and provide good analgesia and muscle relaxation. The more adjusted combination is 5/0.15/0.1 mg/kg of Zoletil, medetomidine and fentanyl respectively.

A-607

Intravenous dexmedetomidine-propofol an alternative to propofol–fentanyl-combination in spinal laminectomy?

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Background and Goal of Study: In this study, we wanted to find out the effects of dexmedetomidine on the consumption of opioid and propofol,

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haemodynamics and recovery period when used for premedication and during general anaesthesia in patients undergoing spinal laminectomy.
Material and Methods: 40 ASA I–II patients undergoing lumbar laminectomy surgery were randomised into two groups. Group P and Group I patients, received dexmedetomidine 0.6 $\mu g\,kg^{-1}h^{-1}$ i.v. over a 15-min period. Anaesthesia was induced with i.v. fentanyl 1.5 $\mu g\,kg^{-1}$ and propofol in Group P, patients in Group I was induced with propofol and didn't receive fentanyl. Anaesthesia was maintained with air (50%), oxygen (50%), and propofol infusion which was adjusted to achieve a target BIS between 40–60. The propofol infusion was started at a rate of 10 mg $kg^{-1}h^{-1}$ in both groups. If hypertension or tachycardia developed during anaesthesia, it was accepted to be due to insufficient analgesia and then fentanyl was given (1 $\mu g\,kg^{-1}$) in Group P and infusion dose of dexmedetomidine was increased from 0.2 $\mu g\,kg^{-1}h^{-1}$ to 0.3 $\mu g\,kg^{-1}h^{-1}$ in Group I. Before induction, immediate and 60 . min after induction, before extubation and after extubation, mean arterial pressure, heart rate, propofol and fentanyl consumption were measured.
Results and Discussions: The two groups were similar in terms of age, weight, height and duration of surgery. Propofol doses for induction and maintenance were lower in group I. MAP values were significantly higher only after induction than the values of preoperative period in Group P. HR in Group I decreased significantly before extubation and was lower after induction, 60 min of the operation, before extubation and after extubation in Group P.
Conclusion: Dexmedetomidine infusion under BIS monitorisation maintained better haemodynamics and analgesia so that we did not have to use opioids and therefore avoided their side effects during general anaesthesia.

A-608

The effects of dexmedetomidine HCl as a premedication agent

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Background and Goal of Study: Premedication is often required in patients to provide anxiolysis and lessen the psychological impact of hospitalization and/or procedures (1). We present our experience with dexmedetomidine as an premedicant prior to anaesthetic induction.
Materials and Methods: After hospital scientific and ethic board approval, 60 patients ASA I–II, aged 18–59 years scheduled for elective surgery under general anaesthesia, were randomly distributed into 3 groups of 20 patients each. As premedication, the patients in group-I (n = 20) were given saline following in the induction 1 $\mu gr.kg^{-1}$ fentanyl, and group II were given dexmedetomidine (0.5 $\mu gr.kg^{-1}$) within 10 minutes intravenously, and group III were given dexmedetomidine (0.5$\mu gr.kg^{-1}$) within 10 minutes intravenously following 1 $\mu gr.kg^{-1}$ fentanyl in the induction. Before and after induction period; level of sedation and anxiety, haemodynamic parametres, quality of induction, response to induction, necessary of additional anaesthetic agent and possible side-effects were compared among the 3 groups.
Results: Ramsey sedation scores were 3, in 55% patients in group III, and 25% in group II, higher than placebo group ($p < 0.05$). The patients' anxiety with Visual Analog Scores (VAS), after premedication were 48.4 $\pm$ 15.9 in group I, 26 $\pm$ 8.8 in group II, 23.7 $\pm$ 10.1 in group III. VAS was found lower than placebo in group II and III ($p < 0.05$). Propofol requirement in induction was decreased in both group II and III compared to placebo (1.1 $\pm$ 0.2, 1.1 $\pm$ 0.2, 2.3 $\pm$ 0.3 mg kg^{-1} respectively. 5 in group III, and 2 patients in group II showed hypotension, 6 patients in group III, and 1 in group II showed bradycardia.
Conclusion: Dexmedetomidine should be considered as a reliable premedication drug for appropriate procedures. Fentanyl administration should be avoided after dexmedetomidine to prevent compromised haemodynamic side-effects.
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A-609

Postoperative nausea and vomiting and pain after transsphenoidal surgery: a review of 877 patients

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Background and Goal of Study: Although postoperative nausea and vomiting (PONV) and pain after supra- and infra-tentorial craniotomy have been evaluated in multiple studies, there is little data regarding pain or PONV after transsphenoidal procedures. Despite the popularity of transsphenoidal surgery, there has been no systematic review of PONV, pain, or associated risk factors. We conducted a retrospective review to provide insight on the mechanisms of PONV and postoperative pain in the transsphenoidal patient.
Materials and Methods: We reviewed the perioperative records of 877 patients undergoing transsphenoidal surgery by a single surgeon and established a patient database.
Results and Discussions: The overall incidence of postoperative emesis was 7.5%, significantly lower than most studies of neurosurgical patients. An intraoperative CSF-leak and subsequent fat grafting, the use of lumbar intrathecal catheter, and patients presenting for the resection of a craniopharyngiomas all had a significantly increased incidence of postoperative emesis (11.4%, 17.1%, and 18%, respectively). Interestingly, antiemetic prophylaxis did not decrease the risk of vomiting overall or in any cohort of patients; however, both droperidol and ondansetron decreased the incidence of nausea in the PACU. Regarding pain and morphine consumption, patients that later developed diabetes insipidus (DI) had a significant increase in morphine requirements in the PACU. No other disease state was associated with increased pain or morphine consumption in the PACU.
Conclusion(s): Although the incidence of PONV after transsphenoidal procedures is lower than that reported for supra- and infra-tentorial craniotomy, we have defined risk factors for postoperative emesis after transsphenoidal surgery. These include intraoperative CSF-leak and the need for fat grafting, use of a lumbar intrathecal catheter, and surgery for the resection of a craniopharyngioma.

A-610

A comparative study of dexamethasone plus midazolam, ondansetron, or saline as prophylactic antiemetic therapy in patients at high risk of postoperative nausea and vomiting

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Background and Goal of Study: The combination of antiemetic drugs could be a solution to prevent severe postoperative nausea and vomiting (PONV) (1). Midazolam may effectively reduce the frequency of PONV following general anaesthesia (2). We compared the prophylactic antiemetic efficacy of combining dexamethasone with midazolam or ondansetron for patients at high risk of PONV.
Materials and Methods: A total of 135 non-smoking female patients with a history of PONV or motion sickness were included in this prospective, randomized, placebo-controlled study. The patients received dexamethasone 8 mg before induction of anaesthesia and received midazolam 0.04 mg/kg (D + M), ondansetron 4 mg (D + O) or saline (D + S) 30 min before the end of anaesthesia. Relevant endpoints were prevention of early (0–2 h), and overall (0–24 h) PONV, and side effects. Sample size calculation was performed before starting the trials by using a statistical power analysis (N = 45). Data were analyzed using Fisher's exact test, Chi square test with Yates' correction, Mantel-Haenszel test and Wilcoxon's ranked sum test as appropriate.
Results and Discussions: Data [mean(SD) or number(%)] and sedation score (0–2 h, 1 = awake/alert and 5 = deep sleep) are shown in the table:

	D + M N = 44	D + O N = 43	D + S N = 42
Age (yr)	51 (12)	54 (13)	49 (14)
Weight (kg)	52 (9)	51 (7)	54 (7)
PONV 0–2 h	10 (23)*	8 (19)*	25 (60)
0–24 h	12 (27)*	10 (23)*	26 (62)
Sedation score	1.9 $\pm$ 0.4	1.7 $\pm$ 0.4	1.6 $\pm$ 0.6
Headache	0	2 (5)	0

*P < 0.05 vs D + S.

Conclusion(s): There was no significant difference in antiemetic efficacy or side effects profile when dexamethasone was combined with either midazolam or ondansetron and that both combination regimens are significantly more effective than dexamethasone alone.
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A-611

CYP2D6 genotype: Impact on prevention of postoperative nausea and vomiting (PONV) with granisetron and dolasetron

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Background and Goal of Study: We investigated the efficacy of granisetron and dolasetron in preventing postoperative nausea and vomiting (PONV). Since the metabolism of the various antiemetic 5-HT3 antagonists involves different isoforms of the hepatic cytochrome P450 system (1), we examined the relationship between the clinical efficacy of these drugs and polymorphic cytochrome P450 2D6 (CYP2D6) genotype.

Materials and Methods: This prospective, randomized, double-blind study involved 150 adult surgical patients with a moderate to high risk for PONV. All subjects received dexamethasone at induction followed by either 12.5 mg of dolasetron or 1 mg of granisetron. We analyzed the number of complete responders (no vomiting or rescue medication) during first 24 hours postoperatively. CYP2D6 genotyping was performed using a TaqMan real-time polymerase chain reaction.

Results and Discussions: The frequency of complete response was higher in the granisetron group (54.7%) as compared to dolasetron group (38.7%, χ^2 test, $p < 0.05$) in the 24 h post-discharge period. There was no significant differences ($p > 0.05$, χ^2 test) in the frequency of distribution in the CYP2D6 metabolizer status between the study groups. More than 2 copies of CYP2D6 gene were detected in 10 patients (6.6%). All patients with gene duplication carried repetition of fully functional CYP2D6 allele. In subjects receiving dolasetron, carriers of the duplication of the CYP2D6 allele predicting ultrarapid metabolizer (UM) status had a higher number of vomiting episodes ($p < 0.05$) than patients in the granisetron group.

Conclusion: It is postulated that the difference in the antiemetic efficacy between two investigated 5HT3 receptor antagonists may be associated with differences in the carrier status for the duplication of the CYP2D6 allele.

Reference:

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A-612

Prevention of postoperative nausea and vomiting (PONV) following open abdominal surgery: A double-blind, multicenter comparison of the NK1 receptor antagonist aprepitant with ondansetron.

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Background and Goal of Study: To compare the efficacy and tolerability profile of the NK1 antagonist aprepitant vs that of ondansetron for the prevention of PONV in inpatients after major surgery.

Materials and Methods: After written informed consent, 922 patients receiving general anesthesia for open abdominal surgery were randomly assigned to receive a single preoperative dose of aprepitant 40 mg p.o., aprepitant 125 mg p.o., or ondansetron 4 mg i.v. Vomiting episodes, use of rescue therapy, and nausea severity were recorded at multiple timepoints over 48 h postsurgery. The primary efficacy endpoints were (1) no vomiting over 0–24 h postsurgery and (2) complete response (no vomiting and no use of rescue therapy) over 0–24 h; secondary endpoint was no vomiting over 0–48 h. Logistic regression was used to compare treatments. Tolerability was evaluated by adverse events, physical and laboratory tests, awakening time, and duration of recovery from anesthesia.

Results and Discussions: Population characteristics and tolerability profiles were similar across groups. Efficacy results are shown in the table.

% (n/N) of patients	Aprepitant 40 mg p.o.	Aprepitant 125 mg p.o.	Ondansetron 4 mg i.v.
No vomiting (0–24 h)*	84 (246/293)	86 (253/293)	71 (200/280)
Complete response (0–24 h)**	64 (187/293)	63 (184/293)	55 (154/280)
No vomiting (0–48 h)*	82 (238/292)	85 (246/290)	66 (185/279)

*$P < 0.001$ for aprepitant 40 mg or 125 mg vs ondansetron; **Lower bound of the 1-sided 95% confidence interval for the odds ratio (aprepitant:ondansetron) >1.

Peak nausea score on 11-point verbal rating scale (0 = no nausea, and 10 = nausea as bad as it could be) (0–24 h)***			
Median	2	2	4
Lower quartile	0	0	0
Upper quartile	6	7	8

***For distribution of peak nausea scores, $P < 0.05$ for aprepitant 125 mg or 40 mg vs ondansetron.

Conclusions: Aprepitant was significantly more effective than ondansetron in reducing the incidence of vomiting and the severity of nausea, and was generally well tolerated.

A-613

The impact of neostigmine and atropine on bacterial growth

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Background and Goal of Study: Drugs used in anaesthesia and intensive care may support or inhibit bacterial growth (1). Medications supporting bacterial growth pose an infection risk if contaminated during preparation. Neostigmine is not only used to reverse nondepolarising muscle relaxants but also as an adjunct for epidural anaesthesia. In this study we investigated the impact of neostigmine and the mixture of neostigmine and atropine on bacterial growth at room temperature.

Materials and Methods: The growth of *Staphylococcus aureus* (ATCC 23923), *Escherichia coli* (ATCC 25922), and *Pseudomonas aeruginosa* (ATCC 27853) in neostigmine and in the mixture of neostigmine and atropine was investigated. Ten μL bacterial suspension was inoculated into neostigmine methylsulfate 500 μg mL^{-1} (Pharmamagist, Budapest, Hungary) and into the mixture of neostigmine 416 μg mL^{-1} and atropine sulfate 0.16 mg mL^{-1} (Egis, Budapest, Hungary) and kept at room temperature. The initial bacterial count was 2×10^3 colony forming units (cfu) mL^{-1}. At 0, 1, 2, 3, 5, 8, and 20 hours 10 μL was plated on Mueller–Hinton (MH) agar. Having incubated for 24 hours at 37°C the cfu was counted. The method was described in details elsewhere (2). Saline 0.9% and MH broth controls were also applied.

Results and Discussions: Both neostigmine and the mixture of neostigmine and atropine is bacteriostatic for the examined *S. aureus* and *E. coli* strains at room temperature. On the other hand neostigmine killed *P. aeruginosa* by the 20th hour and the mixture of neostigmine and atropine by the end of the 8th hour.

Conclusion(s): Our results suggest that the use of neostigmine and the mixture of neostigmine and atropine is safe as far as infection control is concerned when the syringes are kept at room temperature. A recent study examining the effect of neostigmine alone at 37°C on different strains revealed similar results (3).

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A-614

Efficacy of oral casopitant mesylate, a novel neurokinin-1 receptor antagonist, with intravenous ondansetron HCl in the prevention of postoperative nausea and vomiting (PONV) in high-risk patients

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Background and Goal of Study: We hypothesized that casopitant mesylate (GW679769, a novel NK-1 receptor antagonist) administered with ondansetron HCl would reduce frequency of PONV, one of the most common complications of surgery, in high-risk patients undergoing procedures associated with increased emetogenic risk.

Materials and Methods: This multicenter, randomized, double-blind, placebo-controlled, dose-ranging study enrolled 702 female patients with 4 known risk factors for PONV (Apfel simplified scoring scale) undergoing outpatient laparoscopic or laparotomic gynecologic surgery or laparoscopic cholecystectomy. Ondansetron HCl 4 mg IV was administered 1 h prior to anesthesia induction with placebo (control) or a single oral dose of casopitant mesylate 50, 100, or 150 mg. Primary endpoint was proportion of patients achieving a complete response (no vomiting, no retching, no rescue medications, no premature withdrawal from study) in the 0–24 h after emergence from anesthesia (Cochran-Armitage trend test). Secondary endpoints included nausea/significant nausea; time to emesis, rescue, and awakening; and safety.

Results and Discussions: The proportion of patients with complete response was higher in each casopitant mesylate group (59%, 62%, 61%, respectively) vs ondansetron control (40%, $P = 0.0006$). At 24 h, >90% of patients in

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each dose group had no emesis vs control (71%, $P < 0.0001$); time to emesis was longer ($P < 0.0001$); and need for rescue medication was reduced ($P = 0.0036$). Initial analysis revealed no significant differences in nausea among the treatment groups, however, posthoc analysis of nausea scores in the 6–10 range (Likert 10-point scale) at 0–24 h showed significant reduction in severity of nausea in subjects receiving casopitant mesylate (50 mg dose vs control was 41% vs 61%; $P = 0.0012$). All active doses appeared to be well tolerated, with similar proportions of patients in each study arm reporting at least one adverse event. No differences were observed in time to awakening.

Conclusion(s): Oral casopitant mesylate at doses of 50, 100, and 150 mg with ondansetron 4 mg IV administered 1 h prior to anesthesia induction demonstrated a significant difference vs ondansetron alone in preventing PONV in the first 24 h after surgery. Improvement in nausea severity scores were also observed. Phase III studies in PONV are planned for the future.

A-615

Comparison of ramosetron and ondansetron for the prevention of nausea and vomiting after gynecologic surgery

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Background and Goal of Study: Ramosetron (Nasea®, Yamanouchi, Tokyo, Japan) is a new selective 5-HT_3 receptor antagonist, and has more potent antiemetic effect than other 5-HT_3 receptor antagonists.[1–2] The aim of the study was to compare the efficacy of ramosetron and ondansetron for the prevention of postoperative nausea and vomiting (PONV) after gynecologic surgery.

Materials and Methods: In this prospective, randomized, double-blinded, placebo-controlled study, 162 healthy patients, who underwent operation under general anesthesia using sevoflurane, were investigated. Patients were divided into three groups: the ramosetron group ($n = 54$) was administered ramosetron 0.3 mg, the ondansetron group ($n = 54$) 8 mg ondansetron, and the placebo group ($n = 54$) saline before the end of surgery. Postoperative pain was controlled with *iv* PCA using fentanyl. The incidence and severity of PONV during the first 24 h after surgery were evaluated.

Results and Discussions: The incidence of nausea was lower in the ramosetron (50%) and ondansetron (44%) than in the placebo group (69%) ($P < 0.05$), and the incidence of vomiting was lower in the ramosetron (17%) and ondansetron (20%) than in the placebo group (44%) during the 24 h postoperatively ($P < 0.001$). The VAS score for nausea was also lower in the ramosetron and ondansetron than in the placebo group ($P < 0.05$). However, there are no significant differences in the incidence and severity of PONV between the ramosetron and the ondansetron group.

Conclusion(s): Ramosetron and ondansetron significantly prevents PONV in female patients during the first 24 h after gynecologic surgery. However, the antiemetic efficacy of the ramosetron was not differ from that of the ondansetron.

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A-616

Infusion of 1% glucose and magnesium during surgery maintains serum magnesium concentration and prevents catabolism

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Background and Goal of Study: Lack of supplementation of glucose and magnesium may cause disorders in glucose metabolism and/or hypomagnesemia, especially in elderly patients undergoing surgery. In this study, we examined the usefulness of 1% glucose acetated ringer solution containing 2 mEq/L of Mg^{2+} in elderly orthopedic patients.

Material and Methods: After institutional approval and written consent, 30 patients classified ASA I–II, 51–80 year-old, were randomly assigned to receive infusion of acetated ringer solution; 1) The 'C group' received Na^+ 130 mEq/L, Mg^{2+} free; or 2) The 'P group' received 1% glucose, Na^+ 140 mEq/L, Mg^{2+} 2 mEq/L, Physio140™ (Otsuka, Japan). Oral intake was stopped for 12 h before anesthesia. Both solutions were infused at 15 mL/kg for the first 1 h, and maintained at 4 mL/kg/h thereafter. Blood samples were collected from the antebrachium vein thrice: before infusion, 1 h and 4 h after the start of infusion. Measurements of electrolytes, glucose metabolism and blood cell counts were assessed every time.

Results and Discussion: There were no significant differences in patients' demographics between groups. No change was observed in serum Mg^{2+} concentration in the P group, while it decreased significantly to 1.7 mg/dL in the C group ($p = 0.001$). In the P group, blood glucose ($p = 0.001$) and insulin ($p = 0.002$) increased significantly after infusion, however, values returned towards baseline 4 h after the start of infusion. Serum ketone bodies did not increase in the P group. On the contrary, in the C group, serum ketone bodies ($p = 0.016$) and serum hydroxybutiric acid ($p = 0.026$) significantly increased 4 h after the start of infusion.

Conclusion: Infusion of 1% glucose acetated ringer solution containing 2 mEq/L of Mg^{2+} during surgery maintains serum Mg^{2+} concentration, and prevents catabolism in elderly orthopedic patients.

A-617

Long-duration sevoflurane effects on postoperative hepatic and kidney function

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Background and Goal of Study: Sevoflurane is degraded by carbon dioxide absorbents to a difluorovinyl ether (compound A) that can cause renal and hepatic injury in rats. The aim of the present study is to evaluate the effects of long-duration sevoflurane anesthesia (over 8 h) on hepatic and renal functions in humans.

Material and Methods: After approval by local ethics committee, 15 patients, aged between 35–75 year, ASA I–III, undergoing free flap operation were studied. Anaesthesia was induced with thiopental sodium 5 mg kg^{-1} and vecuronium bromide 0.1 mg kg^{-1} and maintained with sevoflurane 2% in 33% O_2 66% N_2O. Renal functions were assessed by blood urea nitrogen and serum creatinine. Hepatic functions were assessed by serum aspartate aminotransferase, alanine aminotransferase, lactate dehydrogenase, and total bilirubin. Blood samples were collected before the operation and on first and sixth days after the operation. Statistical analysis was performed Repeated Measurement Variance Analysis and Mann-Whitney U tests. $P < 0.05$ was considered significant.

Results and Discussion: The mean duration of operation was 13.6 ± 1.1 hours. Serum aspartate aminotransferase, alanine aminotransferase, lactate dehydrogenase, total bilirubin, blood urea nitrogen, serum creatinine were not different in any measurement time ($P > 0.05$).

Conclusion: Serum aspartate aminotransferase, alanine aminotransferase, lactate dehydrogenase, total bilirubin, blood urea nitrogen, serum creatinine seem not to be affected by prologed use of sevoflurane.

A-618

10% lidocaine spray attenuates perioperative hemodynamic response and coughing reflexes during emergence and extubation in suspension laryngoscopy procedures

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Background and Goal of Study: It is well known that suspension laryngoscopy produces marked increases in blood pressure (BP) and heart rate (HR) (1). Coughing during emergence sometimes causes adverse clinical problems. Effects of 10% lidocaine spray in attenuating the perioperative hemodynamic response and coughing reflexes during emergence and extubation in suspension laryngoscopy procedures were investigated.

Materials and Methods: Fifty ASA 1 patients scheduled for excision of vocal polyp under suspension laryngoscopy procedure were randomly divided into two groups ($n = 25$ for each group) and intubated without 10% lidocaine spray (group 1) control or given 1.5 mg/kg lidocaine 10% sprayed to pharyngolaryngeal and intratracheal sites 90 sec prior to intubation (group 2). Anesthesia was maintained using desflurane in O_2/N_2O 50%. BP and HR were measured at preinduction (T0), 1 (T1), 3 (T2), 5 (T3) min after tracheal intubation,

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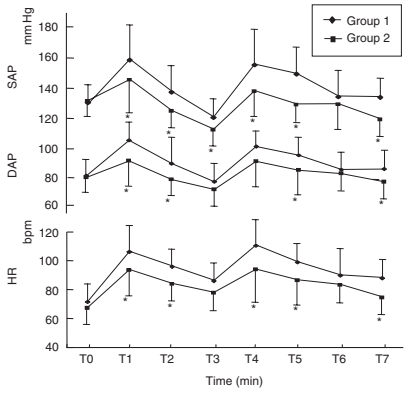
1 (T4), 3 (T5), 5 (T6), and 10 (T7) min after suspension laryngoscopy. The number of coughs was recorded from 5 min before until 5 min after extubation. Statistic analysis was performed using two-way repeated-measures ANOVA and Student's t-test, $p < 0.05$ being significant.

Results and Discussions: Data (Mean ± SD) are shown in the table and figure.

	Group 1 (n = 25)	Group 2 (n = 25)
Sex (m/f)	16/9	18/7
Age (yr)	52.5 ± 10.4	49.4 ± 11.5
Height (cm)	165.8 ± 7.6	169.7 ± 5.9
Weight (kg)	62.3 ± 11.4	69.5 ± 7.6
Operation time (min)	14.7 ± 7.1	12.9 ± 6.3
Smoker	11	10
Number of coughs per patient		
a. 5 min before extubation	12.8 ± 6.7	6.1 ± 5.2*
b. 5 min after extubation	8.3 ± 6.6	4.6 ± 2.9*
c. a + b (10 min)	21.1 ± 7.6	10.7 ± 5.8*

*$p < 0.05$ vs group 1.



*$p < 0.05$ vs group 1. SAP: systolic arterial pressure; DAP: diastolic arterial pressure; HR: heart rate.

Conclusion(s): 10% lidocaine sprayed to pharyngolaryngeal and intratracheal sites before intubation is effective method in attenuating the perioperative hemodynamic response and coughing reflexes during emergence and extubation in suspension laryngoscopy procedures.

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A-619

Monitored anaesthesia care with remifentanil vs anaesthesia with propofol-alfentanil for ultrasound guided transvaginal oocyte retrieval: effect on fertilization rate, cleavage rate, implantation rate and pregnancy rate

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Background and Goal of Study: Anaesthetic techniques for oocyte retrieval may affect the results of in vitro fertilization program (IVF) (1, 2). The aim of the study is to compare the effect of monitored anaesthesia care (MAC) with remifentanil versus general anaesthesia with propofol and alfentanil in IVF outcome.

Materials and Methods: In this randomized prospective study 40 women of ASA I–II, who underwent ultrasound transvaginal oocyte retrieval under either general anaesthesia with midazolam, alfentanil and propofol infusion (group I, 20 cases) or under MAC with midazolam and remifentanil infusion (group II, 20 cases) respectively, were compared for collected oocytes (CO), matured oocytes (MO), fertilization rate (FR), cleavage rate (CR), implantation rate (IR) and pregnancy rate (PR). The prognostic factors as age, body weight, duration of procedure, smoking habitant, infertility (primary or secondary) and IVF protocol, were also recorded. These preliminary data were analyzed using the ANOVA and the quality control of Yates Chi-Square test, in SPSS.

Results and Discussions: The statistical analysis of prognostic factors did not reveal any significant difference. There were no significant differences in CO, MO, FR, CR, IR and PR between two groups (ANOVA). Data (Mean ± SD, p) are shown in the table:

	CO	MO	FR	CR	IR	PR
Group I	6.6 ± 5.1	6.25 ± 5.0	70.2 ± 23.9	93.5 ± 14.0	25.8 ± 37.2	40.0 ± 50.2
Group II	7.8 ± 3.9	7.25 ± 3.8	68.5 ± 24.3	85.7 ± 24.5	16.6 ± 32.8	25.0 ± 44.4
p	0.39	0.72	0.83	0.22	0.41	0.32

Conclusion(s): Monitored anaesthesia care with remifentanil compared with general anaesthesia with propofol and alfentanil does not significantly affect the IVF outcome, although that the implantation rate and the pregnancy rate tended to be higher in the propofol group.

References:

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A-620

Fast-track anesthesia for laparoscopic cholecystectomy: A multicenter randomized comparison between sevoflurane/remifentanil and desfluorane/remifentanil

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Background and Goal of Study: The aim of this study is to evaluate the effects of sevoflurane and desflurane in combination with intravenous remifentanil on time for PACU discharge (Figure) and proportion of PACU bypass after elective laparoscopic cholecystectomy.

Materials and Methods: With Ethical Committee approval and patients' written consent, 231 ASA physical status I–II patients, undergoing elective laparoscopic cholecystectomy in 7 University teaching hospital, were randomly allocated to receive a desflurane-remifentanil (n = 105) or sevoflurane-remifentanil (n = 126) based anaesthetic. A blind observer recorded times for emergence and PACU discharge, proportion of PACU bypass, and occurrence of adverse events.

Results and Discussions: Intraoperative cardiovascular stability was similar in the two groups. Emergence, response and extubation occurred earlier after desflurane (5.4 ± 3 min, 5.5 ± 3 min, and 7.5 ± 4 min) than sevoflurane (6.6 ± 3.5 min, 7.2 ± 4 min, and 9.1 ± 4.2 min) (P = 0.0005, P = 0.05, and P = 0.003, respectively). PACU bypass was possible in 44 desflurane-remifentanil patients (41%) and 55 sevoflurane-remifentanil patients (43%) (P = 0.69), while PACU discharge occurred after 46 min (25th–75th percentiles: 18–40 min) with desflurane and 64 min (25th–75th percentiles: 20–50 min) with sevoflurane (P = 0.04). PONV was observed in 40 desflurane-remifentanil patients (36%) and 53 sevoflurane-remifentanil patients (42%) (P = 0.42).

Conclusion(s): Both the desflurane-remifentanil and sevoflurane-remifentanil combinations provide a similarly adequate intraoperative cardiovascular stability. Emergence and PACU discharge were faster with desflurane-remifentanil than sevoflurane-remifentanil, but this was not associated with a larger proportion of PACU bypass, confirming that no clinically relevant differences are present between the two drugs.

A-621

Inhalation induction with 2%, 4% and 6% sevoflurane in cardiac surgery

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Goal of Study: To compare time, haemodynamic changes and side-effects of inhalation induction with 2%, 4% and 6% sevoflurane in patients scheduled for cardiac surgery.

Materials and Methods: Sixty-nine patients scheduled for cardiac surgery were included and randomised into three groups depending on the sevoflurane concentration used (2%, 4% or 6%). A tidal breathing technique without priming of the anaesthetic breathing system and with a fresh gas flow of 12 litre/min was selected. Premedication with midazolam (10 μg/kg) and fentanyl (1 μg/kg) was given IV. Endotracheal intubation was facilitated with rocuronium (0.6 mg/kg) and fentanyl (3–5 μg/kg) IV. We recorded: loss of response to verbal command and tactile stimulus, loss of eyelash reflex, apnea and airway control times. Mean arterial pressure (MAP), heart rate (HR), oxygen saturation (SpO_2), end-tidal sevoflurane and BIS were measured. Side-effects during induction such as body movement, coughing, laryngospasm or breath holding were recorded. Calculated sample size was 23 patients per group. Repeated measures ANOVA was used to analyse differences.

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Results: All groups were similar with regard to sex, age, weight, height, ASA, procedure, medication, airway evaluation and Cormack-Lehane laryngoscopic view. Induction times in seconds are shown as mean ± SD.

	Verbal command	Tactile stimulus	Eyelash reflex	Apnea	Airway control
2%	148* ± 74	190* ± 77	194* ± 80	202* ± 80	242* ± 97
4%	107 ± 28	128 ± 28	131 ± 27	137 ± 39	177 ± 38
6%	102 ± 22	118 ± 25	121 ± 25	124 ± 33	166 ± 48

*$p < 0.015$ compared with 4% and 6% sevoflurane.

There were no significant differences in MAP, HR, SpO_2 and BIS between the three groups. Incidence of side-effects was significantly higher in the 2% (movement) and 6% (breath holding) sevoflurane groups ($p < 0.01$).
Conclusion(s): In the setting of cardiac surgery, inhalation induction with 4% and 6% sevoflurane is faster than with 2%. All concentrations give haemodynamic stability during induction. The incidence of side-effects with 2% and 6% sevoflurane is higher than with 4%, but it does not interfere with induction.

A-622

The effect of fentanyl on the lower esophageal sphincter during rapid sequence induction

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Background and Goal of Study: The lower esophageal sphincter (LES) is the main barrier to avoid regurgitation. The use of rapid sequence induction (RSI) is the golden standard when there is an increased risk of regurgitation. We wanted to study the effects of fentanyl on LES during a modified RSI, which has not been studied before.
Materials and Methods: The study was approved by the regional research ethics committee. We used a Dent sleeve catheter placed through the mouth into the esophagus and stomach. LES pressure (LESP) and gastric pressure were then continuously recorded. The barrier pressure (BrP) was calculated as BrP = LESP – gastric pressure. At the end of the catheter a plastic bag was filled with 200–400 ml of air to resemble a full stomach. Eleven healthy male volunteers were anesthetized twice. They were randomized to receive either fentanyl 2 μg/kg or placebo. Three minutes later propofol 2 mg/kg followed by succinylcholine 1 mg/kg another minute later was administered.
Results:

Table 1. LES pressure. Median (range)

	Fentanyl	Placebo	
Propofol	9.5 (5.4–25.6)	9.1 (0.6–42.5)	p = 0.62
Succinylcholine	7.7 (1.6–25.0)	11.4 (0.0–52.9)	p = 0.33

Table 2. Barrier pressure. Median (range)

	Fentanyl	Placebo	
Propofol	4.5 (−0.7–21.5)	6.4 (−4.2–40.3)	p = 0.62
Succinylcholine	3.0 (−3.3–21.5)	3.1 (−6.9–51.2)	p = 0.91

Table 1 and 2: LES pressure and Barrier pressure one minute following propofol and succinylcholine.
Statistics: Wilcoxon Signed Rank Test.
Conclusion(s): In this randomized double-blind cross-over study, the use of fentanyl did not make any significant difference on LES pressure or barrier pressure one minute following propofol and succinylcholine during a modified RSI.

A-623

Optimal settings to adjust volatile end-tidal fraction: fresh gas flow or delivered fraction?

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Background: Depth of hypnosis is correlated to the end-tidal fraction (Fet). Desired Fet value may be achieved by setting either the delivered fraction (Fd) or the fresh gas flow (FGF). The aim of this study was to compare efficacy and cost of both settings to achieve a Fet of 1 MAC.
Methods: 40 patients, ASA I–II, scheduled for general anesthesia > 30 min with intubation were allocated to receive sevoflurane or desflurane after IV induction following 2 regimens. In "HFGF", FGF was open at 10 L/min and Fd set 20% above desired Fet until reached, then the circuit was closed at 1 L/min. When turning off, the circuit was open at 10 L/min. In "LFGF", the circuit was closed at 1 L/min and Fd set to max possible value until desired Fet was reached, then Fd was decreased to 20% above desired Fet. When turning off, FGF was kept at 1 L/min. All breezed O_2/N_2O 50%. Time to reach 80 or 100% of Fet, 50% decrement time at the end and volatile consumption were compared by ANOVA.
Results: Desired Fet was achieved in all patients and significantly faster in LFGF, with marked overshoot (table). Decrement time and extubation were faster in HFGF. Volatile consumption was lower in LFGF. No significant difference was found between the two agents.

	HFGF sevo	LFGF sevo	HFGF des	LFGF des
Time (min) – >80% Fet	2.7 ± 0.9	1.4 ± 0.3*	3.7 ± 2.7	1.4 ± 0.3*
Fet not reached at 10 min. (n)	6	0	6	0
% overshoot (Fet max)	0	56 ± 19*	0	37 ± 14*
50% decrement Fet (min)	0.9 ± 0.3	7.3 ± 2.5*	1.0 ± 0.2	6.8 ± 1.5*
Consumption (mL/min)	0.12 ± .02	0.07 ± .01*	0.34 ± .1	0.14 ± .02*

*$p < 0.05$ vs. other regimen, same vapour.

Discussion: Low FGF with Fd overshoot is the fastest though the most economic setting to increase Fet to a desired value. Conversely, a fast Fet decrease was obtained by high FGF. FGF is a relevant factor to overwrite kinetic difference between sevoflurane and desflurane. Behaviour of more soluble agents should be explored the same way.

A-624

Hemodynamic response in remifentanil and fentanil anesthesia for prolonged, major maxillofacial procedures

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Background and Goal of Study: Current management of oral cancer following tumor resection includes reconstruction of the surgical defect with free vascularized flaps. The aim of this study is comparison hemodynamics and depth of anesthesia in remifentanil (RFNT) and fentanil (FNT) analgesia and evaluation of drug consumption in two stages of operation.
Materials and Methods: After ethics committee approval and written informed consent 25 adult patients, ASA I–III were randomly qualified to one of two groups. First group received RFNT n = 13, 51 (±9.09) yr old, anesthesia duration 9.11 h and second one FNT n = 12, 57 (±9,9) yr old, anesthesia duration 9.03 h. Standard monitoring was applied. The following parameters were recorded and analyzed: systolic artery pressure (SAP), diastolic artery pressure (DAP), heart rate (HR) and bispectral index (BIS). Analogous, successive hours of anesthesia for two stages of surgery were compared. There were also studied and compared hemodynamic parameters and drug consumption during resection and reconstruction stage in each opiod group. Statistical analysis was performed Mann-Whitney test.
Results and Discussions: In the 2 and 3 hour of resection stage significant decrease SAP ($p = 0.019$, $p = 0.04$) and DAP ($p = 0.026$, $p = 0.021$) in RFNT group were observed. There was also increase SAP ($p = 0.0001$) in last hour of reconstruction in this group. No difference was noticed among HR and BIS analysis. Consumption of atracurium was smaller ($p = 0.024$) in 1 hour and sewoflurane in last hour ($p = 0.02$) of anesthesia in FNT group. When compared drug consumption in each opioid group there was less atracurium application in reconstruction stage ($p = 0.0001$) in both groups and less FNT consumption during reconstruction surgery. There was no difference in opiod consumption between two stages in RFNT group.
Conclusion(s): 1. RFNT (15 μg/kg/h) compared to FNT (3 μg/kg/h) decreases blood pressure during resection stage at similar depth of anesthesia. 2. At the end of anesthesia SAP increases when RFNT is used. 3. Minor requirement for FNT during reconstruction is probably result of pharmacokinetic properties but not as a result of less pain stimulation. Supposition for localization source of nociceptive stimulation should to be examined.

A-625

Recovery from anaesthesia with desflurane or with sevoflurane in oncologic abdominal surgery in elderly patients

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Background and Goal of Study: Fast recovery from anaesthesia is desirable in elderly patients. Desflurane (DES) and Sevoflurane (SEV) show lower solubility, lower accumulation in fat tissues and faster emergence times after

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anaesthesia than other inhaled anaesthetics. The aim of the study was to compare the recovery from DES or SEV anaesthesia in elderly patients.
Materials and Methods: 40 patients ⩾ 65 years, ASA II–III scheduled for elective oncologic abdominal surgery were randomly assigned to receive either DES (n = 20) or SEV (n = 20) as inhalation agents for maintenance of anaesthesia (0.6–0.8 MAC) in 40% of oxygen. Induction of anaesthesia was performed with remifentanil (1 μg/kg), propofol, rocuronium and maintained with remifentanil infusion (0.2–0.5 μg/kg/min) and with selected inhaled anaesthetics (DES or SEV). At the end of the surgery, anaesthetics were discontinued and fresh gas flow was maintained with oxygen 100%. The times to spontaneous ventilation, eye opening, extubation and orientation to name and date of birth were recorded. Student t test was used for statistical analysis. Data are expressed as mean ± SD and $p < 0.05$ was considered significant.
Results and Discussions: Both groups were comparable in respect of demographic data, anaesthetic dosages and duration of anaesthesia, also BP and HR remained within 20% of baseline value. Recovery times were significantly shorter for desflurane than for sevoflurane.
Conclusion(s): Desflurane was associated with a faster recovery than sevoflurane after anaesthesia for onchologic abdominal surgery in elderly patients.
References:
1 Heavner JE, et al. Br J Anaesth 2003; 91: 502–6.
2 Chen X, et al. Anesth Analg 2001; 93: 1489–94.

Paediatric Anaesthesia and Intensive Care

A-626

Sedation in paediatric patients affected by Metachromatic Leukodystrophy

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Background and Goal of Study: The aim of this study was to compare hypnotic drug requirements between paediatric patients affected or unaffected by Metachromatic Leucodistrophy (MLD) undergoing deep sedation for brain MRI.
Materials and Methods: 39 patients (19 pts with suspected/diagnosed MLD; 20 pts unaffected by MLD) aged 0–16 years, ASA I–III, undergoing brain MRI, were enrolled. The following data were recorded: BMI, age, sex, duration of procedure, drug dosage, side effects.

Sedation was performed as follows: patients < 3 years old (n = 7) were given a TPS 5 mg/kg induction bolus, plus TPS 2.5 mg/kg rescue boluses if needed; patients > 3 years old (n = 32) were given a propofol 1–1.5 mg/kg induction bolus plus propofol 0.1–0.15 mg/kg/min C.I. if needed.

Results and Discussions: No differences in the anthropometrical variables, incidence of side effects and duration of procedures were observed. No major adverse events were observed. Only body mass index (BMI) resulted significantly lower in children > 3 years old affected by MLD ($P = 0.0004$) than in healthy children. The mean dosage of thiopental required to abolish patient's reaction when completing MRI procedure was 102.5 ± 9.6 mg (90–110) and 79 ± 46.5 (32–125) in MLD and HLT groups, respectively ($p = 0.62$).In children aged > 3 yrs propofol consumption was 97.3 ± 61.8 (40–250) in HLT group while in MLD group propofol consumption was 74.8 ± 55.4 ($p = 0.09$).
Conclusion(s): This investigation demonstrates that propofol requirements in children affected by MLD undergoing brain MRI resulted 20–25% lower than in healthy children. This difference failed to reach statistical significance, but apparently there is a trend ($p = 0.09$) towards a lower requirement of anaesthetic drug in MLD-affected children. This could be best explained by the difference in BMI between the groups. As recommended by current guidelines we used thiopental as the anaesthetic drug of choice in children aged < 3 yrs.

In this group, no difference was found in anesthetic drug requirements between children affected by MLD and healthy ones.

A-627

Do adult predictive tests predict difficult intubation in children?

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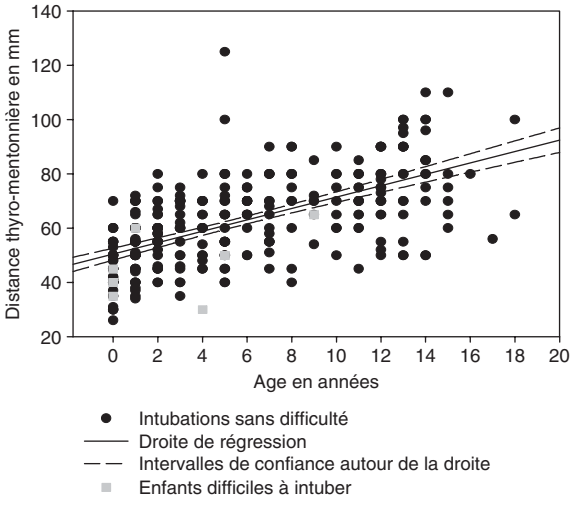
Background and Goal: Whereas several clinical signs and tests like Mallampati have been described to predict difficult intubation (DI) in adults, very few studies evaluated them in children. Our study aimed to evaluate the efficiency to predict DI in children of scores and tests validated in adults.
Material and Methods: In this prospective study, 347 children were assessed preoperatively using the modified Mallampati test, thyromental distance, and interincisor distance mouth completely open. After induction of general anaesthesia, we recorded the time and the number of laryngoscopies needed to achieve intubation and Cormack and Lehane grade. DI was defined by more than 2 laryngoscopies and/or more than 10 minutes required to succeed intubation.

Statistical analysis was performed using a Student t-test and Chi2 according to sample size and variable type.
Results and Discussion: Tracheal intubation was difficult in 8 (2.3%) patients. The inter incisor gap and Mallampati test were unsuccessful for patients less than 18 months and very difficult for those less than 6 years; more over a high Mallampati test had poor reliability with Cormack and Lehane grade. The thyromental distance was smaller in child with DI than the others and it seems to be the most predictive test for DI.

Distribution of the thyromental distance according to age:



Conclusion: The adult predictive test for DI like Mallampati test and interincisor gap fail to predict a DI in children. Thyromental or sternomental distance seem more reliable but are yet to be evaluated on a larger population than in our study.

A-628

Oropharyngeal leak pressures in different head-neck positions from the laryngeal tube vs the laryngeal mask airway in pediatric patients

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Background and Goal of Study: Oropharyngeal leak pressure is an important value for positive pressure ventilation as well as for airway protection from supracuff soiling. In adults leak pressure of the laryngeal mask airway varies in different head-neck positions [1]. Therefore we investigated if there is a difference in oropharyngeal leak pressures in different head-neck positions from the laryngeal tube (LT, VBM, Germany) and the classic laryngeal mask airway (LMA, Intavent, UK) in pediatric patients.
Methods: With IRB approval and written informed consent 52 anaesthetised non-paralysed children were randomly allocated to receive either a

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LMA or a LT. The appropriate sizes of the airway devices were chosen according to the manufacturer's recommendations and intracuff pressure was adjusted to 60 cm H_2O. Oropharyngeal leak pressure was measured by closing the expiratory valve of the circle system at a fixed fresh gas flow of 3 litre min^{-1} and noting the airway pressure at which the dial on the manometer reached equilibrium. These measurements were done in five positions (neutral first, then flexion, extension and rotation to the right and left side). Statistics: Mann-Whitney – or t-test, data are mean ± SD.

Results: The mean leak pressure for the laryngeal tube was significantly higher than that for the classic laryngeal mask airway in all five different head-neck positions (neutral: LT 27.1 ± 7.4 vs LMA 21.9 ± 7.0 cm H_2O, $p < 0.02$, flexion: LT 29.9 ± 6.9 vs LMA 23.8 ± 6.9 cm H_2O, $p < 0.01$, extension: LT 26.8 ± 8.1 vs LMA 18.6 ± 6.8 cm H_2O, $p < 0.001$, right rotational position LT 27.8 ± 6.5 vs LMA 22.7 ± 5.3 cm H_2O, $p < 0.001$, left rotational position LT 28.6 ± 6.6 vs LMA 21.0 ± 5.0 cm H_2O, $p < 0.001$).

Conclusion: Like in adults different head-neck positions lead to different leak pressures in both devices also in pediatric patients. Since the leak pressures for the LT were higher in all positions compared to the LMA, the LT provides a more effective seal of the oropharyngeal tract.

Reference:

1 Brimacombe J, Keller C. Eur J Anaesthesiol 2003;20:65–69.

A-629

Intracuff pressures from the laryngeal tube versus the classic laryngeal mask airway in pediatric patients

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Background and Goal of Study: There is some evidence that high intracuff pressures of supraglottic airway devices are responsible for postoperative pharyngolaryngeal morbidity [1]. Therefore we compared the intracuff pressures from either the laryngeal tube (LT, VBM, Germany) and the classical laryngeal mask airway (LMA, Intavent, UK) after inflating the cuffs as recommended by the manufacturer in pediatric patients.

Methods: With institutional review board approval and written informed consent 52 anaesthetised non-paralysed children were randomly allocated to receive either a LMA or a LT. The appropriate sizes of LT or LMA were chosen according to the manufacturer's recommendations and after insertion the cuffs were inflated with air according to the manufacturers instructions (LT size 1 20 ml, LT size 2 35 ml, LT size 3 60 ml, LT size 4 80 ml, LMA size 1 4 ml, LMA size 1.5 7 ml, LMA size 2 10 ml, LMA size 2.5 14 ml, LMA size 3 20 ml). Cuff pressures were measured with a manometer and adjusted to an intracuff pressure of 60 cm H_2O, since this intra-cuff pressure was the pressure recommended by the manufacturer of each device. Statistics: Mann-Whitney-U-test, data are mean ± SD.

Results: 26 children received a LT (5 size 1, 17 size 2, 2 size 3 and 2 size 4) and 26 children received a LMA (1 size 1, 3 size 1.5, 7 size 2, 12 size 2.5 and 3 size 3) as airway device. The initial intracuff pressure was significantly higher using the LMA (99.7 ± 28.1 cm H_2O) compared with the LT (83.5 ± 21.0 cm H_2O) ($p < 0.01$).

Conclusion: Intracuff pressures after inflating the airway devices according to the manufacturer's instructions often exceed 60 cm H_2O not only in adult patients but also in children. Since high intracuff pressures may impair pharyngeal mucosal perfusion intracuff pressure should always be measured and adjusted to 60 cm H_2O if necessary what is the intracuff pressure that is recommended by the manufacturer of each device.

Reference:

1 Brimacombe J, et al. Anesthesiology 1999;91:1661–5.

A-630

Fetoscopic tracheal occlusion in congenital diaphragmatic hernia

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Background and Goal of Study: The lung hypoplasia degree in fetuses with congenital diaphragmatic hernia (CDH) determines mortality rate (1). The aim of this study was to compare the survival and lung growth rate in babies following intrauterine fetoscopic tracheal occlusion (FETO) treatment versus babies following conventional postnatal treatment. Complications due to the anaesthetic management were also valued.

Patients and Methods: After institutional approval, a prospective study was carried out on 16 prenatal diagnosis cases of CDH with lung-head ratio eco graphic index (LHR) less than 1 and the presence of the liver in the thorax. In the A-group (11 patients) the tracheal balloon (PLUG) was placed by FETO in the 26–27 weeks' gestation (WG) undergoing maternal epidural anaesthesia and a remifentanyl infusion 0.05–0.1 μg/kg/min. The fetus was anaesthetized by intramuscular route with fentanyl 20 μg/kg, atropine 10 μg/kg and vecuronium 0.2 mg/kg. The lung growth was monitorized by eco graphic and magnetic-volumetric lung resonance. The PLUG was removed at the 34 WG under the same anaesthesia technique than it was placed, except for the 2 first cases, in which was removed at birth. In the B-group (5 patients) no intrautero treatment was carried out.

Results and Discussions: After three weeks of FETO A-group showed an increase in the LHR from 0.6–0.99 to 2.3–2.8. Likewise, a 25% increase (18–35% to 45–77%) was seen in the relative lung volume. There was no maternal anaesthetic incidence, neither to place, nor to remove the PLUG. In this group survival to hospital discharge was 54%. In B-group the mortality was 100%.

Conclusions: The FETO in the CDH in the 26–27 WG improves the survival due to stimulation of lung growth. The maternal epidural anaesthesia with a remifentanyl infusion joined with fetal anaesthesia provides suitable conditions to place and to remove the fetal PLUG.

Reference:

1 Deprest J, Gratacós E, Nicolaides KH. Ultrasound Obstetric Gynecol. 2004; 24: 121–126.

A-631

Evaluation of tolerance to Propofol in young children undergoing repeated prolonged deep sedation under spontaneous breathing for proton radiation therapy

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Background and Goal of Study: Limited and controversial data about development of tolerance to Propofol during repeated exposures exist (1–3). The aim of this study was to evaluate signs of tolerance to Propofol in spontaneously breathing young children undergoing repeated prolonged deep Propofol sedation for proton radiation therapy.

Materials and Methods: With ERB approval we reviewed anaesthesia charts of children with Propofol sedation for proton radiation therapy. Sedation was introduced with a single bolus of intravenous Midazolam (0.1 mg/kg) followed by repeated intravenous boluses of Propofol (0.5–1.0 mg/kg) until sufficient depth of sedation for final patient positioning was obtained. Afterwards sedation was maintained with continuous Propofol infusion (10 mg/kg/h) in all patients up to the end of the radiation procedure. Patient data, number, duration and period of sedation, induction dose of Propofol as well as mean arterial blood pressure, heart rate, respiratory rate were noted at the end of the procedure before cessation of the Propofol infusion. Data are mean ± SD and analyzed using unpaired, two-sided student T-test ($p < 0.05$).

Results and Discussions: 17 children aged 2.6 ± 0.7 years and weighing 13.1 ± 2.2 kg were studied. They had 27.4 ± 1.9 (466 in total) radiation procedures within 46.3 ± 4.0 days. Sedations lasted 56.6 ± 9.0 minutes. Propofol bolus dose for induction and positioning was 4.0 ± 1.4 mg/kg. Neither Propofol bolus dose required nor heart rate, mean arterial pressure nor respiratory rate demonstrated statistically significant differences between the first and the following weeks.

Week (No)	1	3	5	7
Propofol bolus (mg/kg)	4.0 ± 1.5	3.8 ± 0.9	3.7 ± 1.1	3.6 ± 1.2
Heart rate (BPM)	99.4 ± 17.2	96.7 ± 10.9	98.1 ± 10.4	96.3 ± 11.7
Mean arterial pressure (mmHg)	53.6 ± 10.4	53.1 ± 5.8	53.1 ± 7.2	53.6 ± 5.7
Respiratory rate (BPM)	25.3 ± 4.1	25.2 ± 4.3	26.1 ± 5.7	24.0 ± 3.6

Conclusion: Repeated prolonged deep sedation in very young children using Propofol for induction and maintenance over several weeks did not cause tolerance to Propofol.

References:

1 Scheiber G, et al. Paediatr Anaesth 1996; 6: 209–13.
2 Keidan I, et al. Anesthesiology 2004; 100: 251–4.
3 Ihmsen H, et al. Br J Anaesth 2005; 95: 367–71.

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A-632

Similar efficacy of Ambu laryngeal mask® and LMA unique® in children less than 30 kg

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Background and Goal of Study: Use of laryngeal masks (LM) in children has increased during the last decade and therefore demands for safe and reliable disposable products are required. The aim of the study was to compare the efficacy of the Ambu laryngeal mask® with the LMA Unique® in non-paralysed infants/children with a weight of less than 30 kg.
Materials and Methods: A randomized, single-blinded, multi-centre, international study design was used, including children scheduled to undergo elective short surgical/anaesthetic procedures. The size of the mask was determined by the weight of the child according to manufacturer's recommendations. Primary endpoint: Insertion time at first attempt. Secondary endpoints: Insertion success rates, efficacy of seal, adequate positioning, hemodynamic and respiratory data, intraoperative and postoperative complications. The cuff of the LM was inflated with the recommended inflation volume. Intra cuff pressure was measured and oropharyngeal leak pressure was determined at 60 cm H_2O. Final position of the laryngeal mask was determined fiber optically.
Results and Discussions: Total number to be included: 66, number of children included November 2005: 22 (10 Ambu, 12 Unique), age: 32 months (2–106 months), weight: 12.9 kg (4.9–25 kg), insertion time in the Ambu group: 15.1 ± 1.1 (SD) sec and 18.8 ± 4.5 (SD) sec in the Unique group. Vocal cords were visualized in 10 of 10 in the Ambu group and in 8 of 12 in the Unique group. No significant differences between neither primary nor secondary endpoints were seen. All LM were placed at first attempt and LM of size no. 1 up to no. 2.5 was used. However, in accordance with the age and weight of the children the mask no. 2 was most frequently used.
Conclusion(s): No clinically relevant differences were seen when comparing Ambu Laryngeal Mask® to LMA Unique®. Therefore, personal preferences and price remain the most important factors when choosing between the two.

A-633

Microcuff RAE tube tip position in children – dependency on head position

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Background and Goal of Study: The use of preformed RAE tubes may be advantageous in paediatric patients undergoing dental or ENT surgery. However, the fixed tube length in relation to its size is a drawback, because adjustment of the depth of tracheal insertion is limited. The aim of the study was to evaluate the position of the tip of the newly developed Microcuff® cuffed RAE tube in children aged 12–96 months in different head positions.
Materials and Methods: A total of 128 children were studied with 32 patients per tube size (selection based on age: 12–24 months 3.5 mm ID, 25–48 months 4.0 mm ID, 49–72 months 4.5 mm ID, 73–96 months 5.0 mm ID). The tube was positioned in midline with the curvature located at the lower lip. Measurements of the carina to tube tip distance were performed using a fiberscope[1] with the head consecutively in three standardized positions: 1. neutral (110° between the stretcher, the meatus acusticus and the upper edge of the eye lid), 2. inclination (80°) and 3. reclination (130°).
Results and Discussions: Carina–tube tip distances are given in the Figure. Malpositions were noted only in inclination: a) endobronchial location in 2 patients with a 3.5, 1 patient with a 4.5 and 1 patient with a 5.0 tube, b) tube tip placement at the carina: 1 patient with a 4.5 and 1 patient with a 5.0 tube.

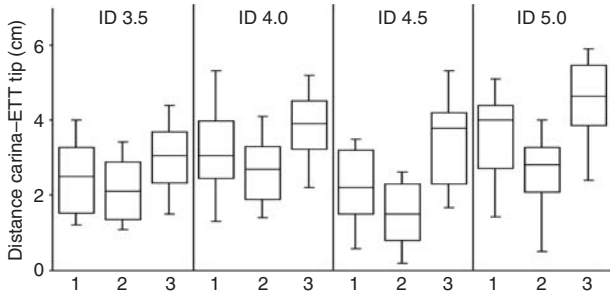

Fig. Distance Carina–tip of endotracheal tube [cm]: 1 neutral position, 2 inclination, 3 reclination of the head.
Conclusion(s): The length of the new Microcuff RAE tubes allows for an adequate placement of the tracheal tube in the neutral head position and in reclination, whereas the risk of malplacement during inclination is increased.
Reference:
1 Weiss M, et al. Appropriate placement of intubation depth marks in a new cuffed paediatric tracheal tube. Brit J Anaesth 2005; 94: 80–7.

A-634

Deep propofol sedation for vacuum-assisted bite block immobilisation of the head in young children undergoing proton radiation of head and brain tumours

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Background and Goal of Study: Vacuum-assisted bite block immobilization of the head in patients with head and brain tumours is a reliable technique for precise head position as required for proton radiation (1, 2). It is well tolerated in the awake adult patients but requires general anaesthesia in small children. We report the preliminary experience using deep Propofol sedation without an artificial airway in children undergoing proton radiation requiring vacuum-assisted bite block immobilization.
Materials and Methods: With ERB approval and parental consent we included young children scheduled for vacuum-assisted bite block immobilization for proton radiation of head and brain tumours. Children were fasten 4 hours for solids and fluids and 2 hours for clear fluids, did not receive praemedication and had a long-term central venous catheter system inserted. Sedation was started with a single bolus of intravenous Midazolam (0.1 mg/kg) followed by repeated intravenous boluses of Propofol (0.5–1.0 mg/kg) until sufficient depth of sedation was obtained for bite block insertion and patient positioning. Sedation was maintained by continuous Propofol infusion at 10 mg/kg/h until removal of bite block. Oxygen 2 lt/min was administered by a nasal cannula. Monitoring consisted of ECG, SpO_2, NIBP and end-tidal CO_2 taken at the nose.
Results and Discussions: 10 children aged (mean ± SD) 2.6 ± 0.8 years were included so far. They had 26.7 ± 1.9 radiation procedures. Propofol dose administered for induction, bite block insertion and patient positioning was 3.9 ± 0.5 mg/kg. Time from insertion to removal of the bite block lasted 48.3 ± 6.2 minutes. Highest endtidal CO_2 value recorded was 8.4 kPa and SpO_2 values ranged from 95–100% with spontaneous breathing, supplemental oxygen and bite block inserted. No adverse respiratory event such as coughing, airway obstruction, arterial desaturation or aspiration occurred during the 267 sedation procedures performed.
Conclusion: Based on our initial experience, deep Propofol sedation without the use of an artificial airway is an appropriate technique for vacuum-assisted bite block immobilisation in young children undergoing proton radiation of head and brain tumours.
References:
1 Willner J, et al. Radiother Oncol 1997; 43: 315–2.
2 Marks JE, et al. Clin Radiol 1976; 27: 175–77.

A-636

The effects of intercostal nerve block and IV fentanyl on emergence delirium after sevoflurane anesthesia in pediatric patients undergoing pectus excavatum repair

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Background and Goal of Study: The quick recovery from sevoflurane is likely to be accompanied by postoperative delirium, which is considered due to the early appearance of pain (1). we aimed to evaluate the recovery and emergence profiles of either IV fentanyl or intercostal nerve block in the prevention of emergence delirium.
Materials and Methods: Fifty-four pediatric patients undergoing pectus excavatum repair by the Nuss procedure were randomly assigned to receive intravenously dose of 0.9% normal saline 2 ml (group 1), fentanyl 1 μg/kg (group 2) or intercostal nerve block (group 3: 0.75% ropivacaine 2 ml X 3 level, both) before skin closure. Postanesthetic recovery, agitation and pain scores were evaluated at arrival to PACU, 10, 20 and 30 min, respectively. Data were analyzed by using ANOVA, Chi-square test and Fisher's exact test.
Results and Discussions: Agitation and pain score in group 2 and group 3 were significantly lower than in group 1 ($p < 0.05$).

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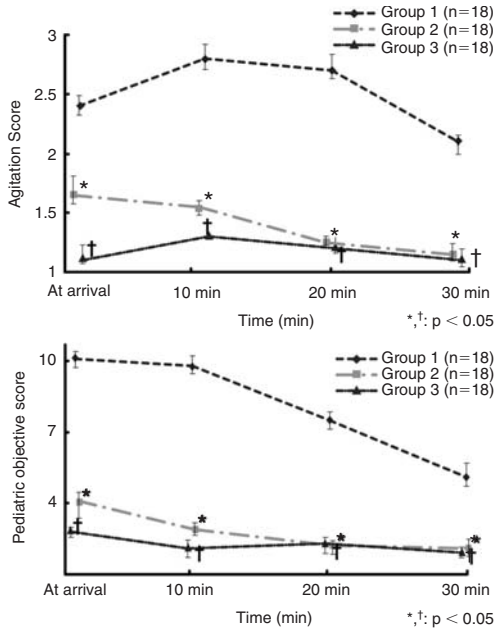

Conclusion(s): For preventing emergence agitation after sevoflurane anesthesia, we recommend using fentanyl or intercostal nerve block.

Reference:

1 Lerman J. et al. Anesthesiology 1996; 84: 1332–40.

A-638

Ultrasonography and peripheral nerve blocks of the umbilical region in children

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Background and Goal of Study: Most popular peripheral nerve blocks in umbilical hernia repair are rectus sheath block and para-umbilical block. However, complications may occur. Ultrasonographic (US) guidance of peripheral nerve blocks reduces complications and improves quality of blocks (1). The aim of this study is to describe an US-guided umbilical nerve block in the lateral edge of the rectus abdominis muscle in children.

Materials and Methods: Prospective study in 10 children scheduled for ambulatory umbilical hernia repair (2–5 yr, ASA 1–2). General anesthesia, spontaneous ventilation; US study with a Sonoline G40 ultrasound unit (Siemens, Germany) and a 10 MHz linear probe. Bilateral punction site: intersection point between 10th intercostal nerve and lateral edge of rectus muscle. Technique: a 22G 25 mm long short-bevelled insulated needle (Stimuplex; Braun, Germany) was introduced in-line with the US probe in a transverse cut plane and advanced until tip was seen between aponeurosis of internal oblique and transversus abdominis muscles; nerve stimulator (Stimuplex; Braun) was turned on (0.5–1 mA, 100 μseg, 2 Hz), muscular contractions elicited, 0.1 ml/kg of plain bupivacaine 0.25% injected. Intraoperative hemodynamic parametres and postop. analgesia (modified CHEOPS scale) evaluated.

Results and Discussions: Umbilical anatomy was clearly identified with US probe in all cases. Needle tip easily followed and placed between the muscles aponeurosis. However, since 10th intercostal nerve was not visualized, nerve stimulator was used to elicit muscular contractions previous to bupivacaine administration. All blocks effective during surgery and 1st postop. hour. Two children punctuated ⩾5 in mCHEOPS scale during 2nd postop. hour, received acetaminophen 15 mg kg^{-1} i.v. and could be discharged uneventfully. No complications.

Conclusion(s): US guidance enables performance of umbilical nerve block in the lateral edge of rectus abdominis muscle. Further studies should be carried on to visualize the intercostal nerve.

Reference:

1 Marhofer P, et al. Br J Anesthesia 2005; 95(2): 226–230.

A-639

EEG epileptoid signs during sevoflurane induction in children: a comparative study between incremental and rapid induction

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Background: Sevoflurane (S) has become the volatile agent of reference in pediatric anesthesia. However epileptogenic effects of high concentrations (8%) of S have been suspected during induction (1). Using moderate inspired concentrations of S (6%), this study compared epileptoid EEG signs of S under rapid induction (**Ri**) versus incremental induction (**Ii**) in children.

Materials and Methods: After IRB approval and informed consent, 60 children (2–10 yr) scheduled for tonsillectomy were included. After premedication with midazolam, patients were randomly assigned to receive, in N_2O–O_2 (50–50), **Ri** with 6% of S (n = 30, 19 ± 6 month, mean ± sd) or **Ii** with 2% (2 min), 4% (2 min) and 6% up to visualisation of central pupils (CP) (n = 30, 19 ± 5 month). In both groups tracheal intubation was performed at CP without any additive agent. Clinical events, bispectral index (BIS), heart rate (HR), expired fraction (Fe) of S, and EEG were continuously recorded using AS5 Collect (Datex-GE). Epileptoid signs were assessed by a blinded neurophysiologist, from baseline to tracheal intubation. Major epileptoid signs were defined as polyspike, rhythmic polyspike and periodic discharge with or without burst suppression (BS).

Results: Induction was well tolerated in both groups. During **Ri**, the loss of eyelash reflex (LER) and CP occurred earlier, the BIS at LER was lower, the nadir of the BIS occurred earlier and was lower than during **Ii** (T1). Major epileptoid signs were markedly more frequent during **Ri** than during **Ii** (T2).

Conclusion: Compared to **Ii**, **Ri** with 6% of S, is associated with more frequent EEG epileptoid signs. Our results suggest that the speed of S induction may influence the occurrence of major EEG epileptoid signs.

T1	t LER (s)	BIS LER	t nadir (s)	BIS nadir	t CP (s)
Ri	52 ± 19	75 ± 19	148 ± 40	16 ± 3	300 ± 80
Ii	84 ± 22***	85 ± 10*	220 ± 38***	22 ± 10**	377 ± 40***

T2	Polyspike n (%)	Rhythmic polyspike n (%)	Periodic discharge with BS; n (%)
Ri	20 (67)	12 (40)	21 (70)
Ii	11 (36)*	0 (0)***	1 (0)***

*p < 0.05, **p < 0.01, ***p < 0.001, **Ii** vs **Ri** (ANOVA).

Reference:

1 Vakkuri, Acta Anaesthesiol Scand 2001; 45:805.

A-640

Prolonged use of caudal epidural catheter in low birth weight infants

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Background: Although single-shot caudal anaesthesia has an established place for minor procedures such as herniotomies in preterm infants and neonates, catheters are rarely used postoperatively for prolonged periods. The aim of this retrospective study was to evaluate the safety (concerning local/systemic infection) of caudal epidural catheters used for postoperative pain management.

Material and Methods: Twenty seven infants scheduled for major thoracic and abdominal surgery, receiving a caudal epidural catheter were included. The median age (not corrected for preterm infants) at the time of operation was 3 days (range: 0–119 days) and the median weight was 2.3 kg (range: 0.9–3 kg). After induction of general anaesthesia a caudal epidural catheter was introduced. All catheters were subcutaneously tunnelled. After epidural injection of a test dose the local anaesthetic drug (1 ml/kg Ropivacaine 0.2–0.375% plus 2 μg/kg Clonidine) was administered. Postoperatively all infants received continuous infusion of Ropivacaine 0.2%. The puncture site was inspected daily. The caudal catheters were removed when the infants were either free of pain or would show any symptoms of local or systemic infections. After removal all but 6 catheter tips (1 dislocation, 1 contamination during removal, 4 no details given) were sent in for bacterial analysis.

Results and Discussions: Catheters were left in place for a median time period of 7 days (range: 3–45 days). Besides the one dislocated catheter

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three had to be removed early. The puncture site of these three catheters was slightly inflamed in one infant, subcutaneously swollen in another one and faecal contamination of the adhesive tape was demonstrated in one infant. All others showed no pathological findings. Bacterial contamination could be demonstrated on two catheter tips, but without any pathological finding of the puncture site on removal. No infant developed severe local or any symptoms of systemic infections or demonstrated signs of toxicity.

Conclusion: According to our findings it is safe in low birth weight infants to leave a caudal epidural catheter in place for several days. The local situation of the puncture site on removal does not predict the probability of bacterial contamination of the catheter tip.

A-641

Comparing four different proximal sciatic approaches for anesthesia in pediatric patient. Preliminary study

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Background and Goal of Study: The sciatic nerve block provides significant advantages in terms of postoperative analgesia. No specific sciatic approaches has been reported in the pediatric population, being a strict impose of the approaches described in the adult patient. The aim of our study is to compare four different adult approaches in children undergoing foot and ankle surgery and over lower-extremity of eight different new born cadavers.

Materials and Methods: The data from 52 sciatic punctures of 23 children scheduled for ankle or foot surgery are reported. After induction of general anesthesia and in sim's position, 14 Labat's classical approach (L) were performed; 14 Winnie modification of Labat's classical approaches (W); 12 Casal's approaches (C); and 12 Rucci's sciatic approaches (R). Presence or absence of muscular response, and details of the motor response, intensity of neuroestimulation, depth of needle insertion, motor block and success of the technic were evaluated. We consider valid motor responses those distal over the foot, and invalid those proximal over the posterior aspect of the thigh and gluteus maximus. In addition we evaluate the same approaches over 8 differents new born cadavers in the university. Distance from the needle to the nerve, and depth of the insertion were registered.

Results and Discussion: Two tibial or peroneal motor response was obtained in L (14%), seven in W (50%), four in C (33%) and nine in R (75%). In one case combined motor response of tibial and peroneal was obtained in R. Rest of approaches obtained proximal motor responses or was absent. The depth of insertion of the needle was 5 ± 2 cm, intensity of stimulation between 0.18–0.5 mA. In cadavers, only the R inserted the needle over the sciatic nerve in all cases, and W in all but three.

Conclusions: This study shows, in instance, that the R approach seems to be the most clinically succesful approach and less needle depth must be required in the pediatric patient. The same results were confirmed in cadaver. W approach shows less success with born landmarks easy to identify. The depth of insertion recommends 50–100 mm isolated needles for all approaches.

A-642

Low volume vs. high volume in caudal analgesia for complex hypospadia repair

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Background and Goal of Study: Caudal block provides good intra- and postoperative analgesia in children undergoing infraumbilical surgery. So far, only few studies (1,2) evaluated quality and duration of caudal block against the volume of the local anaesthetic applied. This study compares the duration of postoperative analgesia in children scheduled for complex hypospadia repair when two different volumes and concentrations of a fixed dose of ropivacaine are used.

Materials and Methods: After IRB approval and informed parental consent, 30 children (ASA I, 1–5 years old) were included. After premedication with midazolam, anesthesia was induced with thiopental and maintained with sevoflurane in oxygen/air. After induction, patients received a caudal blockade either with ropivacaine 0.375% at 0.5 ml/kg (Low Volume High Concentration Group, LVHC; $n = 15$), or ropivacaine 0.1% at 1.8 ml/kg (High Volume Low Concentration Group, HVLC; $n = 15$). Surgery was allowed to begin ten minutes after performing the block. In the recovery room, pain was assessed using the CHEOPS Pain Scale and the motor block was scored with a modified Bromage scale. After transferral to the ward, the patients were observed for 24 hours for signs of postoperative pain. The time period to first supplemental analgesic demand, i.e., from establishment of the block until the first registration of a CHEOPS score $\geqslant 9$, was considered the primary endpoint of the study. The time periods were compared using analysis of variance adjusted for age, weight and duration of surgical procedure as covariates.

Results and Discussions: All patients were judged to have sufficient intraoperative analgesia. Patients' characteristics were similar, besides the age (32 ± 10 (LVHC) vs. 24 ± 9 months (HVLC); $p < 0.05$). Analgesics were needed after 520 ± 480 min in the LVHC and 952 ± 506 min in the HVLC group ($p < 0.05$). Motor block was less in the HVLC group.

Conclusion(s): In children undergoing hypospadia repair, caudal block with a "high volume, low concentration" regimen produces prolonged analgesia and less motor block, compared to a "low volume, high conc." regimen.

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A-643

Ilioinguinal/iliohypogastric nerve block or surgical instillation. Comparison between two techniques of postoperative analgesia with 0.5% ropivacaine following inguinal herniorrhaphy in children

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Background and Goal of Study: This study compared the postoperative pain relief provided by simple instillation of ropivacaïne 0.5% into a hernia wound with that provided by ilioinguinal/iliohypogastric (IG/IH) nerve block [1].

Materials and Methods: After local ethic committee approval, in a randomized, double-blind study, 53 children (aged 1 to 9, ASA physical status I or II) were randomly allocated in 2 groups. Group 1: IG/IH nerve block performed before operation using 2.5 mg/kg, 0.5% ropivacaine and group 2: 2.5 mg/kg, 0.5% ropivacaïne instilled, which remained in the wound for 60 seconds before wound closure. The Objective Pain Scale (OPS) and VAS scores were used to monitor postoperative pain. Rescue analgesic was given when the VAS score was >3. The time before requiring rescue analgesic was analysed using a Kaplan Meier curves and Log-Rank test, $P < 0.05$ was considered statistically significant.

Results and Discussions: The groups were comparable with regards to age, weight, sex and type of surgery. Duration of surgery, anaesthesia, and recovery time were not different among groups. No difference regarding the time to the first analgesic demand was found between the 2 groups. The median time to first analgesic demand was 193 minutes in the IG/IH group and 188 minutes from the instillation group. There were neither anaesthetic complications nor clinical toxicity of ropivacaine.

Conclusion(s): 0.5% ropivacaine instillation provided reliable postoperative analgesia similar to IG/IH nerve block in our study children who were undergoing herniorrhaphy. 0.5% ropivacaïne for as short an instillation period as 60 seconds can provide a good analgesic alternative after herniorrhaphy and hydrocelectomy in paediatric patients.

Reference:

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A-644

Bispectral index and burst suppression in daily clinical anesthesia of young children

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Background: Anesthetic overdosage prevention is often neglected in pediatric anesthesia because of the good hemodynamic tolerance of children. However some concerns have been raised about potential deleterious effects of anesthetics in young animals. The aim of this observational study was to evaluate the incidence of EEG signs of hypnotic overdose in daily clinical anesthesia of young children.

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Materials and Methods: After IRB approval and informed consent, 60 patients <2 years scheduled for general anesthesia, were prospectively included. Anesthetic administration was left at the discretion of the anesthetist in charge of the child. The bispectral index (BIS XP2000, Aspect) and the percentage of burst suppression (%BS) were continuously and blindly recorded. The anesthetics administered, and their dosage were noted.

Differences between children exhibiting at least 10% of BS (BS+) and the others (BS−), were analysed using ANOVA or Chi^2. Relation between BIS and %BS were evaluated using linear regression. $P < 0.05$.

Results: 32 out of 60 (53%) children showed BS. BS occurred during induction (9), maintenance (7) and both periods (16). The duration of BS (24 ± 30 min, mean ± sd) periods varied from 1 to 198 min, and lasting more than 30 min, in 8 children. Differences between BS+ and BS− are described in the tables 1 and 2. BIS was highly correlated with %BS ($r = 0.84$). In all cases, the presence of more than 30% of BS was associated with a BIS less than 30.

Conclusion: In routine practice, GA in children less than 2 years is associated with BS in 50% of cases. The use of BIS might allow to limit BS occurrence in young children.

Table 1.

	Age (month)	Duration GA (min)	Propofol (n)	Sevoflurane (n)	Major surgery (n)
BS−	14 ± 6	60 ± 42	0	28	0
BS+	8 ± 6***	92 ± 75	19***	32	8***

Table 2.

	BIS baseline	BIS during GA	BIS extubation	BIS during BS	Mean % of BS
BS−	93 ± 6	50 ± 10	90 ± 9	–	–
BS+	91 ± 9	39 ± 11***	85 ± 16	27 ± 12	37 ± 18

***$p < 0.001$, BS+ versus BS−.

A-645

An ultrasonographic analysis of the "ASIS-Umbilicus" landmark: can we improve the ilioinguinal nerve block in children

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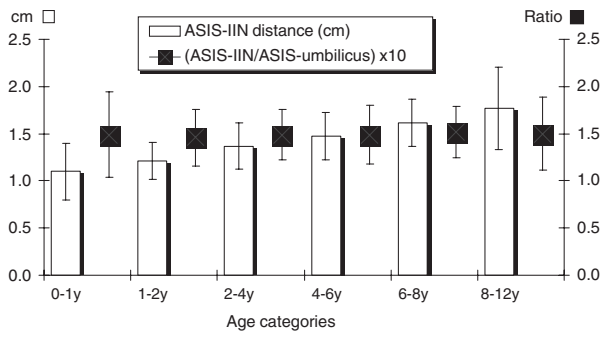
Background and Goal of Study: The ilioinguinal nerve (IIN) block is a popular technique in children. We compared the usual cutaneous landmarks [lateral ¼ of anterior superior iliac spine (ASIS)-umbilicus distance] with ultrasonographic data [ASIS-IIN distance] (1).

Materials and Methods: After local ethical committee approval and informed parental consent we recruited 60 children distributed in 6 age categories: <1 yr, 1–2 yrs, 2–4 yrs, 4–6 yrs, 6–8 yrs, 8–12 yrs. The ASIS-umbilicus distance was measured under anesthesia. Using a Sonosite Titan® ultrasound unit (5–10 MHz linear probe) we measured the distance between the IIN and the centre of the ASIS (ASIS-IIN). These measurements were made strictly on the line from ASIS to umbilicus. The ASIS-IIN distance was compared to the ASIS-umbilicus distance and expressed in tenth of this distance. Statistics: results are expressed as mean ± SD (see Fig).

Results and Discussions: In 5 children (8.3%) the IIN could not be seen. The ASIS-IIN distance showed individual variations but never reached the lateral ¼ of the ASIS-umbilicus distance. The mean of this distance increased with age (1.10, 1.21, 1.37, 1.47, 1.65, 1.77 cm respectively) but remained constant when related to the ASIS-umbilicus distance and expressed in tenth of this distance (1.49, 1.46, 1.49, 1.49, 1.54, 1.50/10 respectively).



Conclusion: The "ASIS-umbilicus" line remains an easy and reliable landmark to perform an IIN block in children. Instead of using the lateral ¼ point (25%) of it, our preliminary results indicate that we should use the lateral 1.5/10 point (15%), regardless of age.

Reference:

1 *BJA* 2005;95:226–30.

A-646

Safety and efficiency of general anesthesia with sevoflurane for children undergoing magnetic resonance imaging: a prospective study

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Introduction: Children's magnetic resonance imaging require total immobilisation in order to obtain exploitable pictures. The anaesthesia must be fast, efficient and riskless. The purpose of our work is to evaluate the technique that we use.

Methods: This is a prospective and descriptive study. All children having to be anesthetised have been included in the study for three months. None of them were premedicated. Most of them were hospitalised on a one day basis. Induction by sevoflurane 8% in a mixture of 50% O_2-50% N_2O. After deep sedation, evaporator was set at 3%. A Guedel cannula was put into place, followed by an oxygen probe and a capnography probe inside the cannula; anaesthesia was maintained by 2l/min of oxygen. Children were maintained with spontaneous respiration. The intraveinous drip was optional. The abdominal perimeter was measured before induction and at the end of the magnetic resonance imaging. The analysed data were the haemodynamic and respiratory parameters, expired and inspired gas, complications during magnetic resonance imaging and at the awakening, pictures quality, sevoflurane consumption and the room pollution established by multiple tests and spectrophotometer analysis.

Results: 103 children were included (ASA 1 and 2 : 83%; ASA 3 and 4: 17%). The average age was of 3 years and 4 months [3 months–15 years] and the average weight was of 15.5 kg ± 7.41. The average anaesthesia time was 34 min [15–89]. There was cardiovascular stability. There was during the magnetic resonance imaging 5 movements of the child (4.8%) which needed a deeper anaesthesia, 2 apneas (1.9%), 1 bronchospasm (1%), 2 laryngospasms (1.9%) with hypoxia <95%, no regurgitation or inhalation. In USI? child woke up straight away, 8 children threw up (7.8%), supervision was not needed after 30 min. Children could have a meal once in their room. The average increase of abdominal perimeter was of +0.38% which is not significant [1]. 99% of pictures were of good to excellent quality. Average consumption of sevoflurane was of 36.5 ml per child. Residual level of sevoflurane in the room was <2 ppm, with peaks of pollution up to 39.3 ppm at the end of the induction, at the child's head (middle morning).

Conclusion: This anaesthesia technique seems reliable, reproducible, fast (6 children in 4 hours), with a residual pollution level in conformity with legislation.

A-647

Effects of dantrolene on hypoxic-ischemic injury in the neonatal rat brain

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Background and Goals: Dantrolene has been reported to inhibit Ca^{2+} release from endoplasmic reticulum through ryanodyne receptors into cytosol. This study was designed to investigate the neuroprotective effect of dantrolene on the hypoxic-ischemic brain damage (HII) in the neonatal rat brain.

Materials and Methods: 7-day-old Sprague-Dawley rats were assigned to 2 groups; control group (CG, n = 69) and dantrolene group (DG, n = 60). The DMSO (CG) and dantrolene (DG) were administered intracerebroventricularly before HII. HII was induced by the ligation of common carotid artery and then exposure to 2.5 hours of 7–8% hypoxia at 37°C. TUNEL stain and ^{1}H-MR spectroscopy were carried out 1 day after HII. Morphologic score analysis and the relative infarct area after TTC stain 14 days after HII were employed.

Results: The Lipid/Creatinine (Lip/Cr) ratios were significantly lower than those of CG ($P < 0.05$). The number of TUNEL positive cells was less than that the number in CG. The gross morphologic scores were lower in DG than those scores of CG ($P < 0.05$) and the relative infarct area after TTC stain was less than the area in CG ($P < 0.05$) 14 days after HII.

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Conclusions: It was demonstrated that dantrolene administered intracerebroventricularly before HII had salutary effect on HII model in the neonatal rat brain.

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A-648

Sevoflurane increases the fade of the neuromuscular response to the train-of-four stimulation in children receiving rocuronium

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Background and Goal of Study: Sevoflurane enhances neuromuscular block affecting not only single twitch (T1) response but also the ability to maintain the response to high frequency (tetanic or TOF) stimulation.

Materials and Methods: We compared TOF fade during spontaneous recovery from the rocuronium-induced neuromuscular block in 24 children (3–11 years old, ASA PS I or II) anaesthetized with N_2O/O_2 and sevoflurane, 1 MAC end-tidal concentration (SEVO group) or N_2O/O_2 and fentanyl (FENT group). EMG response of the adductor pollicis muscle to TOF stimulation of the ulnar nerve repeated every 20 s was recorded, and depression of the fourth twitch, T4 was used as a measure of fade. Two compartment model was used for pharmacodynamic (PK) calculations. PK parameters were fixed, and PD data were fitted to effect compartment model proposed by Sheiner (Sheiner *et al.* 1979).

Results and Discussions: Sevoflurane delayed the recovery of both T1 and T4, reduced rocuronium concentration in the effect compartment corresponding to 50% inhibition of both T1 and T4 (EC_{50}), and decreased the equilibration rate constant between the central and effect compartments (k_{e0}).

	SEVO	FENT	P
T1			
k_{e0} (min^{-1})	0.10 ± 0.04	0.24 ± 0.14	0.009
EC_{50} ($\mu g\,mL^{-1}$)	1.41 ± 0.45	2.32 ± 1.00	0.02
T4			
k_{e0} (min^{-1})	0.08 ± 0.04	0.26 ± 0.22	0.03
EC_{50} ($\mu g\,mL^{-1}$)	0.93 ± 0.31	1.61 ± 0.64	0.009

Conclusion: Sevoflurane enhances the sensitivity of the prejunctional part of the neuromuscular junction to rocuronium which seems to affect the feedback control of acetylcholine release from the nerve ending and increased fade of the neuromuscular response to TOF. This explains significantly delayed recovery of the neuromuscular transmission in patients anaesthetized with sevoflurane who are given rocuronium for muscle relaxation.

A-649

Effects of the different doses of remifentanil on hemodynamics, recovery and side effects in pediatric patients

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Background and Goal of Study: Different infusion rates of remifentanil during GA were compared in terms of peroperative hemodynamics, recovery profiles and side effects in children.

Materials and Methods: 100 children (3–15 years) undergoing ophtalmologic operations were studied. Remifentanil 1 $\mu g\,kg^{-1}$, thiopental 4–6 $mg\,kg^{-1}$ and vecuronium 0.1 $mg\,kg^{-1}$ used for induction. Remifentanil infusions in the doses of 0.05 $\mu g\,kg^{-1}\,min^{1}$ (Group I), 0.1 $\mu g\,kg^{-1}\,min^{-1}$ (Group II), 0.2 $\mu g\,kg^{-1}\,min^{-1}$ (Group III) and 0.3 $\mu g\,kg^{-1}\,min^{-1}$ (Group IV) (n = 25 each) with 50% O_2 + N_2O/0.4% sevoflurane were used for maintanence: SAP, DAP, MAP, HR were recorded. Remifentanil 0.2 $\mu g\,kg^{-1}$ bolus doses, atropin and fluid infusions were given as necessary. Durations of surgery and anesthesia, time to extubation, spontaneous eye opening, response to verbal orders; Aldrete recovery scores (⩾9), post-op. agitation scores (4 point scale), pain scores (5 points VAS), nausea-vomiting rates were recorded. Oneway Anova, Tukey HDS, Student-t, Ki-square tests were used for statistical analysis.

Results: DAP in group I significantly increased with surgical stimulus; SAP in group IV significantly decreased after the 30th min of the operation ($p < 0.05$).

Remifentanil bolus doses were given at the percentages of 40, 24, 19.2 and 16% for groups I, II, III, IV ($p > 0.05$).

Atropine was necessary at the rates of 16, 12, 40 and 16% for patients in groups I , II , III and IV ($p > 0.05$).

No difference were found between the recovery times, Aldrete, agitation and pain scores between the groups.

Nausea and vomiting rates were clinically higher in group IV ($p > 0.05$).

Discussions – Conclusions: In pediatric population, the effective remifentanil infusion dose to control the painful stimulus was said to be twice as high as the adult dose (>0.2 $\mu g\,kg^{-1}\,min^{-1}$ vs. >0.1 $\mu g\,kg^{-1}min^{-1}$) (1).

Although statistically insignificant, our findings suggest that 0.05 $\mu g\,kg^{-1}\,min^{-1}$ is not a sufficient dose to supress the surgical stimulus and doses ⩾0.2 $\mu g\,kg^{-1}\,min^{-1}$ may have a tendency to cause bradicardia and hypotension in these group of children and operation.

Reference:

1 Hernan R, et al. Anaesthesiology 2002; 97:1142–45.

A-650

The effect of remifentanil on oculocardiac reflex in pediatric strabismus surgery

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Background and Goal of Study: Rapidly acting narcotics have enhanced the degree of bradycardia due to oculocardiac reflex (OCR) elicited by tension of extraocular muscle (EOM) during strabismus surgery (1). We evaluated the effect of remifentanil on the OCR, compared to sevoflurane in pediatric strabismus surgery.

Materials and Methods: One hundred and twenty healthy children undergoing elective strabismus surgery, as inpatients were randomly assigned to receive sevoflurane (group S) or remifentanil (group R). None of the children was premedicated with anticholinergic agent. Anesthesia was induced with ketamine 1 mg/kg or midazolam 1.5 mg/kg with 66% N_2O in O_2. Laryngeal mask airway was placed with rocuronium 0.5 mg/kg. Anesthesia was maintained with sevoflurane 2.0–3.0 vol%, or remifentanil 0.75 μg/kg over 1 min and followed by constant infusion of remifentanil 0.5 μg/kg/min with 66% N_2O and O_2. Data was analyzed by t-test and χ^2 test. P value <0.05 was considered significant.

Results and Discussions: Heart rate (HR) and blood pressure were maintained lower in the group R during anesthesia ($p < 0.05$). Percent changes of HR following EOM traction were higher in the group R ($p < 0.05$).

	Ketamine		Midazolam	
	S (n = 30)	R (n = 30)	S (n = 30)	R (n = 30)
↖HR > 10%	63.3%	90.0%	50%	86.6%
↖HR > 20%	50.0%	60.0%	23.3%	56.6%
↖HR > 40%	0.0%	16.7%	0.0%	10.0%
Change in HR	−15.0 ± 13.2%	−23.4 ± 14.2%*	−8.9 ± 15.0%	−24.6 ± 18.9%*

* $P < 0.05$ compared with the group S.

Conclusions: Remifentanil enhanced the degree of bradycardia due to the OCR in pediatric strabismus surgery.

Reference:

1 Arnold RW, Jensen PA, Kovtoun TA, et al. Binocul Vis Strabismus Q 2004;19: 215–22.

A-651

Which anaesthesia is safer for paediatric cleft lip and palate repair?

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Background and Goal of Study: Anaesthetic management of paediatric cleft lip and palate is associated with higher rate of intraoperative and postoperative complications (1). Our aim was to compare two anaesthestic

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techniques used in our institution for paediatric cleft lip and palate repair. We hypothesized that general balanced anaesthesia compared to sevoflurane inhalation anaesthesia is associated with lower rate of complications.

Materials and Methods: After written parental informed consent, 117 consecutive children (aged 5 days to 3 years with body weight 3–21 kg) were randomly allocated to two groups. Children in Group I were induced with sevoflurane (5–8 vol%) and maintained with fentanyl (0.005 mg·kg^{-1}), vecuronium (0.1 mg·kg^{-1}) and midazolam (0.05 mg·kg^{-1}). Children in Group II were induced with sevoflurane (5–8 vol%) and maintained with sevoflurane/ oxygen/air mixture supplemented with fentanyl (0.005 mg·kg^{-1}).

Results and Discussions: Table shows intraoperative and postoperative complications.

Complications	Group I (n = 63)	Group II (n = 54)	p-value
Difficult intubation	3 (4%)	3 (5.5%)	1.000
Ventricular extrasystole	0 (−)	1 (1.8%)	0.453
Postoperative excitation	0 (−)	17 (31.5%)*	<0.001
Postoperative nausea and vomiting (PONV)	2 (3.2%)	3 (5.6%)	0.657
Total	5 (7.9%)	24 (44.4%)*	<0.001

* $p < 0.05$ vs Group I, Fisher's exact test.

Conclusions: General balanced anaesthesia provides safer anaesthetic management of cleft lip and palate repair because it is associated with lower incidence of intraoperative and postoperative complications.The most often complication in children associated with sevoflurane is postoperative excitation.

Reference:

1 Machotta A. *Anaesthesist*. 2005;54:455–466.

A-652

Hemodynamic disorders associated with target-controlled infusion (TCI) using remifentanil in children with cerebral palsy undergoing dental procedure

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Background and Goal of Study: Remifentanil is associated with a fast and predictable recovery, independent of hepatic and/or renal functions. Its ultrashort half-life allow for a prompt emergence even after long infusion. The use of remifentanil in children with cerebral palsy could have the advantage of reducing the time for extubation. The goal of this study was to evaluate the tolerance of TCI remifentanil in a group of children with cerebral palsy undergoing dental procedure and a group of ASA 1 children.

Materials and Methods: It is a non randomised retrospective study. We studied all children undergoing dental procedure for which TCI administration of remifentanil was used. Remifentanil was infused according to the Egan's model [1] with a target concentration of 6 ng.ml^{-1}. Anesthesia was induced and maintained with sevoflurane. All children received atropine. We evaluated hemodynamic changes during surgery. Time between the end of perfusion of remifentanil and tracheal extubation was recorded. After extubation, children were sent to the postanaesthesia care unit (PACU) were they were supervised.

Results and Discussions: 123 children from 2 to 17 years (mean = 6 years) were studied including 43 with cerebral palsy (75% received one or more antiepileptics).

Children	n	Hypo TA	Bradycardia	Need suppl atropine	Time to extubation
ASA 1	80	1 (1.25%)	2 (2.5%)	1 (1.25%)	20 ± 6 min
Cerebral palsy	43	5 (11.6%)	11 (25.6%)	6 (13.95%)	17 ± 7 min

The mean duration of the infusion of remifentanil was 1 h 34 ± 39 min. For postoperative analgesia, nalbuphine was needed in 93.5% of children during PACU stay.

Conclusion(s): TCI Remifentanil in children with cerebral palsy under antiepileptic treatment is associated with important hemodynamic disorders compared with ASA 1 children. However the time to tracheal extubation seem relatively short in these children.

Remifentanil could be used in these children with cerebral palsy, as it doesn't seem to delay extubation, but with particular attention to its hemodynamic effects.

Reference:

1 Egan, et al.: Anesthesiology 1993, 79:881–92.

A-653

Comparison of sevoflurane and halothane induction in children: changes of cerebral blood volume and oxygen status

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Background and Goals: Inhalation induction is the most commonly used technique in pediatric anesthesia, so it is very important to use the most potent and secure inhalation agents. One of the major negative side effects of inhalation anesthetics is increasing of intracranial blood volume that in some patients can cause serious consequences. This clinical study was undertaken to evaluate and compare the effects of sevoflurane and halothane on cerebral blood volume and oxygen status in children.

Material and Methods: A total of 56 children, aged 3–14 years, ASA I–II, undergoing minor pediatric surgery were enrolled in the study. Inhaled induction was performed in a randomized sequence with sevoflurane (n = 29) or halothane (n = 27). Cerebral content of oxyhaemoglobin (O_2Hb), deoxyhaemoglobin (HHb), total haemoglobin (tHb) and regional cerebral tissue saturation (rSO_2) was measured by near infrared spectroscopy (NIRS). The NIRS monitoring was continued from the beginning of inhalation induction, till the surgical incision.

Results: Sevoflurane induction was followed by slight rise of intracranial blood volume.

There was an average increase of 6.73% ± 4.4% in tHb compare to the previous stage, mostly because of O_2Hb increase (13.64 ± 5.25%). In the same time we registered a 15.88% (±6.28%) decrease of HHb. rSO_2 increase (6.94 ± 1.81%) is mostly due to pure oxygen inhalation during sevoflurane induction.

There were more significant changers of monitored parameters during halothane induction. We demonstrated a 20.46 ± 6.64% increase of tHb, 30.7 ± 5.23% increase of O_2Hb, 7.4 ± 1.86% decrease of HHb, and 6.49 ± 0.37% increase of rSO_2.

Conclusions: This study demonstrated that sevoflurane induction affects brain oxygen status and cerebral blood volume significantly less than halothane inhalation. We found also a dose dependent character of these changers. This might be relevant for the choice of anesthetic in children with risk of increased intracranial pressure, neurosurgery, or craniofacial osteotomies.

A-654

Topical ketamine for post-tonsillectomy pain

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Background and Goal of Study: The pain relief after tonsillectomy is an important issue (1). Topical approaches have a potential advantage of local pain control with minimal systemic side effects and good patient acceptability (2). In the present study, effects of topically applied ketamine was compared with topical morphine + ketamine combination on effective analgesia time, postoperative analgesic consumption, nausea-vomiting, recovery time, sleep disturbances, nightmare and loss of appetite.

Materials and Methods: After ethics committee approval and parental informed consent, 45 children undergoing tonsillectomy were randomized for the study. They were divided into 3 groups as control (group 1), topical ketamine (20 mg) (group 2), topical morphine (20 mg) + topical ketamine (20 mg) (group 3). All study drugs were given in 5 mL of artificial saliva at the tonsil lodge for 5 minutes after tonsillectomy. Postoperative pain score was assessed by Modified Hannallah Score (MHS) at 0 (arrival to the PACU), 30, 60, 120th minutes and also at 24th hour with a four point scoring. Effective analgesia time was recorded and rescue medication was 20 mg kg^{-1} rectal paracetamol. Chi square, One way Anova and Bonferroni tests were used for the statistical analysis where applicable.

Results and Discussions: Demographic data and side effects were similar among groups.

Table. Values are in mean ± SD (*#$p < 0.05$)

	(MHS)0	Total analgesic consumption at 24th hour	Effective analgesia time (min)
Group 1	5.87 ± 2.3*	1.13 ± 0.9*	243.9 ± 501.0
Group 2	2.87 ± 1.4	0.07 ± 0.2	1364.0 ± 294.3#
Group 3	4.07 ± 1.8	0.33 ± 0.6	697.6 ± 724.3

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Conclusion: Topical ketamine alone seems to be superior to ketamine + morphine combination in post-tonsillectomy pain in children.

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1 Warltier DC. Anesthesiology 2003; 98: 1497–1502.
2 Slatkin NE, Rhiner M. Pain Medicine 2003; 4: 298–303.

A-655

Pharmacokinetics of remifentanil sedation in paediatric intensive care

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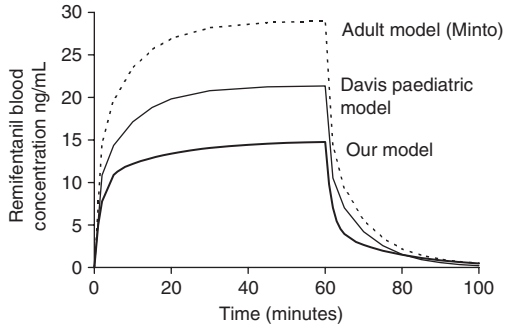
Background and Goal of Study: Remifentanil is a potentially useful agent for sedation of critically ill children. This study determined remifentanil pharmacokinetics in post-cardiac surgery children.

Materials and Methods: We studied 25 children (0.06 to 9 yrs, 3.1 to 39.8 kg) receiving remifentanil (0.8 mcg kg^{-1} min^{-1}) and midazolam (50 mcg kg^{-1} hr^{-1}) for sedation during mechanical ventilation following cardiac surgery. A stepped wake-up was performed where the remifentanil infusion rate was reduced by 0.1 mcg kg^{-1} min^{-1} every 20 minutes until arousal. Arterial blood samples were collected for remifentanil quantification. Preliminary kinetic models, where weight only was evaluated as a covariate, were constructed using NONMEM software.

Results and Discussions: The optimal model was 2-compartmental and weight-proportional. Typical parameter estimates were: CL = 67 mL kg^{-1} min^{-1}, Q = 24 mL kg^{-1} min^{-1}, V1 = 151 mL kg^{-1} and V2 = 300 mL kg^{-1}.

These values are consistent with those from our earlier report in 10 patients[1] but are higher than those previously reported in post-cardiac surgery children[2]. Clearance is comparable to adult values but the volume of distribution is increased[3]. Kinetic simulations demonstrate these findings:



Conclusion: The increased distribution volume in post-cardiac surgery children results in reduced remifentanil blood concentrations, relative to healthy adults.

References:

1 Rigby-Jones AE, *et al*. *Br J Anaesth.* 2005; 95: 578P.
2 Davis PJ, *et al. Anesth Analg.* 1999; 89: 904–8.
3 Minto CF, *et al*. *Anesthesiology.* 1997; 86: 10–23.

A-657

Haemodynamic assesment with pulse contour analysis in children undergoing liver transplantation – a preliminary report

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Background and Goal of Study: Invasive cardiovascular measurement using pulmonary artery catheter (PAC) is considered necessary in adults during liver transplantation because of haemodynamic instability during the procedure. Pulse contour analysis, which is less invasive than PAC, seems to be an alternative in pediatric patients, in whom PAC is infrequently used because of technical difficulties. We are reporting our preliminary results of the use of PiCCO system (Pulsion Medical System, Munich, Germany) to monitor haemodynamic changes in children undergoing liver transplantation.

Materials and Methods: Eight children (50–219 months old, 12.6–58 kg) participated in the study. Percent change (from the baseline) of the heart rate (HR), mean blood pressure (MAP), as well as cardiac output index (PCCI) and systemic vascular resistance index (SVRI) were recorded the onset of surgery (baseline), before and after caval clamping (CC − 10 min., CC + 15 min.), before and after graft reperfusion (R − 15 min., R + 20 min.), at the end of biliary tract reconstruction (EBT) and at the end of surgery.

Results and Discussions:

	% change of		PCCI	SVRI
	HR	MAP	l min^{-1} m^{-2}	dyn s cm^{-5} m^2
Baseline	100 ± 0	100 ± 0	5.5 ± 1.3	1324 ± 673
CC − 10 min.	99 ± 10	94 ± 12	5.3 ± 0.9	1124 ± 377
CC + 15 min.	141 ± 45*	90 ± 14	6.2 ± 1.7	1035 ± 729
R − 15 min.	119 ± 42*	90 ± 14	4.3 ± 1.2*	1561 ± 555
R + 20 min.	119 ± 26*	99 ± 23	6.4 ± 2.1	1170 ± 529
EBT	118 ± 22*	99 ± 19	6.3 ± 1.9	973 ± 357*
End of surgery	106 ± 16	97 ± 18	6.0 ± 2.2	1274 ± 846

* significantly different from baseline ($P < 0.05$).

Conclusion(s): The initial results indicate that the PiCCO technology is a valuable alternative to pure clinical judgment in children undergoing liver transplantation.

References:

1 Della Rocca *et al., Br J Anaesth* 2002; 88: 350–6.
2 Grigorov Tchenkov *et al., Transplant Proc.* 2003; 35: 1920–2.

A-658

Singularity of heart rate and postanesthetic recovery time

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Background and Goal of Study: We investigated whether multifractal heart rate variability during general anesthesia is correlated with postanesthetic recovery time and electrocardiogram can be used for another monitor for prediction of recovery time.

Materials and Methods: Twenty-nine patients (2–8 years old) without any cardiovascular disease enrolled in this study. Electrocardiographic data of 15 minutes' duration were obtained during 1.5 MAC of sevoflurane anesthesia with 60% of N_2O and were used to perform spectral and multifractal analysis of RR interval. Postanesthetic recovery time (an time interval from the time of termination of inhalational agent administration to that of discharge from recovery room) was recorded.

Results and Discussions: Indices of multifractal analysis of short- and long-range singularity exponent (ap1s and ap1l) were significantly correlated with postanesthetic recovery time ($p < 0.05$). As the singularity of heart rate at short- and long-range scale during general anesthesia become lower, the recovery time tends to be longer.

Table 1. Spearman's rho correlation coefficient

	recovery time	P value
TP	0.16	0.94
LP	−0.32	0.16
HP	−0.15	0.51
ap1s	0.46	0.032*
ap1l	0.42	0.050*

* $P < 0.05$

Conclusions: This result suggested the capability that short- and long-range singularity of heart rate can be useful to predict the recovery time in children.

Reference:

1 François Schmitt, Daniel Schertzer, Shaun Lovejoy. Multifractal analysis of foreign exchange data. Appl. Stochastic Models Data Anal. 1999; 15, 29–53.

A-659

Liver and renal function after repeated general anaesthesia in children for the treatment of corrosive oesophagitis

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Background and Goal of Study: Four decades ago halothane (H) was blamed for hepatotoxicity. Its use was neglected during repeated anaesthesia. The children who ingested caustic material have to undergo repeated procedures under general anaesthesia (GA) for the treatment oesophageal

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burn. The aim of this study was to find the effect of repeated GA in which modern anaesthetics used on the laboratory tests showing the kidney and renal functions.

Materials and Methods: The charts of children who had admitted to paediatric surgery department with the diagnosis of corrosive oesophagitis and had undergone GA at least 5 times, since January 2000 were retrospectively reviewed. The anaesthesia protocol defined in the clinic for these procedures are as follows:

- induction: propofol or thiopentone or sevoflurane,
- neuromuscular block: cis-atracurium or atracurium
- maintenance with propofol and remifentanil infusion with/without N_2O (TIVA) when remifentanil is not available sevoflurane, isoflurane and rarely H

Demographic data, the frequency and the type and number of procedures duration of the pathology, the drugs used during anaesthesia, laboratory findings of liver enzymes, urea, creatinine, hemogram, electrolyte levels were received from the charts. Multi-factorial ANOVA test was applied to find out the confounding factor on laboratory changes by using SPSS Vers. 10.0

Results and Discussions: Patients aged ranged 1–14 years (17 girls, 45 boys, age 1–14) and had undergone 720 procedures under GA (11 ± 7 times, 5–31) in duration of 15 ± 10 months (2–41 months). Induction was intravenously in 43% and maintenance with TIVA in 96.8%. Thirteen patients undergone major surgery and 5 had oesophageal perforation during treatment. The urea and creatinine levels increased solely in 2 cases in 2 others with liver enzymes increases. Eighteen patients had elevations in liver enzymes and another 9 had elevated ALP and lactate dehydrogenase levels. Statistical evaluation showed no prominent factor effecting the laboratory results.

Conclusion: Despite using new agents to reduce the anaesthesia effects on organ functions 50% of the patients in this study had pathologic laboratory findings during the treatment, which might be to several factors.

Reference:

1 Gut J et al. Pharmacol Ther. 1993;58(2):133.

A-660

Therapeutic plasma exchange in treatment of fulminant liver failure in children. Report on two successfully treated cases

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Background and Goal of Study: Therapeutic plasma exchange (TPE) is proposed as one possible treatment option in various forms of hepatic failure. We present two cases of paediatric fulminant hepatic failure (FHF), where TPE was successfully used.

Materials and Methods: Case 1: A 5-year old boy was admitted three days after ingestion of unknown toxins. Patient was presented in coma, with hypotension, severe lactic acidosis, hyperammonemia (317 μmol/l), 200-fold elevation of aminotransferases and sign of sever coagulopathy.

Case 2: A 14-year old girl developed three days after ingestion of mushrooms signs of severe intoxication including disturbed consciousness, vomiting, diarrhea, hyperbilirubinaemia, 10-fold elevation of aminotransferases and coagulopathy. Both patients were in addition to general supportive therapy, treated with TPE. Prisma by Gambro-Hospal, filter Prisma TPE 2000 SET, exchanged volume of 55–57 ml/kg was used in three consecutive treatment days.

Results and Discussions: In both cases, dramatic improvement of clinical and laboratory signs were seen: there was no need for vasoactive and respiratory support by day 4, while aminotransferases (ALT/AS; U/l) decreased from 7980/5746 to 427/336 in Case 1 and 3779/4395 to 479/151 in Case 2, respectively. PPT(%)/INR improved from 15/3.1 to 66/1.2 and 38/1.6 to 80/1.1. Three months later, both patients were well without any symptoms of liver dysfunction.

Conclusion(s): Our experience suggests that TPE may be a safe and effective measure to reduce acute complications in paediatric FHF population.

Reference:

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A-661

Vasopressin in neonates after Norwood stage I procedures

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Background and Goal of Study: The balance between pulmonary and systemic resistance is of critical importance after Norwood stage I procedures. Prolonged bypass time and complex surgery may cause SIRS with catecholamine-resistant cardiocirculatory failure (1). This observational study reports the effect of arginine vasopressin (AVP) as potent vasopressor in children with catecholamine-resistant vasodilatory shock (2).

Materials and Methods: Between Jan. and Nov. 2005 seven neonates (3.16, 2.5–3.9 kg; 7.2, 6–12 days [mean; min, max]) were treated with AVP. Indications circulatory shock with epinephrine (E) and norepinephrine (NE) treatment (>0.1 μg/kg/min each), oliguria (<2 ml/kg/h), a positive fluid balance >100 ml/kg on the day of surgery or increasing lactate levels.

Result and Discussion: The ECC time in the 7 neonates was 192 ± 27 min. AVP treatment was started on day of surgery in 5 and on POD 1 in 2 neonates. After start of treatment hemodynamics improved, urine output increased (>2 ml/kg/h) within 10–48 hrs and fluid balance was markedly reduced (−100 to −300 ml). In 5 neonates lactate levels almost returned to normal within 24 hours (Table). Two neonates, one with right ventricular ischemia [5] and one with uncorrected tricuspid insufficiency [6] died.

Table. Fluid balance on the day of surgery; RR sys = mmHg; AVP = mU/kg/min, lactate = mmol/l; *died.

Pat	fluid balance	RR sys	Init. dosage	Max. dosage	Lact. I	Lact. II
1	+495 ml	39	0.1	0.3	1	0.9
2	+393 ml	59	0.05	0.15	2.3	2.0
3	+282 ml	43	0.15	0.17	2.3	1.9
4	+375 ml	50	0.2	0.4	9.6	4.3
5*	+442 ml	44	0.1	0.6	8.9	8.9
6*	+540 ml	20	0.1	0.1	9.5	1.8
7	+525 ml	48	0.1	0.2	3.3	1.8

Conclusion(s): With AVP, systemic perfusion can be improved in neonates after Norwood I. However, with increasing afterload, the balance between pulmonary and systemic circulation may be disturbed. A close observation of lactate levels after initiation of AVP therapy is therefore recommended.

References:

1 Dünser et al: Circulation 2003:107, 2313.
2 Rosenzweig et al: Circulation 1999:100, II 182.

A-662

Hydroxyethyl starch 130/0.4 versus 5% human albumin in children undergoing spinal fusion: safety and efficiency

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Background and Goal of Study: Hydroxyethyl starch (HES) has replaced albumin as a first choice colloid for volume replacements in adults. The third generation HES (130,0.4) shows favourable physicochemical properties and avoid negative effects on coagulation (1). Because of limited clinical experience in children with HES 130/0.4 (2), we designed a study with the aim to assess the efficacy and safety of the novel 6% HES 130/0.4 compared to 5% HA with regard to coagulation and renal function in children undergoing spinal fusion.

Materials and Methods: After local Ethical Committee approval and parental consent, 13 children aged 12 to 15 years and undergoing spinal fusion were prospectively randomised to receive either 6% HES 130/0.4 (Voluven®) or 5% HA for intra-operative volume replacement in a goal directed and standardized setting. Haemodynamic parameters, coagulation and renal functions were assessed preoperatively as well as during and end of surgery, and until de 2nd postoperative day. The amount of colloid administered intraoperatively and laboratory tests were the primary and secondary outcome measurements respectively.

Results and Discussions: Preliminary results in 13 children showed that the mean dose of HES administered was 20 ml/kg versus 17 ml/kg for HA. These results are in agreement with the amount of intraoperatively blood loss that was of 19 ml/kg and 13 ml/kg in the group HES and HA respectively. Hemodynamic parameters, coagulation tests, and renal functions were comparable. Mild adverse events were reported in 3 patients but could not be attributed to the administration of colloids.

Conclusion: Our preliminary data oriented towards a comparable efficiency and safe profile of HES 130/0.4 with comparison with the former "gold standard" HA in children undergoing spinal fusion. Further cases from the current ongoing study may confirm these findings.

References:

1 Vogt N. *Anesth Analg* 1996; 83: 262–268.
2 Lochbühler H. *Crit Care* 2003, 7, Suppl. 2: P107.

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A-663

Thromboelastography in pediatric cardiac catheterization: comparison of cyanotic and acyanotic patients

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Background and Goals: The aim of this study was to evaluate whether there were differences between thromboelastography (TEG) and standard coagulation tests of cyanotic and acyanotic patients undergoing congenital heart surgery.

Material and Method: Forty patients (3 months–10 years) assigned for open heart surgery were studied. TEG measurements and standard coagulation tests (ACT, PT, aPTT, platelet count, fibrinogen and d- dimer) were done at 3 different times (immediately after the induction, at the end of the operation, postoperative 24th hr).

Results: There were no significant differences in any of the standard coagulation tests between the groups. TEG measurements revealed significant differences with respect to maximum amplitude and angle of INTEG values, clot formation time and angle of EXTEG values between the acyanotic and cyanotic groups. Postoperatively, neither TEG nor the standard laboratory parameters were found to be related to the drainage amounts in 1st 24 hours in the ICU. Amount of the bleeding and requirements for blood products were similar between the groups.

Conclusion: In children with congenital cardiac anomalies (both cyanotic and acyanotic), TEG measurements revealed significant differences when compared to standard laboratory tests both during and after the surgery. However these differences had no effect on postoperative bleeding and transfusion requirements.

A-664

Oral clonidine versus midazolam in the prevention of sevoflurane-induced agitation in children

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Background and Goal of Study: Sevoflurane is frequently associated with early post-anaesthetic agitation in children. This randomised double blind study tested the hypothesis that, in comparison to midazolam, oral premedication with clonidine will reduce the incidence of emergence agitation in sevoflurane-anaesthetized children.

Materials and Methods: After local ethics committee approval and parental written informed consent, 60 ASA I–II children (1–6 yr) undergoing circumcision were included. Exclusion criteria were a history of agitation or an inappropriate pain therapy with penile blockade (0.3 ml/kg bupivacaïne 0.5%). Patients were randomised according to premedication given orally 30 min before the induction of anaesthesia: 0.5 mg/kg midazolam (group I), 2 mcg/kg clonidine (group II) and 4 mcg/kg clonidine (group III). Anaesthesia was obtained with sevoflurane and N_2O (O_2/N_2O: 40/60). Inspired concentration of sevoflurane at the different peroperative time points was strictly standardized. In addition to the penile blockade, each patient received intrarectal paracetamol (30 mg/kg). Postoperatively, patients were evaluated by a blinded investigator using the modified "Objective Pain Scale", taking into account crying, movements and behaviour (1). Post-anaesthetic agitation was defined as a total score $=$ or >3 at any time-point for these items during the first postoperative hour. Data were analysed using analysis of variance and Chi-square when indicated. A $p < 0.05$ was considered significant (*).

Results and Discussions: (mean $\pm$ SD)

	Group I (N = 20)	Group II (N = 20)	Group III (N = 20)
Age (months)	31 ± 15	39 ± 19	34 ± 17
Weight (kg)	13.8 ± 3.1	15.6 ± 4.2	14.3 ± 3.3
Recovery time (min)	7 ± 3	7 ± 4	8 ± 5
Agitation (%)	60	40	25 *

Incidence of hypotension and bradycardia were not different between groups.

Conclusion: Clonidine at the dose of 4 mcg/kg given orally 30 minutes before induction of anaesthesia is effective in reducing sevoflurane-induced emergence agitation without increasing postoperative side effects.

Reference:

1 A Joly, et al, *Ann Fr Anesth Réanim* 1998; 17:633–41.

A-665

Investigation of implicit memory during general anaesthesia for elective surgery in children using the mere exposure effect

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Background and Goal of Study: There is evidence that one form of implicit memory, perceptual priming, persists during adequate general anaesthesia in adult[1]. However, conceptual priming is prevented by adequate anaesthesia. In children, studies investigating implicit memory during general anaesthesia are rare and fail to show an evidence of priming. Their negative results can be explained by the use of conceptual memory tests, and by the premedication with benzodiazepine[2] which is known to reduce conceptual priming. Therefore, we designed a prospective study to evaluate implicit memory in children during general anaesthesia for elective surgery, using a sensitive and valid perceptual test based on the mere exposure effect[3].

Materials and Methods: Lists of 12 uncommon neutral words were played 12 times in a random order via headphone to children aged 8 to 12 yrs having elective surgery. Children were not premedicated and general anaesthesia was standardized. Word presentation started after surgical incision. Within 36 hours after word presentation, children had to make a forced-choice preference judgment between target and distractor words, according to the mere exposure procedure. A time constraint and a word deterioration with a low pass filter was used to prevent a conscious recognition. The implicit memory score was obtained by calculating the proportion of target words preferred which was compared to chance level (0.5).Values are mean $\pm$ SD

Results: Preliminary results obtained in 8 children show that 5 children had a percentage of correct response higher than the chance level. The mean memory score was 0.52 (0.14). Since the study is ongoing, statistical analysis will be performed after testing the 24 children planned to be included in the present study.

Conclusion(s): While investigating persistence of implicit memory in children during their general anaesthesia with sensitive and validated perceptual tests, preliminary results demonstrate a very low perceptual priming effect when using the mere exposure effect.

References:

1 Andrade J. Anesthesiology 2005;103:919–20.
2 Bonke B et al. Anaesthesia 1992;47:747–49.
3 Bornstein RF. Psychological Bulletin 1989;106: 265–89.

A-666

Psychological impact of intraoperative awareness in children

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Background and Goal of Study: Adults experiencing intraoperative awareness can develop disturbing after-effects such as day anxiety, sleep disturbance, nightmares, flashbacks, and in the worst case, a post-traumatic stress disorder (PTSD)[1]. It is however unknown whether intraoperative awareness in children has a similar psychological impact. Thus, we designed this study in order to evaluate the incidence of psychological symptoms of children reporting an intraoperative awareness in our institution. Furthermore, we aimed at determining the factors that may influence the severity of the psychological sequelae.

Materials and Methods: Children, prospectively identified cases of awareness in a previous study, are systematically located 6–12 months after surgery. A PTSD questionnaire is administered to the child and his parent in order to retrospectively detect the long-term (6–12 months) and the early (1 month) psychological symptoms. Intraoperative perceptions were also analyzed.

Results and Discussions: Preliminary results show that none of the 8 children located and interviewed so far developed a PTSD syndrome. In opposition to what is reported in adults, none of the children experienced major pain, terror, helplessness or dissociative experience during surgery. The latter are known to be a predictive factor of chronic PTSD in adults[1]. Surprisingly, children seem to cope with this experience, as they try to secure themselves during the operation and consider "normal" to have perceptions during a surgery.

Conclusion: Preliminary results show that unlike for adults, children appear to have less post-traumatic stress disorder following intraoperative awareness. This finding may be attributed to the fact that children have generally less knowledge about the anaesthesia procedure and their expectancy towards medical procedure as well as medical staff is different than that for adults.

Reference:

1 Osterman JE, Hopper J, Heran WJ, et al. *Gen Hosp Psychiatry* 2001; 23: 198–204.

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A-668

Emergency agitation in children after propofol anesthesia

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Background and Goal of Study: The administration of inhaled anesthetic agents is associated with a high incidence of emergence agitation in young children. Halothane and propofol appear to cause much less emergence agitation. In our study we compared the effects of these two anesthetic agents in emergency agitation in children in different surgical treatment.
Materials and Methods: We included 691 children, mean age 6 years, who underwent 575 surgical procedures with propofol anesthesia and 116 with halothane anesthesia. All patients were premedicated with midazolam. The mean dose of maintains with propofol was 4.5 mg/kg/h, fentanyl 2–3 μg/kg or halothane 1.5–2%. Complications after extubation (intense coughing, laryngospazm), postoperative pain, nausea and vomiting, recovery time and emergence agitation were registered. Fisher's exact test was used for the statistical analyses.
Results: There were statistically significant differences regarding the recovery time (16 ± 3.3 min vs. 19.5 ± 4.2 min) in favour to propofol group. Intense coughing and laryngospasm after extubation was lower in halothane group, but higher in patients after adenotonsillectomy (4%). Nausea and vomiting was also higher in patients after adenotonsillectomy (blood content). Analgesia requirements were same in all cases. Emergency agitation was frequently in propofol group ($p < 0.05$).

Type of surgery	Age	Numb. of cases	Preop. anxiety	Anesthetic agents	Emergence agitation
Adeno-tonsillectomies	2–9 yrs.	268	5.4%	Propofol 85% Halothane 15%	23%* 4%
V-P shunt insertion	1–7 yrs.	110	1.8%	Propofol 74% Halothane 26%	11% 7.1%
Herniectomies	1–9 yrs.	158	1.1%	Propofol 89% Halothane 11%	9.8%* 2%
Appendectomies	2–12 yrs.	67	5.7%	Propofol 67% Halothane 33%	22.2%* 11.6%
Fract. of extremit.	3–14 yrs.	88	6.6%	Propofol 88% Halothane 12%	18.5%* 4.9%

Conclusion: The administration of propofol is associated with higher incidence of emergency agitation in young children. It is unclear whether this is due to direct pharmacological action of this agent or whether the earlier awakening caused by the action of this drug ameliorates postoperative excitement.

A-669

The effects of maternal presence during anesthesia induction on the mother's anxiety and changes in children's behaviour

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Background and Goal of Study: Different interventions such as parental presence during induction, sedative premedication, anesthesia information booklets, have been compared to decrease the perioperative anxiety of the children and their parents. This study aimed to evaluate whether maternal presence during induction has additional beneficial effects on mother's anxiety and changes in children's behaviour when an information booklet and premedication was given to all patients.
Materials and Methods: 100 children, aged 2–10 years, scheduled for ambulatory surgery were randomly assigned to a mother-present (Group M) or mother absent group (Group S) after premedication with intranasal midazolam. All mothers were informed about general anaesthesia with a detailed information booklet. Preoperatively (pre) and one week after the operation (post), maternal anxiety was assessed using State-Trait Anxiety Inventory (STAI) and Posthospitalization Behaviour Questionnaire (PHBQ) was used to measure changes in children's behaviour. Anesthesia was induced using sevoflurane-oxygen-nitrous oxide inhalation. The anaesthesiologist graded the level of the children's stress at anesthesia induction with a four-point scale. T-test, chi-square test, Mc Nemar's test, paired t test and general linear model were used for statistical analysis. The study has 95% power to detect 20% difference between the postoperative STAI scores of the two groups ($\alpha = 0.05$).
Results and Discussions: There were no differences between the two groups regarding demographics, anxiety levels of the mothers and postoperative behavioural changes and stress scores of the children ($p > 0.05$ between the groups *$p < 0.005$ within groups).

Mean ± SD	Group S	Group M
Children's age/weight	5 ± 2/19 ± 6	4 ± 2/19 ± 6
Maternal age/STAI trait	33 ± 5/43 ± 8	34 ± 6/44 ± 9
STAI state (pre/post)	49 ± 12/33 ± 9*	49 ± 10/33 ± 9*
Children stress score	2 ± 0.8	2 ± 0.7

Conclusion: We think that maternal presence during induction in addition to premedication and information booklets had no additive effects in terms of reducing the maternal or children's anxiety or postoperative behavioural changes.

A-671

Which agent for premedication in children?

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Background and Goal of Study: The oral form of midazolam is not available in francophone countries. Therefore, hydroxyzine is usually used as a premedication agent in children. However, no published survey had compared this molecule to midazolam in premedication of children. The aim of this study was to compare hydroxyzine to midazolam in premedication of preschool children.
Materials and Methods: ASA I–II children, aged between one and five years, undergoing ambulatory surgery were included in a prospective observer-blind study. Parental and child anxiety were assessed during the preoperative evaluation. Patients were randomised to receive orally either 0.5 $mg.kg^{-1}$ midazolam (intravenous presentation, 5 mg = 1 ml) with some sugar (Group M) or 2 $mg.kg^{-1}$ hydroxyzine (syrup, 10 mg = 1 ml) (group H) one hour before induction of standardized anaesthesia. Children in which surgery lasted more than one hour were excluded. The quality of premedication was evaluated by the tolerance to the face mask, crying, agitation, calling for parents and Ramsay score at the entrance of operating room. These parameters and time to extubation were recorded at the awakening. Chi-square and Student's t-test were used in statistical analysis.
Results and Discussions: Sixty children were included in the study (Group M = Group H = 30). There were no difference between the two groups in demographic data, parental and the child preoperative anxiety level and duration of surgery. Midazolam provided best conditions for children in the operating room:

	Group M	Group H	P
Tolerance to FM	22 (73%)	13 (43%)	0.018
Calling for parents	3 (10 %)	10 (33%)	0.028
Agitation	7 (23%)	15 (50%)	0.032
Crying	10 (33%)	23 (77%)	0.001

FM: face mask.

Time to extubation, behaviour at the awakening and Ramsay score on arrival to operating room and at the end of surgery and were similar in both groups.
Conclusion: Premedication with midazolam results in significantly better anxiolysis and parental separation tolerance.

A-672

Post operative behavioral disturbances in preschool children: comparison between two premedication' agents

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Background and Goal: Hydroxyzine is well accepted by children as a premedication agent because of its sweet taste. However, no published survey had evaluated its efficiency and the incidence of post operative behavioral disturbances (PBD) in this indication. The aim of this study was to compare hydroxyzine to midazolam in prevention of PBD in preschool children.
Materials and Methods: Following ethics committee approval and parental informed consent, ASA I–II children, aged between one and five years,

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undergoing ambulatory surgery were included in a prospective observer-blind study. Patients were randomised to receive orally either 0.5 mg.kg^{-1} midazolam (intra venous presentation, 5 mg = 1 ml) with some sugar (Group M) or 2 mg.kg^{-1} hydroxyzine (syrup, 10 mg = 1 ml) (Group H) 60 minutes before induction of standardized anaesthesia. Fifteen days after discharge, the parents were called to check on the occurrence of nocturnal enuresis, nightmares, appetite decrease and relationship disorders after anaesthesia in their child. Chi-square and Student's t-test were used in statistical analysis; $p < 0.05$ was considered significant.

Results: Sixty children were included in the study (Group M = Group H = 30). There were no difference between the groups in age, sex, weight and duration of surgery. Regrouping information about PBD was possible in only 50 children.

PBD	Group M	Group H	p
Nightmares	0	6 (20%)	0.022
Appetite decrease	5 (17%)	12 (40%)	0.037
Relationship disorders	2 (6.7%)	4 (13.3%)	0.384
Nocturnal enuresis	1	1	1

Conclusion: In our study, premedication with midazolam caused less PBD than hydroxyzine.

A-673

Midazolam-dexamethasone combination effectively reduces postoperative nausea and vomiting following strabismus surgery in children

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Background and Goal of Study: Postoperative nausea and vomiting (PONV) is one of the most common complications following strabismus surgery. This prospective, randomized, double-blind-study was designed to evaluate the efficacy of midazolam in reducing the incidence of PONV in children.

Materials and Methods: One-hundred children, ASA class I, aged 4–12 years who were scheduled to undergo elective strabismus surgery were enrolled in this study. No premedications were given to the children. Anesthesia was induced by sevoflurane, nitrous oxide and oxygen mixture. After induction, fentanyl 2 μg/kg and cisatracurium 0.1 mg/kg were administered intravenously and an endotracheal tube was inserted. Patients were randomly allocated into four groups to receive placebo, midazolam 50 μg/kg, dexamethasone 0.5 mg/kg, or a combination of midazolam 50 μg/kg and dexamethasone 0.5 mg/kg after induction of anesthesia and before start of surgery. All episodes of nausea, retching and vomiting during the first 24 hours after anesthesia were recorded.

Results:

Incidence of postoperative nausea and vomiting	Post-operative nausea (%)	Post-operative vomiting (%)
Placebo	48%	52%
Dexamethasone	32%	32%
Midazolam	12%*	0%**
Midazolam + Dexamethasone	0%**	0%**

* P value <0.01 ** P value <0.001.

Conclusion: Administration of midazolam dexamethasone combination to children undergoing strabismus repair resulted in significant reduction in the incidence of PONV.

A-674

Routine antiemetic prophylaxis is not required for pediatric circumcision surgery: preliminary results of a prospective audit

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Background and Goal of Study: The incidence of postoperative nausea and vomiting (PONV) after pediatric circumcision using modern anaesthetic methods is not extensively documented. Simple predictive scores are not exact (1), routine prophylaxis is inappropriate and hence it has been suggested the individual incidence of PONV for different surgeries and populations be evaluated (2). The goal of our study was to determine the incidence of PONV after pediatric circumcision.

Materials and Methods: A prospective observational audit was carried out of children scheduled for circumcision. Those with history of previous PONV were excluded. All children were induced with either propofol or sevoflurane and maintained with air, oxygen, isoflurane mixture. Children received either caudal or dorsal penile block, opiods including short acting agents, were not given. No routine antiemetic prophylaxis was given, and ondansetron was prescribed for treatment of PONV. PONV and treatment required was noted at 0, 6 and 24 hours postoperatively.

Results and Discussions: A total of 35 patients studied so far. The incidence of PONV was 3%, but 0% if those with motion sickness were excluded.

Age (years)	Range 1–16, median 7				
Weight (kg)	Range 15–80, median 25				
PONV	Yes	1	Motion sickness	Yes	1
				No	0
	No	34	Motion sickness	Yes	1
				No	33

Conclusion(s): With careful technique those children without risk factors do not require routine antiemetic prophylaxis for circumcision.

References:

1 Eberhart LHJ, et al, BJA 2004 93(3):386–392.
2 Villeret I, et al, Paediatric Anaesthesia 2002 12:712–717.

A-675

Childhood obesity, a bigger anaesthetic challenge than anticipated

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Background and Goal of Study: Childhood obesity is increasing across the UK and developed world. An increase in critical incidents, respiratory infections, difficulties with cannulation, airway management and derangement of respiratory physiology have been reported in the obese child (1). The study aim was to identify the prevalence of childhood obesity in the surgical paediatric population attending our district general hospital (DGH).

Materials and Methods: A prospective study of all children between 2–15 years of age admitted electively for surgery over a twelve-month period was conducted. Weight/heights were recorded to establish body mass index (BMI). BMIs were plotted on standard UK90 BMI for age/sex reference charts (2). We define overweight and obesity using International Obesity Task Force definitions corresponding to adult cut-offs at age 18, of BMI >25 kg/m^2 and >30 kg/m^2 respectively. Statistical analysis was by the Mantel-Haenszel chi-squared test, significance taken at the 1% level.

Results and Discussions: Preliminary results; 100 cases

	Boys (n = 68)		Girls (n = 32)	
	National prevalence %	DGH prevalence %	National prevalence %	DGH prevalence %
Overweight >25 kg/m^2	22	28 (n = 19)	28	28 (n = 9)
Obese >30 kg/m^2	5	12 (n = 8)	7	9 (n = 3)

Considering all overweight children; there was no significant difference in the prevalence ($p > 0.01$), however the difference was significant when only boys were studied ($p < 0.01$). The prevalence of obese children compared to the national average for both sexes was significantly higher ($p > 0.01$).

Conclusion(s): A disparity in the prevalence of childhood obesity in those presenting for surgery in our centre from the accepted national figures is clear. This has implications for UK anaesthetists, further work is required to quantify this underestimated problem.

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1 Smith HL, et al, Pead Anaesthesia 2002 (12) 750–61.
2 Cole TJ, et al, BMJ 2000 (320) 1240–3.

A-676

$VTCO_2$ and compliance for guiding lung recruitment in surfactant depleted piglets

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Background and Goal of Study: Lung recruitment and reversal of atelectases is part of lung protective ventilation. Surfactant depleted piglets were used to test the hypotheses that $VTCO_2$ would decrease with over-distension and compliance decrease at closing pressure.

Materials and Methods: Lungs were lavaged with saline to an oxygenation index of 10–20 at FiO_2 1.0 in six 5 weeks old, anaesthetised piglets. Ventilation, circulation and blood-gases were continuously monitored. After lavage all piglets were ventilated for five minutes with zeroPEEP and an end inspiratory

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pressure (EIP) resulting in 10 ml/kg tidal volume. Two consecutive procedures were run in each piglet. Ventilation was adjusted to a predefined baseline (PEEP 6/EIP 25 cmH_2O) for ten minutes followed by recruitment at PEEP 12 cmH_2O and stepwise increase of EIP succeeded by a downward PEEP titration. Guided by this a condensed one minute up-and-down procedure followed. A final 5 minutes optimal ventilation period was then performed (PEEP 2 cmH_2O above closing pressure in the forgoing derecruitment with an EIP resulting in a tidal volume of 10 ml/kg). A second 5 minutes zero PEEP period preceeded a second run. One CT scan/ventilatory setting delineated collapsed, poorly aerated, normal and overdistended lung (1, 2).

Results and Discussions: In 8 of 12 recruitments $VTCO_2$ peaked or levelled off with high EIP but it was not a conclusive a marker of overdistension. Compliance declined immediately before CT scans revealed an increase of collapsed areas during PEEP titration. CT scans of the final optimal ventilation period showed a higher proportion of normal lung and less collapse than during the baseline period. Coherent with this 10 ml/kg tidal volume was achieved at lower amplitudes (EIP-PEEP) and compliance was >60% higher than at baseline.

Conclusion(s): $VTCO_2$ did not conclusively reflect overdistension. Compliance decreased at pressure levels indicative of formation of atelectatic areas.

References:

1 Gattinoni L, Pesenti A, Avalli L, et al. *Am Rev Respir Dis* 1987;136:730–36.
2 Vieira SR, Puybasset L, Richecoeur J, et al. *Am J Respir Crit Care Med* 1998; 158:1571–77.

A-677

Impact of depth of propofol vs ketamine sedation on functional residual capacity and ventilation distribution in preschool aged children

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Background and Goal of Study: Children are particularly vulnerable for hypoxaemia when undergoing sedation. Measuring functional residual capacity (FRC) provides important information on gas exchange. This study aims to evaluate the impact of increasing doses of propofol or ketamine, the two most commonly used sedational agents, on FRC and ventilation distribution in preschool children.

Materials and Methods: We studied 46 children (2–6 years) without cardiopulmonary disease, scheduled for elective surgery. In 20 children, sedation was induced by a bolus of propofol 2 mg/kg i.v. followed by an infusion of 120 $\mu g\,kg^{-1}\,min^{-1}$ propofol i.v. (Level I). After the first measurement, a bolus of 1 mg/kg propofol i.v. was given followed by 240 $\mu g\,kg^{-1}\,min^{-1}$ propofol i.v. (Level II). When calculating the propofol pharmacokinetics in children using the Kataria's model, this sedation regime reaches "pseudo" steady state conditions 5 minutes after application of the bolus. In 26 children, sedation was induced with ketamine 2 mg/kg followed by a continuous infusion of ketamine 2 mg/kg/h (Level I). After five minutes, the first FRC measurement was performed. Then, a bolus of ketamine 2 mg/kg followed by ketamine 4 mg/kg/h i.v. was applied (Level II) and after five minutes the second FRC measurement was performed. All children were breathing spontaneously via a close fitting face mask receiving 50% oxygen. FRC and ventilation distribution were measured using a SF_6 washout technique with an ultrasonic transit-time airflow meter (Exhalyzer D, Eco Medics, Duernten, Switzerland). FRC and lung clearance index (LCI), an index for ventilation homogeneity indicating peripheral airway collapse, were calculated using a multi-breath analysis.

Results and Discussions: *Propofol group*: FRC decreased from 20.7 (3.3) ml/kg at sedation level 1 to 17.7 (3.9) ml/kg at level 2 ($p = 0.001$) and the LCI increased from 10.4 (1.1) to 11.9 (2.2), ($p = 0.001$). *Ketamine group*: Neither FRC nor LCI changed between the two levels [FRC 25.6 (4.3) ml/kg vs. 25.5 (4.2) ml/kg, LCI 10.5 (1.2) vs. 10.3 (1.1)].

Conclusion(s): In contrast to ketamine, a deeper level of propofol sedation leads to a significant decrease of FRC and ventilation distribution. This indicates an increased vulnerability to hypoxemia with a deeper level of propofol sedation compared with ketamine sedation.

A-678

The relation between the middle ear pressure changes and postoperative nausea and vomiting in pediatric strabismus surgery

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Background and Goal of Study: This study was aimed to investigate the effects of tympanometric changes on the incidence of postoperative nausea and vomiting (PONV) after strabismus surgery in pediatric patients.

Materials and Methods: Forty-nine nonpremedicated children undergoing elective strabismus surgery were studied. Tympanogram was obtained before induction of standardized anesthesia and after full recovery using Impedance Audiometer AZ26 (Denmark). The incidence of PONV was assessed at various time intervals (0–2 h, 2–6 h, 6–24 h) using 4-point scale (0: No nausea, 1: Nausea but no vomiting, 2: One episode of vomiting, 3: Two or more episodes of vomiting), and correlation with tympanometric data was investigated.

Results and Discussion: The PONV score was highest in the first, and lowest in the last measurement. Fourteen (28.6%) patients had nausea, and 10 (20.4%) patients vomited. The gradient, compliance, and pressure values were fount to be significantly higher in postoperative measurements than those of preoperative values in both groups ($p < 0.05$). The volumes of both ears in both groups increased postoperatively, but these differences were not statistically significant ($p > 0.05$). Changes in middle ear pressure, volume, compliance, and gradient did not correlate with PONV ($p > 0.05$).

Conclusion(s): Gradient, compliance, volume, and pressure changes in middle ears were not found to be related to the incidence of nausea and vomiting after strabismus surgery. We conclude that further studies are required to detect the predictive value of tympanogram for anticipation of PONV in strabismus surgery in children.

A-679

Middle ear pressure and postoperative nausea and vomiting in children undergoing adenotonsillectomy: desflurane plus N_2O or remifentanyl versus sevoflurane plus N_2O or remifentanyl

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Background and Aim: N_2O, widespreadly used in anesthesia, increases space volumes because of its high rate of diffusion and in non-compliant tissues such as middle ear cavity it increases pressure. Increase in middle ear pressure is an undesirable condition because of its potential complications.

The aim of this study is to compare effects of N_2O plus desflurane or sevoflurane and remifentanyl plus desflurane or sevoflurane on middle ear pressure and postoperative nausea and vomiting.

Method: Patients in ASA group I–II aged between 10–18 undergoing adenoidectomy or adenotonsillectomy are randomized into groups according to anesthesia we performed as desflurane + N_2O group (Group DN, $n = 15$), sevoflurane + N_2O group (Group SN, $n = 15$), desflurane + remifentanil group (Group DR, $n = 15$) and sevoflurane + remifentanil group (Group SR, $n = 15$). Mean arterial pressure (MAP), heart rate (HR) monitorization of cases and preoperative (T_0), after intubation (T_1), before extubation (T_2), after extubation (T_3), 30th minute after extubation (T_4) middle ear pressures (MEP) are measured then MEP values and postoperative nausea vomiting (PONV) frequencies among groups are compared.

Results: T_0 measurements of MEP are not different between groups but T_1 measurements are higher in N_2O used groups than remiphentanyl used groups. Similar rise in MEP is observed in remiphentanyl used groups paralel to prolonged anesthesia duration. There is no difference between groups in respect to side effects also. When 17 cases with nausea and vomiting are reviewed, pressure difference between left and right ear is determined.

Conclusion: In middle ear surgery, remiphentanyl plus sevoflurane or desflurene is a better alternative than N_2O only for brief surgical interventions. Major factor for postoperative nausea and vomiting is pressure difference between right and left ear independent from the agent used and more detailed studies on this subject are necessary.

A-680

Transient respiratory depression following extubation in the operating room after congenital heart surgery

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Background and Goal of Study: There is increasing evidence that early extubation in children after surgery for congenital heart disease (CHD) is beneficial. The goal of this study is to show that respiratory depression and hypercapnia often seen after early extubation are transient.
Materials and Methods: Retrospective review of arterial blood gas analysis ($paCO_2$ and pH) of 127 pediatric patients undergoing surgery for CHD between July 2002 and May 2005. Inclusion criteria were age between 1 month and 18 years and extubation in the OR. General anesthesia was supplemented with single shot caudal or intrathecal morphine in all patients.
Results and Discussions: Data for the pH is shown in Table 1:

pH values in ICU

	At 24 hours		
Admission	Normal	Low	Very low
Normal (n = 48)	48	0	0
Low (n = 73)	69	4	0
Very low (n = 4)	4	0	0
Total (n = 125)	121	4	0

Normal: ⩾7.35, Low: 7.25–7.35, Very low: <7.25.
Data for the $paCO_2$ is shown in Table 2:

$paCO_2$ values in ICU

	At 24 hours		
Admission	Normal	High	Very high
Normal (n = 50)	48	2	0
High (n = 68)	63	5	0
Very high (n = 7)	4	3	0
Total (n = 125)	115	10	0

Normal: <45, High: 45–60, Very high: >60 [mmHg].

No patient had to be reintubated for respiratory depression.
Conclusion: The hypercapnia and respiratory depression seen after early extubation are common but usually resolve within the first 24 hours.
References:
1 Steve D. *Pediatr Crit Care Med* 2004;5(1).
2 Kloth RL. *Crit Care Med* 2002 Apr;30(4):787–91.

A-682

Pressure support ventilation versus spontaneously breathing pediatric patients during anesthesia for fibroscopy

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Background: Fibroscopy in children is a high risk procedure for respiratory adverse event. Pressure support ventilation (PSV) could enhance ventilation (1,2) and perhaps decrease complications.
Methods: this prospective, comparative, randomized study included 10 children upper 1 year with PSV vs 10 spontaneously breathing children for fibroscopy. They were anesthetized with 1.5 MAC of sevoflurane according to the age, and 10 μg/kg of alfenanil. The pressure support was set to 15 cmH_2O and decrease if tidal volume exceed 12 ml/kg. We recorded ventilatory parameters, bispectral index and respiratory complications during and after the procedure. Data are recorded before induction of anesthesia, after PSV initiation, immediately after the fiberscope crossing vocal cords, 5 min after and at the end of the procedure.
Résults and Discussion: the both groups were comparable. PSV improve minute ventilation ($p < 0.05$) after anesthetic induction and after fiberscope introduction ($p < 0.01$) by enhancing tidal volume ($p < 0.05$) but not respiratory rate. End-tidal CO_2 was higher in PSV group without statistical difference. PSV allows to maintain a normal alveolar ventilation. There is a better dead space/tidal volume ratio. Under these conditions, end-tidal CO_2 measurement is more accurate. The complication rate was lower in the PSV during fibroscopy without statistical significance. The complications were significantly lower in this group during the wakening ($p = 0.0389$).
Conclusion: PSV improve ventilation and decrease respiratory complications after the procedure. We expect to demonstrate a same benefit during fibroscopy.
References:
1 Bosek V, Roy L, Smith RA. *Pressure support improves efficiency of spontaneous breathing during inhalation anesthesia.* J Clin Anesth, 1996. 8(1): p. 9–12.
2 Banchereau F, et al., *Pressure support ventilation during inhanlational induction with sevoflurane and remifentanil in adults.* European Journal of Anaesthesiology, 2005. 22: p. 1–5.

Obstetric Anaesthesia

A-683

Spinal anesthesia in cesarean section and success rates: 25G vs 26G vs 27G needles

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Background and Goal of Study: The incidence of failed spinal anesthesia with 27-gauge (27G) Whitacre® needle raises 3.8% *vs* 0% with 25G in obstetric patients[1]. Similar datas are not available with 26G needle. Our aim was to compare the success rates between 25, 26 and 27G needles for spinal anesthesia in scheduled cesarean section.
Materials and Methods: After informed consent, 134 consecutive women undergoing cesarean section were included and randomized in three groups: 25, 26 or 27G needle (Withacre®). Women with dysgravidia or pre-eclampsia were not included. All the punctures were performed by a trained senior. Failure was defined as 3 unsuccessful punctures with the same needle. In this case the next available bigger needle was used (26 after 27G or 25 after 26G). Recorded parameters were: patient's demographic datas, success of spinal puncture defined by a cerebro-spinal fluid (CSF) backward at the beginning and the end of the injection. A Chi square test was used with a $p < 0.05$ considered significant.
Results and Discussions: Results are shown in the Table. There were no statistical differences between the groups regarding demographic datas. There was no statistical difference in the success rate between 25 and 26G. Failures were statistically less frequent in the 26G group than in the 27G ($p = 0.002$).

	25G (n = 46)	26G (n = 46)	27G (n = 42)
Height (cm) ± SD	162 ± 7	159 ± 6	160 ± 7
Weight (kg) ± SD	77 ± 18	72 ± 15	73 ± 13
BMI ($kg.m^{-2}$) ± SD	29 ± 7	28 ± 6	29 ± 5
Failure: n (%)	1 (2.1)	0 (0)	7 (16.6)
Success: n (%)	45 (97.9)	46 (100)	29 (83.4)

Conclusion: Our preliminary results show that the success of spinal anesthesia is much more frequent with 26G than with 27G needle. Because the success rate with 25 and 26G needle is similar, 26G needle could be the good choice taking account potential for both post-dural puncture symptoms and spinal failure.
Reference:
1 Smith & al., Anaesthesia, 1994;49:859–862.

A-684

Randomized double-blind comparison of multiple phenylephrine-ephedrine combinations during spinal anaesthesia for caesarean section

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Background and Goal of Study: For treatment of hypotension during spinal anaesthesia (SA) for Caesarean section (CS), ephedrine (EP) may cause fetal acidosis and phenylephrine (PH) may cause bradycardia. Combination of PH + EP has been described[1] but only at a single fixed ratio. This study aimed to compare different equipotent combinations of PH + EP.
Materials and Methods: With IRB approval and written consent, we enrolled 125 patients having elective CS. After spinal bupivacaine-fentanyl, we started IV cohydration and randomized patients to 1 ml/min IV infusion of one of 5 mixtures of PH + EP, each based on an estimated potency ratio of 80:1[2] (Gp1 PH 100 μg/ml + EP 0 mg/ml; Gp2 PH 75 + EP 2; Gp3 PH 50 + EP 4; Gp4 PH 25 + EP 6; Gp5 PH 0 + EP 8). Infusions were continued if Q1 min systolic BP (SBP) was ⩽baseline or stopped if >baseline. We analyzed data using ANOVA, Chi-square and robust linear regression.
Results and Discussion: Hypotension (SBP < 80%) and nausea were more frequent in Gp5 vs the other Gps (Table). Incidences of bradycardia (HR < 50/min) and hypertension (SBP > 120%) were similar. Umbilical

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arterial (UA) PH and BE decreased directly with increasing EP dose; regression analysis showed that PH reduced this effect in a dose-dependant manner.

Table. (data are number or mean) *Gp5 vs other Gps

	Gp1	Gp2	Gp3	Gp4	Gp5	P
Number	24	24	25	24	25	
Hypotension	1	3	3	2	8	.01*
Bradycardia	3	1	1	0	1	ns
Hypertension	12	13	9	8	15	ns
Nausea	0	4	0	5	10	.01*
UA pH	7.29	7.27	7.25	7.21	7.14	<.01
UA BE	−2.0	−3.0	−3.9	−4.7	−6.2	<.01
UA pH < 7.2	0	3	6	7	12	.02

Conclusion(s): UA PH and BE decrease with increasing EP dose; this is attenuated by adding PH. Adding PH to EP improves BP control and nausea. Best results were with PH alone.

References:

1 Mercier, et al. Anesthesiology 2001; 95: 668–74.
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A-685

Relevance of rapid crystalloid administration after spinal anaesthesia (coload) in prevention of hypotension during elective caesarean section

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Background and Goal: Rapid crystalloid administration after, rather than before induction of spinal anaesthesia for elective caesarean section, may be advantageous in terms of managing maternal blood pressure (1). This study examined the relevance of timing of fluid administration.

Materials and Methods: After ethics committee approval and informed consent 60 full-term women were included in this study. All patients were ASA physical status I, and were scheduled for elective caesarean delivery under spinal anaesthesia. Patients were randomly allocated to receive either 20 ml/kg of crystalloid solution during 15 min prior to spinal induction anaesthesia (preload group), or an equivalent volume by rapid infusion immediately after induction (coload group). Modalities of spinal anaesthesia were standardized in all patients. Maternal heart rate and arterial blood pressure were recorded before (basic values), then every minute during 30 min following induction. Hypotension, defined as systolic arterial pressure (SAP) $< 80\%$ of basic value was treated by IV boluses of ephedrine 6 mg. Continuous variables were analyzed by using unpaired t-test. Nominal or ordinal variables were analyzed by using χ^2-test. $P < 0.05$ was considered statistically significant.

Results: Groups were similar in demographic and baseline data. According to characteristics of hypotension, no differences between groups were observed, but time to onset of first hypotension was longer in preload group than in coload group (see Table).

	Coload (n = 30)	Preload (n = 30)	*P*
Hypotension before extraction (%)	93.3	83.3	0.423
Hypotension during intervention (%)	96.7	86.7	0.353
Lowest SAP (mmHg)	77 ± 13	83 ± 15	0.139
Hypotension onset time (min)	6 ± 5.6	11.8 ± 9.1	0.01
Ephedrine dose requirement (mg)	17.3 ± 11.3	14.8 ± 17.0	0.189

Conclusion: Incidence of spinal anaesthesia induced-hypotension during elective caesarean section was not higher when crystalloid infusion was performed immediately after, rather than before induction. Preload only delayed hypotension onset. Coload could replace preload to prevent maternal hypotension during spinal anaesthesia for elective caesarean section, but further large scale randomised trials are required.

Reference:

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A-686

Spinal anaesthesia using hyperbaric 0.75% ropivacaine vs hyperbaric 0.5% bupivacaine for elective caesarean section

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Background and Goal of Study: Spinal anaesthesia produced with ropivacaine (R) and morphine is proved to be as effective and safe as that provided by bupivacaine (B) and morphine for caesarean section, with an earlier recovery of sensory and motor functions [1]. Our study aimed to answer the question whether hyperbaric plain R is different to hyperbaric plain B in this setting.

Materials and Methods: After Ethical Committee approval and informed consent, 75 patients scheduled for elective caesarean section were randomly allocated into group R and group B. Group R (n = 36) received intrathecally 2 mls of hyperbaric 0.75% R, while group B (n = 39) received intrathecally 2 mls of hyperbaric 0.5% R. Profile of sensory and motor block as well as cardiovascular effects were compared between the groups. Mann Whitney test, ANOVA with post-hoc Scheffe test and two-tailed Fischer test were used when appropriate. $p < 0.05$ was considered significant.

Results and Discussions: Onset of sensory and motor block was comparable in R and B group (6.1 ± 1.1 vs 6.4 ± 1.4 min. and 10.4 ± 2.2 vs 11.2 ± 2.6 min., respectively). Duration of sensory blockade was also similar (129 ± 29 min. for R and 130 ± 24 min. for B) – similar results were found in the duration of motor bockade (79 ± 13 min. for R vs 78 ± 17 min. for B). Mean values of blood pressure and heart rate were comparable between the groups. Five patients in R group (13.9%) and five patients in B group (12.8%) were given ephedrine because of arterial hypotension.

Conclusion: Plain ropivacaine 0.75% is fully comparable to plain bupivacaine 0.5% during spinal anaesthesia for elective caesarean section.

Reference:

1 Danelli G., et al. Reg Anesth Pain Med 2004; 29: 221.

A-687

General anesthesia for caesarean section: use of remifentanil for surgical stress control and effects on newborn well-being

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Background and Goal of Study: Opioid administration for caesarean section is usually avoided until child delivery in order to reduce the risk of neonatal depression. We investigated the effect of remifentanil on maternal stress response during caesarean section under general anaesthesia and on newborn well-being.

Materials and Methods: We randomised into two groups (A and B) twenty healthy parturients at term undergoing general anaesthesia for caesarean section. In both groups, anaesthetic induction was performed with sodium thiopenthal 4 mg/Kg and succinylcholine 1 mg/Kg; sevoflurane 1.5% and N_2O 50% were used for maintenance. Basic and bispectral index monitoring were performed. In Group A, a remifentanil bolus of 0.5 μg/Kg was administered at the induction of anaesthesia, and a continuous infusion of 0.15 μg/kg/min was started. The continuous infusion was stopped at peritoneal incision and started again after childbirth. In Group B fentanyl 5 μg/Kg was administered after childbirth. Norepinephrine, epinephrine, ACTH, GH and cortisol were measured in samples obtained before surgery, before uterine incision and at the end of surgery. Apgar scores, umbilical vein and artery pH were noted at delivery. Demographic and blood gas analysis were compared by unpaired T-test. Apgar score and maternal hormones data were compared by Wilcoxon test.

Results: There was no significant difference between the two groups in heart rate, blood pressure and Bispectral Index**.** Before uterine incision norepinephrine and ACTH concentrations were lower in Group A ($p < 0.05$; $p < 0.01$). There were no significant differences in GH, epinephrine and cortisol levels. There were no significant differences in umbilical vein and artery pH and base excess, but 1 and 5 minutes neonatal Apgar scores were significantly lower in group A ($p < 0.05$).

Conclusion: Remifentanil during general anaesthesia for caesarean section reduces maternal stress response. Continuous infusion of remifentanil is associated with an higher incidence of transient neonatal sedation.

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2 Gin T., Ngan_Kee W., Siu Y.K., et al. Anesth Analg 2000; 90(5): 1167–72.

A-689

Neonatal effects of a remifentanil-based technique in general anesthesia for planned cesarean section

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Goal of Study: Opioids are routinely omitted at the induction of general anesthesia for cesarean delivery due to the risks of respiratory neonatal

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depression. The short-acting opioid remifentanil may afford advantages at the induction and surgical stimulation, without subsequent neonatal depression.
Material and Methods: In this double blinded study, 40 patients undergoing elective cesarean section and required general anesthesia were allocated randomly to receive either remifentanil (0.5 μg/kg) at the induction of anesthesia (G1, n = 20) or placebo (G2, n = 20). Exclusion criteria were pregnancy duration of less than 32 weeks, diabetes, preeclampsia, difficult tracheal intubation, intrauterine growth retardation or other fetal abnormality. Induction of anesthesia was performed with Propofol 2 mg/kg and succinylcholine 1 mg/kg. Anaesthesia was maintained with nitrous oxide, oxygen 50/50%, Propofol (100 μg/kg/min), remifentanil (0,2 μG/kg/min) and atracurium. Neonates were assessed by using Apgar scores, possible respiratory neonatal depression, with or without ventilation in the mask or intubation and umbilical cord blood gas (artery:UA and vein:UV).Values are expressed as means. Pearson's chi squared and t test were used for statistical analysis $P < 0.05$ was considered significant.
Results: There were no statistical differences in neonate weight or height between the two groups. Seven respiratory depressions were noted (3 in G1, 4 in G2). 3 neonates required brief assisted ventilation by mask (1 in G1, 2 in G2).

Table 1. Neonatal data.

	Apgar 1 min	Apgar 5 min	RR	UA pH	UV pH	$UAPCO_2$ mmHg	$UVPCO_2$ mmHg
G1 n = 20	8.15	9.40	46	7.26	7.28	49.62	44.08
G2 n = 20	8.05	9.40	49	7.25	7.29	45.93	40.69
P	NS	NS	NS	NS	NS	NS	NS

NS: not significant; RR: respiratory rate; UA: umbilical artery; UV: umbilical vein.

Conclusion: We conclude that, in parturients undergoing elective caesarean section under general anesthesia, remifentanil (0,5 μg/kg) at the induction of anesthesia can be used without subsequent neonatal depression. However, we believe that further research is necessary to extrapolate these results to a pregnancy carrying an acutely distressed fetus.

A-690

Prediction and prophylaxis of post spinal hypotension guided by analysis of the autonomic nervous system

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Background and Goal of Study: Hypotension due to spinal anaesthesia (SA) for cesarean section is harmful (1). Autonomic regulation, reflected by heart rate variability (HRV), was investigated in 140 patients (P) to evaluate the individual risk, and to guide prophylactic treatment.
Materials and Methods: Low to high frequency (LF/HF) of HRV reflecting the autonomic balance (2,3) prior to SA and systolic blood pressure (SBP) in the course of SA were studied. PART I: 41 P were classified to one of three groups by the lowest SBP after SA (SBP-LOW). LF/HF was analysed retrospectively. PART II: 59 P were assigned by baseline (BL) LF/HF to low or high risk group. BL LF/HF and SBP-LOW were correlated. PART III: 40 P at high risk indicated by LF/HF were prophylacticly treated with either vasopressor infusion (n = 20) or intensified prehydration (n = 20). SBP and adverse events in the course of SA were analysed. *Statistics*: Two way anova for matched pairs, Student's t test, $p < 0.05$.
Results and Discussions: PART I: Mild hypotension (SBP-LOW = 112 ± 11 mmHg) was correlated with low BL LF/HF (1.4 ± 0.7), moderate (97 ± 9 mmHg) and severe (78 ± 9 mmHg) hypotension demonstrated elevated LF/HF (3.3 ± 2.2 and 3.2 ± 1.9, $p < 0.05$). PART II: Prospective analysis demonstrated a significant correlation of elevated BL LF/HF (4.4 ± 1.9 vs. 1.4 ± 0.5) and hypotension (SBP-LOW = 80 ± 14 vs. 113 ± 18 mmHg, $p < 0.05$). Thus, BL LF/HF may predict high risk of post SA hypotension. PART III: Prophylactic vasopressor intervention prevented hypotension in 19 of 20 P (SBP-LOW = 116 ± 17 mmHg). Intensified prehydration decreased an elevated BL LF/HF and prevented hypotension in 17 of 20 P (SBP-LOW = 104 ± 19 mmHg). No adverse events occurred. Thus, BL LF/HF may guide prophylactic treatment.
Conclusions: These data indicate that HRV analysis may detect patients at high risk of hypotension after SA. Prophylactic measures may be successfully guided by analysis of LF/HF. Adverse effects of these interventions may be successfully prevented.
References:
1 Chestnut D: Obstetric anesthesia. Principles and practice 1999.
2 Pomeranz B, et al.: Am J Physiol 1985.
3 Pagani M, et al.: Circ Res 1986.

A-691

Propofol decreases bispectral index during the induction-delivery period in caesarean section

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Background and Goal of Study: The lightest part of the general anesthesia during the caesarean section is induction-delivery period (1,2). The aim of the study is to compare of thiopentone and propofol on awareness during the induction-delivery period in pregnants by using bispectral index (BIS) monitorization. To the best of our knowledge, this is the first study that investigating the effect of propofol on the awareness in the induction-delivery period.
Material and Methods: 61 pregnant women (aged 20–37, ASA I-II) who were scheduled for elective caesarean section under general anaesthesia were included for prospective, randomized, double blinded study. The patients were divided into two groups to receive 4 mg/kg thiopentone (group I) or 2 mg/kg propofol (group II) for anaesthesia induction. After the intubation (0.8 mg/kg rocuronium), anesthesia was maintained with 50% N_2O in oxygen and 0.6% end-tidal concentration of isoflurane. Standard hemodynamic parameters and BIS values were evaluated in the induction-delivery period. The newborn's APGAR scores were also recorded. Statistical analysis was made with student t test. $p < 0.05$ was considered significant.
Results: Patient-demographics data were similar. No difference between the 5th APGAR scores of the groups ($p = 0.5$). The distribution of patients in both groups according to the BIS values during induction-delivery period is shown at the Table.

	BIS (mean ± SD)		
	Intubation	Skin incision	Delivery
Group I ($n = 31$)	48.9 ± 16.3	57.2 ± 16.5	63.8 ± 13.6
Group II ($n = 30$)	39.4 ± 10.3*	44.2 ± 12.2*	52.0 ± 11.2*

*$p < 0.01$ comparing to group I.

Conclusion: Propofol provides better anaesthesia depth during induction-delivery period without any side effects on the newborn's APGAR scores.
References:
1 King H, Ashley S, Brathwaite D et al. *Anesth Analg* 1993;77:84–88.
2 Chin KJ, Yeo SW. *Anaesthesia* 2004;59:1064–1068.

A-692

Occupational exposure to nitrous oxide does not affect haemoglobin concentration in midwives

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Background and Goal of Study: Chronic exposure to higher trace concentrations of nitrous oxide is associated with potentially negative health effects. Nitrous oxide may cause neurological and haematological signs and symptoms, as a result of its tendency to form a complex with cobalt (I) in methylcobalamin, the cofactor for methionine synthase, resulting in irreversible oxidation of the cofactor and inactivation of the enzyme protein. Formation of active enzyme requires new protein synthesis, as well as cobalamin supply (vitamin B12) (1,2). The purpose of this study was to determine if midwives chronically exposed to occupational nitrous oxide in their working environment had any negative haematopoietic effects correlated to nitrous oxide use.
Materials and Methods: Blood was drawn before and after at least 10 days of vacation (mean 29 ± 11 std dev days) from 12 healthy midwives (39 ± 8 years) who use nitrous oxide frequently (70% of deliveries) in delivery rooms for pain relief. Blood was assayed for erythrocyte and haemoglobin concentrations at the hospital laboratory.
Results and Discussions: No low mean corpuscular haemoglobin concentrations or changes in any haemoglobin values were observed between the pre- and post-vacation testing (Table). All mean and individual values were within normal limits except for one low pre-vacation haemoglobin concentration.

	Reference values	Before vacation	After vacation
Erytroctes ($\times 10^{12}$/L)	4.0–5.0	4.4 ± 0.3	4.3 ± 0.3
Haemoglobin (g/L)	120–150	133 ± 8	132 ± 8
Evf (%)	34–43	39 ± 2.5	38 ± 2.4
MCV (fL)	80–96	89 ± 3.6	89 ± 4.0
MCH (pg)	27–32	30.6 ± 1.2	30.5 ± 1.2
MCHC (g/L)	320–360	344 ± 5	344 ± 6
Platelets ($\times 10^9$/L)	150–360	236 ± 44	237 ± 38
Leucocytes (10^9/L)	3.5–9.0	6.3 ± 1.0	6.7 ± 1.5

Evf = erythrocyte volume fraction; MCV = mean corpuscular volume; MCH = mean corpuscular haemoglobin; MCHC = mean corpuscular haemoglobin concentration.

Conclusion(s): Work place exposure to nitrous oxide in a delivery unit did not give raise to significant negative blood value effects.

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A-693

Pharmacogenetic effect of β_2AR genotype on preterm labor and response to tocolysis: a systematic review

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Background and Goal of Study: The β_2-adrenergic receptor (β_2AR) displays genetic variability with several single nucleotide polymorphisms (SNPs). At codon 16 (Arg16Gly), the Arg allele is associated with decreased down-regulation of the β_2AR; at codon 27 (Gln27Glu), the Glu allele decreases desensitization and down-regulation[1]. Since the β_2AR is expressed in uterine muscle and is a target for tocolytic agents, it has been postulated that SNPs of β_2AR could alter the course of preterm labor (PTL) and delivery (PTD). The goal of this systematic review of the literature was to analyze the current evidence regarding the β_2AR genotype as it pertains to PTL and PTD.
Materials and Methods: We searched MEDLINE (1966 to 2005) using the following search terms: preterm labor, pregnancy, tocolysis, β_2 adrenergic receptor, polymorphism, genetic. We found 4 studies assessing the effect of β_2AR genotype on outcome of PTL: 3 case-control studies[3–5] and one prospective cohort treatment trial with β_2-agonists for tocolysis$_2$.
Results and Discussions: In all four studies, β_2AR genotype affected the course of PTL. In the study assessing the response to tocolysis[2], neonatal outcomes were also significantly altered by genotype (Table).

References	n	SNP/variant	Outcome	p
Landau 2005[2]	60	Arg16	↑ gestational age	0.04
			↑ birth weight	0.036
Doh 2004[3]	32	Arg16	↓ PTD	0.002
Ozkur 2002[4]	80	Glu27	↑ PTL	0.001
Landau 2002[5]	28	Arg16	↓ PTD	0.01

n = # patients with PTL.

Conclusions: Arg16 homozygosity had a protective effect on the occurrence of PTD and improved neonatal outcomes while the Glu27 variant was associated with an increased incidence of PTL. This is the first review assessing the pharmacogenetic effect of β_2AR genotype on PTL. Further trials using such tocolytic therapy or β_2–agonists for other indications (ephedrine for treatment of hypotension) should control for receptor genotype.
References:
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5 Landau R. *Am J Obstet Gynecol* 2002; 187(5): 1294–8.

A-694

Survey of methods used to ensure asepsis whilst performing regional anaesthesia and analgesia in obstetrics

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Background and Goal of Study: Asepsis and sterile precautions prior to regional techniques are vital to avoid serious neuroaxial infections. The Royal College of Anaesthetists publication (2004) offer some guidance regarding aseptic technique for continuous epidural infusions. We decided to conduct a postal survey of obstetric anaesthetists to establish what they believed to be the necessary minimal essential sterile precautions.
Materials and Methods: Questionnaires that looked at commonly used aseptic techniques and variations, were sent to all college tutors in hospitals in the North London region. We requested that these were distributed to all anaesthetists practising obstetric anaesthesia.
Results and Discussions: 84 (29%) anaesthetists responded. Only 36% (n = 31) were aware of local guidelines which set standards for asepsis. We defined strict aseptic technique as full scrub (similar to that of surgeons), wearing hat, gown, mask and sterile gloves. 60% (n = 50) adopted these precautions for spinal anaesthesia and 44% (n = 37) for epidural analgesia.

	% of responders	
ATTIRE WORN	Spinal	Epidural
Gown/gloves/hat/mask	73.8 (n = 62)	58 (n = 49)
Gown/gloves/hat	21.4 (n = 18)	20.2 (n = 17)
Gown/gloves/mask	1.2 (n = 1)	6 (n = 5)
Gown/mask/hat	2.4 (n = 2)	2.4 (n = 2)
Gown/gloves	1.2 (n = 1)	11 (n = 9)
Gloves only		2.4 (n = 2)

40% restricted the number of individuals in the room whilst performing the spinal procedure. 23% (n = 19) of respondents performed rapid sequence spinal anaesthesia for emergency caesarean section. 12 complications were noted from this survey these included meningitis (3), epidural abscess (3), local infection (5) and other (1).
Conclusions: Most anaesthetists were unaware of guidelines which set standards for aseptic technique. Our survey suggest that are considerable differences in practice in relation to the minimum essential precautions used to ensure sterility for regional anaesthsia and analgesia. There are also variations of technique when performing either spinal and epidural.
Reference:
Sellors, J et al Anaesthesia 2002 (57) 593–596.

A-695

Obstetric anaesthesia practice: Lithuanian survey

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Background: Regional anaesthesia and analgesia become prevailing methods in anaesthesia care for obstetric patients. Data concerning obstetric anaesthetic practice in Lithuania are lacking. A comparison with figures from other European countries might be of interest.
Goal of Study: To investigate the availability and pattern of obstetric anaesthesia and analgesia services in Lithuania.
Materials and Methods: Standard questionnaires on obstetric anaesthesia in 2004 were mailed to all dept. of anaesthesia of hospitals providing obstetric care.
Results and Discussions: In 2004 there were 49 hospitals providing obstetric care in Lithuania. Responses were received from 32 dept. of anaesthesia. Responding hospitals had cared for 69.9% of deliveries in the country. Non-pharmacological means of analgesia were available in 96% of hospitals. Systemic analgesia was provided in 80% of facilities, obstetricians being responsible for it in 83.3%, anaesthetists – 8.3%, both – 8.3% of hospitals. Regional analgesia for labour was possible in 67.7% of facilities, but it was provided only in 8.8% (min.–max. 0–39.8%) of cases. It was performed due to medical indications in 7.3% and according to preference of parturient in 92.7% these cases. Mean annual Sectio caesarea (SC) rate was 16.9% (min.–max. 5–27.5%), 6% were scheduled and 10.9% were emergency SCs. For scheduled SC general anaesthesia was used in most cases (62%), followed by spinal (29%) and epidural anaesthesia (9%). General anaesthesia was used extensively for emergency deliveries (91%). General anaesthesia with tracheal intubation and controlled ventilation was the only option of general anaesthesia for SC in responding hospitals.
Conclusions: Means of non-pharmacologic and systemic analgesia for labour were extensively used in Lithuania in 2004. Methods of regional analgesia were available only to a small number of parturients. The use of regional anaesthesia for SC was considerably less common in Lithuania than in Western European countries.

A-696

Anesthetic techniques for obstetrics in Catalonia in 2003

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Goal of Study: Within an extensive epidemiological survey of anaesthetic activity in Catalonia (ANESCAT) we analysed common practice of obstetric analgesia and anaesthesia during 2003.
Methods: We conducted a cross-sectional survey that used information reported by anaesthesiologists from all public and private hospitals practising anaesthesia around Catalonia (6,704,146 inhabitants) on 14 randomised days in 2003. We recorded information that included characteristics of patients, anaesthetic techniques and procedure for which anaesthesia was required. We analysed information concerning obstetric activity, calculating what proportion of all anaesthetic activity it represented, the coverage of the entire obstetric population, the rate of caesarean section (CS) and the distribution of anaesthetic techniques.
Results: In 131 hospitals 23,136 anaesthetic procedures were performed on the 14 days studied. Seventy-one hospitals (54%) performed obstetric procedures, 44 of them public and 27 private. Anaesthesia for obstetrics represented 11.3% of all cases. This extrapolates to 67,864 anaesthetic

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procedures; 87.7% of them were related with labour and delivery. The rate of obstetric analgesia and/or anaesthesia was 82.6% of all deliveries. The mean CS rate in the population was 25.1%, with the rate increasing significantly with age. The rate of regional analgesia for labour and CS were 98.7% (96.9% epidural block) and 96.2%, respectively. The Table shows the percentage of every anaesthetic technique for CS according to whether it was elective (Elect) or non-elective (N-Elect).

CS	General	Regional	Spinal	Epidural	Combined
Elect.	1.2	97.7	75.5	23.3	1.2
N-Elect.	3.3	95.8	44.8	53.3	1.9

Conclusion(s): The overall use of analgesia and anaesthesia for labour and CS in Catalonia is among the highest in the world. The use of general anaesthesia for delivery is practically marginal as result of routine use of continuous epidural analgesia for labour and the common use of pencil point needles for spinal anaesthesia. New follow-up national surveys are needed to analyse and compare new tendencies in obstetric anaesthesia.

Reference:

Anesthesiology 1999;92:1509, Anaesthetist 2002;51:103.

A-697

Anaesthesia for caesarean section in Serbia – clinical audit

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Background and Goal of Study: The aim of the Confidential Enquiry into Maternal Death (CEMD) is to help ensure that all pregnant and recently delivered women receive high quality, safe care. According to their findings, mortality associated with general anaesthesia is 17 times higher than in those receiving regional anaesthesia. Failed airway management and aspiration are the major components of general-anaesthetic deaths.

Patients and Methods: An audit, involving 97 anaesthetists from 8 units (4 teaching hospitals and 4 district general hospitals) and analyzing the ratio of the use of general anaesthesia (GA) versus spinal anaesthesia (SA), was performed. The reasons for choosing GA over SA, as well as the presence of a partner during labour, was also audited. Statistics were analysed with the Chi-squared test.

Results:	Serbia	UK	p value
Elective CS (SA)	7%	91%	$p < 0.01$
Emergency CS (SA)	1%	77%	$p < 0.01$
Presence of birth partners	<1%	>90%	$p < 0.01$

Reasons for the choice of GA	(n of audited)
Educational system	81 (83%)
Training	76 (78%)
Patient refusal	49 (51%)
Risk of Hypotensive Crises	37 (38%)

Conclusions: In order to improve standards of obstetric anaesthesia in Serbia it is necessary to: modify the educational system, such that it favours regional anaesthesia for caesarean section as a much safer anaesthetic technique, introduce guidelines to be used in all units, organize a system of reporting any perioperative complications of caesarean section and informing patients of possible complications of GA.

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A-698

Post spinal meningitis: a iatrogenic epidemic

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Background: Severe complications after spinal anesthesia are believed to be extremely rare, but the incidence is probably underestimated[1]. A recent publication has estimated the absolute annual risk to be 3/1.000.000[2]. We report a case-series of 4 women undergoing a gynaecological/obstetrical procedure within 5 consecutive days (8/7/2005–12/7/2005), in a major hospital in Tunis with 3500 deliveries/year.

Description of Cases: After skin preparation with iodine povidione 10%, spinal anaesthesia was provided with bupivacaine, fentanyl and morphine by 4 different anesthesiologists. A prophylactic dose of antibiotics (2 g iv cefazolin) was given at the start of the surgical procedure. All women developed the following symptoms within the next 12–16 h: headache, photophobia, 39°C fever. A diagnostic lumbar puncture was performed in all women (Table), following which women were treated with 12 g iv cefotaxime/day.

Table. Clinical data and results of CSF exam

#	Age	Procedure	Onset	CSF direct exam	CSF WC/mm^3	CSF culture
1	33	CS	14 h	No germ	70,000	Negative
2	33	CS	14 h	Gram neg+	12,600	Negative
3	35	CS	16 h	No germ	45,000	Negative
4	49	Curettage	12 h	No germ	7,000	Negative

Discussions: The differential diagnosis included bacterial or aseptic meningitis. Following the CSF exam, it was concluded that all 4 cases were most likely to be of bacterial origin. The fact that a causal germ was found in only 1 case is probably due to the prophylactic dose of cefazolin. Iatrogenic contamination of CSF by skin germs due to insufficient aseptic measures is the most likely cause for bacterial meningitis. Another possible cause is the multiple use of morphine vials in our institution.

Conclusions: To improve quality and safety of anaesthetic procedures, our hospital policy has been changed since July 2005. It has become mandatory to wear face masks and sterile surgical gowns for all procedures, as well as use thorough disinfection with iodine povidione 10%. Multi-use of opioid vials has been banned since then.

References:

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2 Gaul. Pain 2005; 116: 407–10.

A-700

Anaesthetic management of HELLP syndrome (haemolysis, elevated liver enzymes, low platelets)

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Background and Goal of Study: HELLP syndrome is a life-threatening complication of pregnancy characterized by hemolysis, elevated liver enzymes and low platelets, first described by Weinstein in 1982 (1). Spinal anaesthesia may be safely administered in patients with HELLP syndrome, without coagulopathy (2). The aim of our study was to analyze the mode of anaesthesia applied at the cesarean section of HELLP patients.

Materials and Methods: We treated 107 patients with HELLP syndrome at the I. Dept. Ob/Gyn., Semmelweis University between 1995 and 2004. Cesarean section was performed in 103 cases. The anaesthesia was spinal in 38 cases (37%) and general in 65 cases (63%).

Results and Discussions: The main age of the patients was 29 years, mean gestational age was 31 weeks. The lowest platelet count observed was 41.000/μl. The complications of anaesthesia are shown in the Table.

	Spinal n = 38	General n = 65	p
Intraoperative infusion (ml)	1816 (±541)	1737 (±590)	NS
Hypotension	4 (10.52%)	0	NS
Hypertension	1 (2.63%)	15 (23%)	$p = 0.006$
Tachycardy	1 (2.63%)	10 (15.38%)	$p = 0.038$
Shivering	4 (10.52%)	0	$p = 0.016$

Conclusion(s): Our study supports the observation that spinal analgesia has advantages over intratracheal narcosis in the anaesthesia of HELLP syndrome.

References:

1 Weinstein L. *Obstet Gynecol* 1982; 142:159–167.

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A-701

Expectant fathers and labor epidurals

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Background and Goal of Study: There are negative aspects of birth for men, the major being the witnessing of pain suffered by the partner (1).The aim of this study was to investigate fathers attitudes towards labor and delivery with and without epidural analgesia.

Materials and Methods: The study was performed by using a questionnaire which included yes/no, multiple choice or 6 point ordinal scale answers. The questionnaire was administered to all expectant fathers whose partners were nullipara between the 36th–38th weeks gestation and thereafter the day after the birth. To investigate paternal anxiety during labor we used the State-Trait Anxiety Inventory (STAI). Data was examined by Student's t-test, Mann-Withney U-test and Chi squared test as appropriate.

Results and Discussions: The questionnaire was given to 243 expectant fathers. 145 (60%) of parturients received epidural analgesia and 98 (40%) did not. Age, level of education, marital status and mean duration of the couple's relationship were comparable as well as the desire of a child. Respectively, fathers 41% (with epidural) and 32% (no epidural) attended an antenatal anesthetic consultation and childbirth preparation classes with their partners. Fathers whose partners did not receive epidural analgesia felt their presence as troublesome and unnecessary ($P < 0.001$). The presence of maternal epidural analgesia increased threefold paternal feelings of helpfullness and was associated with a greater involvement ($P < 0.001$) and less anxiety and stress ($P < 0.001$). Median (range) STAI score was respectively 75 (50–80) and 30 (20–60) in fathers whose partners did not or did receive epidural analgesia ($P < 0.01$). Maternal analgesia greatly increased paternal satisfaction ($P < 0.0001$).

Conclusion: Epidural analgesia reduces paternal anxiety and stress, increases paternal involvement, participation and satisfaction with the experience of childbirth.

Reference:

1 Johnson MP. J Psychosom Obstet Gynecol 2002;23:173–82.

A-702

Use of norepinephrine in pregnancy after emergency cardiopulmonary bypass

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Background and Goal of Study: There are no human studies with norepinephrine in pregnancy, and it is indicated only if the risk to maternal survival outweighs the potential harm to the fetus.

Materials and Methods: 28 yr female presented to the ER with worsening chest pain and shortness of breath 2 years after undergoing AVR with a mechanical valve. TTE showed thrombosis of the prosthetic valve with LV distension. Ultrasound showed an active fetus with good beat-to-beat variability at 140–150. Patient was rushed emergently to the OR for redo AVR using CPB. BP was 60/40. Rapid sequence induction was accomplished with 14 mg etomidate and 100 mg succinylcholine. BP immediately following induction was 64/45. 100 mcg epinephrine were given without response. BP fell to 25 mmHg and chest compressions were begun. Sternotomy was performed and epinephrine boluses were given. Upon weaning from CPB, BP could not be maintained above 70 mmHg. Increase of epinephrine rate caused ventricular dysrhythmias. Norepinephrine 0.05 mcg/kg/min was instituted contrary to recommendation of the obstetrician. BP increased to 110/65. Postoperative ultrasound showed fetus with FHR in the 120's. The patient carried fetus to term and delivered a normal, healthy baby boy.

Results and Discussions: Hemodynamic compromise is a well-known complication in acute valve thrombosis, leading to LV distention and failure, often resulting in death. Fetal survival rate during CPB only approaches 50%. Infusion of phenylephrine, epinephrine, and norepinephrine all decrease uterine blood flow in pregnant sheep. Phenylephrine has been associated with improved umbilical cord gases at bolus doses up to 50 mcg. No studies exist with the use of norepinephrine in pregnancy.

Conclusion: Use of norepinephrine in pregnancy may be indicated in extremely unstable situations. Uterine artery vasoconstriction must be weighed against adequate blood pressure to maintain adequate placental perfusion.

Reference:

1 Parry AJ. Cardiopulmonary bypass during pregnancy. Ann Thorac Surg 61:1865, 1996.

A-703

Spinal anesthesia for caesarean section in preeclampsia

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Background and Goal of Study: Despite controversy over the haemodynamically safest blockade for cesarean section in women with severe preeclampsia, an increasing number of anesthetists now prefer the spinal anesthesia. Many studies had found that spinal anesthesia offered an equally safe and effective option for these patients.

Materials and Methods: Randomized prospective-retrospective study, including 60 patients: ($n = 30$) normotensive and ($n = 30$) severely preeclamptic, but haemodynamically stabilized parturients. Standardized spinal anesthesia with 9 mg isobaric bupivacaine (0.5%) + 20 μg fentanil (L3–L4 spinal puncture). Heart rate and NIBP were measured at specific time points. Hypotension was treated with 10 mg iv boluses of ephedrine, if the systolic pressure fell >20% from the baseline, or if the patient exhibited symptoms of hypotension.

Results and Discussions: Although the magnitude of the decrease in systolic, diastolic, and mean arterial blood pressure was similar between groups, the mean ephedrine requirement of the normotensive group (25.2 ± 10.6 mg) was significantly greater than that of the preeclamptic group (12.3 ± 9.6). Hypotension was less frequent in preeclamptic patients than in normotensive group (19.7% versus 37.8%). The risk of hypotension in the preeclamptic group was almost 2 times less than that in the normotensive group.

Conclusion(s): This suggests that the hypotension induced by spinal anesthesia in women with severe but haemodynamically stabilized preeclampsia, is less than that of normotensive patients. Although general anesthesia can be used safely in preeclamptic women, it is fraught with greater maternal morbidity and mortality. Currently, the safety of regional anesthesia techniques is well established and they can provide better obstetrical outcome when chosen properly.

References:

1 Aya AG, Vialles N, Tanoubi I, Mangin R, Ferrer JM, Robert C, Ripart J, de La Coussaye JE. Spinal anesthesia-induced hypotension: a risk comparison between patients with severe preeclampsia and healthy women undergoing preterm cesarean delivery. Anesth Analg. 2005 Sep; 101(3): 859.

2 Mandal NG, Surapaneni S. Regional anaesthesia in pre-eclampsia: advantages and disadvantages. Drugs, 2004; 64(3): 223–36.

A-704

Postoperative analgesic and antihyperalgesic effect of spinal clonidine used during elective caesarean section

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Background: Spinal (IT) clonidine (CLO) improves analgesia during and after cesarean section (CS) (1). Surgical injury induces central changes associated to increased postoperative pain (hyperalgesia) and to residual pain which is not unusual after CS (2). Because, IT CLO has demonstrated antihyperalgesic properties in experimental pain and postoperative patients (3), the study evaluates benefit of adding CLO to IT analgesia for CS.

Materials and Methods: After informed consent, healthy parturients undergoing elective CS (max 1 previous CS), were randomly assigned to receive IT hyperbaric bupivacaine 0.5% 1.8 mL combined with either sufentanil 1.8 μg (BS group; $n = 14$), or sufentanil 1.8 μg and clonidine 75 μg (BSC group; $n = 13$), or clonidine 150 μg (BC group; $n = 12$) in 3 mL volume. Postoperative analgesia was assessed by IV PCA morphine requirements and VAS pain scores (VAS 0–10) for wound pain at rest and movement. Mechanical hyperalgesia was measured with von Frey filaments. Presence and intensity (score: 1 to 5) of residual wound pain at 1,3 and 6 months was questioned. Statistical analysis used ANOVA with postohoc test, X^2 for multiple groups, $P < 0.05$ significant with BS (*).

Results and Discussions: Demographic data were similar as well as surgery and IT analgesia duration. Only movement parietal pain at 12 h was lower in BSC group (3 ± 2* vs 7 ± 2 in BS group and 4 ± 2 in BC group). PCA morphine use was lower in BC group at 24 h (12 ± 10 mg* vs 27 ± 16 mg in BS group and 18 ± 12 mg in BSC group).

	BS	BSC	BC
Hyperalgesia at 48 h	61.5%	33%	17%*
Residual pain at 1/3/6 Months (n)	4/1/1	4/3/3	2/0/0
Intensity (score 1–5) at 3/6 Months	2.5/2	3/1	—/—

Conclusion: Besides short term opioid sparing effect, these preliminary data show that IT clonidine 150 μg reduces the development of mechanical

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hyperalgesia, i.e. clinical expression of central sensitization, hence seems to prevent the development of residual pain after CS.

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1 Benhamou, et al. Anesth Analg 1998; 87: 609–13.
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3 De Kock, et al. Anesth Analg 2005; 101: 566–72.

A-705

The effects of intravenous general anesthetics on frequency and amplitude in oxytocin-stimulated myometrium strips from term-pregnant rats

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Background and Goal of Study: Uterus is required to relax for manipulation of fetus during pregnancy, however relaxation of uterus can cause massive bleeding after delivery and abortion. Therefore muscle tonus of uterus is important in obstetric anesthesia. In this study, effects of ketamin, propofol, thiopental sodium and midazolam on frequency and amplitude of concentrations in myometrium strips from term-pregnant rats.

Materials and Methods: Twelve rats in 19–21 days of pregnancy as pregnant rats were sacrificed. Myometriums of rats were removed quickly. Strips of myometrium ($8 \times 2 \times 2$ mm) were suspended vertically in 10 ml isolated organ baths. The organ chambers contained Krebs solution, gassed with 95% O_2 and 5% CO_2 during the measurements, and maintained at 37°C. The strips were tied with silk to a force transducer on one end and fixed with silk ties to a glass support on the other. Strips were performed tension 2 g before adding drugs, then strips were treated by oxytocin (10 μU). After regular isometric contractions were obtained, intravenous general anesthetics, ketamin, propofol, thiopental sodium and midazolam were added by cumulative concentrations (10^{-7}–10^{-4} M). Isometric tension alterations were recorded before adding drugs and after adding cumulative concentrations. When data of contractions were calculate, contraction response obtained by oxytocin (10 μU) were considered as 100% (control). After drugs were added by cumulative concentrations, their responses were calculated as response % of contractions of oxytocin (10 μU).

Results: Ketamin, propofol, thiopental sodium and midazolam did not change to frequencies of contractions, but they caused to decreases concentration-dependent on amplitudes of contractions. Propofol-induced depression was more significantly in all concentrations ($p < 0.05$). E_{max} values of ketamin, propofol, thiopental sodium and midazolam-induced amplitudes were 40.4 ± 3.7, 66.6 ± 6.2, 28.8 ± 3.0, 36.6 ± 3.2 respectively.

Conclusion(s): The least relaxation was obtained by thiopental sodium, most relaxation was obtained by propofol in strips of myometrium in vitro. Furthermore, effects of intravenous general anesthetics on uterus should be investigated by more advanced experimental and clinic studies.

A-706

Analgesic effects of intravenous paracetamol vs. ibuprofen after cesarean section

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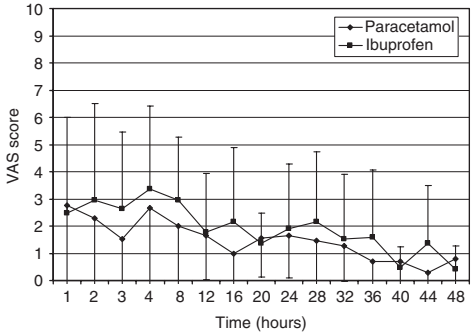
Background and Goal: Post-cesarean pain is typically treated with opioids or non-steroidal anti-inflammatory drugs (NSAIDs), however, opioids carry the risk of respiratory depression and sedation and NSAIDs are not desirable in lactating mothers. In contrast, intravenous paracetamol is a non-opioid analgesic that is devoid of these adverse effects. This double-blind study compared the analgesic efficacy of intravenous paracetamol with that of oral ibuprofen in patients undergoing cesarean section.

Materials and Methods: Thirty American Society of Anesthesiologists' class I–II patients, aged 22–42 yrs, and scheduled for cesarean section randomly received either paracetamol 1 g IV 30 min before anesthesia and 1 g IV q6h for 48 h subsequently (group P), or oral ibuprofen 400 mg PO 30 min preoperatively and q6h for 48 h thereafter (group I). Spinal anesthesia using 0.5% hyperbaric bupivacaine 12.5 mg mixed with fentanyl 10 μg was performed in all patients. In recovery room, morphine 0.05 mg · kg^{-1} IV was administered to all patients followed by patient-controlled analgesia (PCA) using morphine (2 mg dose, 10 min lockout, no infusion). No other analgesics or NSAIDs were allowed for 48 h. Postoperatively, visual analogue scale (VAS) score was determined q1h for 4 h then q4h for 48 h. Data presented as mean ± SD.

Results: VAS scores over time were similar in both groups (Figure) ($P = 0.155$). Patients in groups P and I received a total of 99.3 ± 37.7 and 93.3 ± 31.4 mg morphine, respectively ($P = 0.589$). The median PCA attempts over study period were 109 (IQR 150-64) for group P and 108 (IQR 187-60) for group I ($P = 0.988$). No adverse effects.

Conclusion: IV paracetamol is an effective alternative to oral ibuprofen for post-cesarean section analgesia.



A-707

Subhypnotic doses of midazolam prevents nausea and vomiting due to spinal anaesthesia for cesarean section

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Background and Goal of Study: Numazaki et al. have shown that subhypnotic dose propofol is effective in the prevention of emetic symptoms during spinal anaesthesia for cesarean section (C/S). Our hypothesis was midazolam at subhypnotic doses could be as effective as propofol in reducing emetic symptoms during C/S.

Materials and Methods: Ninety ASA I and II parturients undergoing C/S with spinal anaesthesia were included in this randomized, double blinded, placebo controlled study. Exclusion criteria; multiple pregnancy, any gastrointestinal disease, or taken an antiemetic medication within 24 hours of surgery. Patients received placebo (Group C), 20 mg propofol bolus followed by propofol at a subhypnotic dose (1 mg kg^{-1} hr^{-1}) (Group P), and 1 mg midazolam bolus followed by midazolam at a subhypnotic dose (1 mg hr^{-1}) (Group M) immediately after clamping of the umbilical cord. Patients reported the presence of nausea or vomiting at any time and asked directly at 2 min intervals and also the hemodynamics were recorded. Nausea, vomiting and hypotension were treated by increasing the rate of fluid administration and 5 mg increments of iv ephedrine, total ephedrine consumption was also recorded. One-way ANOVA, Kruskal-Wallis, Mann-Whitney U-test, x^2 test, were used for statistical analysis. $p < 0.05$ considered as significant.

Results and Discussions: Mean ± SD of age (yr), height (cm), weight (kg) of 90 female patients were 30 ± 42, 162 ± 13, 75 ± 66 respectively. Group P and M were similar but Group C was statistically different according to the parameters shown in the Table (*$p < 0.05$).

	Group P (n = 30)	Group M (n = 30)	Group C (n = 30)
No of patients, experienced nausea	17	20	29
Total nausea (Mean ± SD)	0.83 ± 0.83	1.20 ± 1.12	4 ± 2.11*
No of patients, experienced vomiting	2	3	14
Total vomiting (Mean ± SD)	0.03 ± 0.18	0.1 ± 0.30	0.6 ± 0.85*
Total ephedrine consump.	23 ± 8.2 mg	28.3 ± 11.4 mg	39.1 ± 15.4*mg

Conclusion(s): Midazolam at subhypnotic doses was as effective as propofol in preventing nausea and vomiting and also in decreasing ephedrine consumption according to the placebo in C/S patients under spinal anesthesia.

Reference:
1 Numazaki M, MD et al. Journal of Clinical Anesthesia 2003; 15:423–427.

A-708

The effect of adding intrathecal magnesium sulphate to morphine for postoperative analgesia after caesarean section

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Background: The addition of intrathecal (IT) magnesium to spinal morphine prolongs the duration of spinal analgesia for caesarean section. In this

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prospective, randomized, double blind, controlled study, we investigated the effect of IT magnesium sulphate, morphine and there association in postoperative analgesia.

Methods: Ninety seven ASA I or II parturient undergoing caesarean section are randomly allocated to receive intratecally:

Group A (GA) (n = 31): 0.1 mg morphine
Group B (GB) (n = 32): 100 mg magnesium
Group C (GC) (n = 34): Association of 0.1 mg morphine and 100 mg magnesium.

We recorded the following: quality of postoperative analgesia with the visual analogic score (VAS), analgesic requirement, and side effects.

Result(s) and Discussions: In the GC: we observed a better quality and longer duration of analgesia until 36 hours with first demand of analgesic of 27 hours versus 19 hours in the GA ($p < 0.001$). Also, the analgesic requirement was significantly lower in the GC ($p < 0.001$) with a better maternal satisfaction.

Besides, we did not find in the GC any:
*Modification of the quality and the duration of the sensory and motor block.
*Increasing of the incidence of hypotension.
*Enhancing of the intrathecal morphine side effects.
*Impact on Apgar's newborn score.

Conclusion: The addition of IT magnesium sulphate (100 mg) to morphine in spinal anaesthesia for caesarean section improved quality and duration of the postoperative analgesia with a better maternal satisfaction without additional side effects.

Reference:

1 O Zalevli M, et al. Acta Anaesthesiol Scand 2005; 49: 1514–1519.

A-709

Levobupivacaine is a reliable test dose in parturients

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Background and Goal of Study: In clinical practice, test doses are rounded up to a convenient volume, generally between 1 and 3 mL. For levobupivacaine 0.5%, 1.5 mL (7.5 mg) approximates to the upper 95% confidence interval for the ED95 as estimated in a previous MLAC study (1). We therefore performed a randomized, double blind study to determine whether 1.5 mL 0.5% levobupivacaine (L) + epinephrine (E) may be used as an effective test dose in parturients.

Materials and Methods: After informed consent, we randomized 90 healthy parturients having cesarean section under CSE technique into 3 equal groups to receive either 1.5 mL L + E 15 μg epidurally, 1.5 mL saline intrathecally, and 1.5 mL saline IV (Group E) or 1.5 mL L + E 15 μg IV, 1.5 mL saline epidurally, and 1.5 mL saline intrathecally (Group IV) or 1.5 mL L + E 15 μg intrathecally, 1.5 mL saline epidurally, and 1.5 mL saline IV (Group IT). We recorded heart rate (HR) changes, motor block (MB) with a modified Bromage scale and sensory block (SB) by using pinprick every minute until 10 min. We evaluated the following variables: an increase of HR > 15 bpm, the occurrence of any motor block and a sensory loss to pinprick sensation >T12. Hypotension was defined as a 20% decrease in mean arterial blood pressure and treated with IV ephedrine. Data was analyzed by the Chi squared test and the Kruskal-Wallis test.

Results and Discussions: Results at 5 min are reported in the Table. All parturients in Group IV developed positive HR changes and all parturients in the IT group experienced some degree of motor block whereas none of the parturients in the E group developed any motor block within 5 min ($P < 0.001$)

Group	HR changes (>15 bpm)	MB	SB (>T12)	Hypotension
IV	100%	0%	0%	0%
E	0%	0%	0%	0%
IT	0%	100%	93.3%	70%

Conclusions: Levobupivacaine 1.5 mL + epinephrine 15 μg is a reliable epidural test dose to clearly detect the accidental IT as well as IV injection at 5 min.

Reference:

1 Camorcia M, et al. BJA 2004; 92:800–3.

A-711

Combined epidural clonidine and neostigmine safely and effectively prolong initial spinal labour analgesia: a randomised, double-blind, placebo-controlled trial

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Background and Goal: Spinal neostigmine (N) and clonidine (C) prolong initial spinal analgesia produced by a local anaesthetic/opioid mixture, administered as part of combined spinal epidural (CSE) labour analgesia (1,2). Unfortunately, these spinal adjuvants introduce nausea and hypotension (1,2). However, epidural C and N produce effective analgesia with less side-effects (3,4). The present study evaluated whether initial spinal analgesia could be prolonged if C and N were administered epidurally 15 min after spinal injection of ropivacaine (R) and sufentanil (S).

Material and Methods: Following ethics committee approval and written consent, 70 primigravid patients with singleton, vertex presenting pregnancies in labour, were randomized to 2 groups. In both groups initial spinal analgesia was initiated with 3.5 mg R and 1.5 μg S. Fifteen min after spinal injection, 10 ml study solution was administered epidurally. In the P-group, the study solution was plain saline and in the NC-group it was 500 μg N and 75 μg C dissolved in saline. Primary outcome parameters were duration of initial spinal analgesia, hourly local anaesthetic consumption and number of patients delivering without receiving additional epidural analgesia. A log-rank test was used to compare duration of analgesia. Fisher exact test was used to compare the proportion of women delivering before requesting additional analgesia. A two-sample Wilcoxon test was used to compare hourly R consumption. Appropriate statistical tests were used for all other variables. $P < 0.05$ was considered significant.

Results and Discussion: No intergroup differences in demographics, side-effects, obstetric and neonatal outcome were noted. Epidural C and N significantly prolonged initial spinal analgesia (142 ± 58 min vs 93 ± 31 min in the P-group, $p < 0.0001$) and reduced hourly R consumption (8.4 ± 5.6 mg/h vs 12.9 ± 5.1 mg/h in the P-group, $p < 0.0003$). More patients in the NC-group delivered prior to the first request for additional analgesia (9 vs 2 patients in the P-group, $p < 0.045$).

Conclusion: The immediate epidural administration of 500 μg N and 75 μg C, following the intrathecal injection of R and S, effectively and safely prolongs initial spinal analgesia and reduces hourly R consumption.

References:

1 Van de Velde, et al. Can J Anaesth 2004; 51, 696.
2 D'Angelo, et al. Anesth Analg 2001; 93, 1560.
3 Landau, et al. Anesth Analg 2002; 95, 728.
4 Roelants, et al. Anesth Analg 2003; 96, 1161.

A-712

A double blind comparison of levobupivacaine and ropivacaine administered at 1.5 MLAC for epidural labour analgesia

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Background and Goal of Study: The minimum local analgesic concentration (MLAC) model determines the relative potencies of local anaesthetics (1). The aim of this prospective, randomised, double blind study was to compare the analgesic efficacy of two local anaesthetics given at equipotent dose, corresponding to 1.5 MLAC.

Materials and Methods: After approval of the Hospital Ethics Committee and written informed consent, 60 healthy women requesting epidural analgesia for uncomplicated spontaneous labour were studied. Patients were randomly assigned to receive either levobupivacaine 0.125% (group L) or ropivacaine 0.135% (group R). After a test dose of 3 ml of lidocaine 2% with epinephrine, boluses of the prepared solution were injected to achieve a sensory block at T10, followed by a continuous infusion. Analgesic efficacy was assessed using a 100-mm visual analogue pain scale (VAS) and motor (modified Bromage scale) and sensory (cold test) block assessment. When the patient requested more analgesia, boluses of the study solution were given. Ineffective analgesia was defined as a VAS greater than 30 mm with a sensory block level higher than Th10. The day after delivery, patients were questioned about the quality of their analgesia using a VAS. Standard maternal, uterine and foetal monitoring were used. Statistical analysis included unpaired Student t-test and Chi-square test, as appropriate. A $p < 0.05$ was considered significant (*).

Results and Discussions: (data as mean ± SD or %)

	Group L (N = 30)	Group R (N = 30)
Duration of analgesia (min)	207 ± 179	217 ± 147
Ineffective analgesia (%)	33%	20%
Maternal satisfaction (mm)	89 ± 15	85 ± 15
Instrumental delivery (%)	17	20
Caesarean section (%)	7	7
Maternal hypotension (%)	10	10

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Demographic and obstetric characteristics, highest sensory level and degree of motor blockade were not different between groups. Foetal parameters at birth were similar.
Conclusion: In the conditions of our study, 1.5 MLAC levobupivacaine and ropivacaine have similar efficacy. Side effects were not different between agents.
Reference:
1 Benhamou D, et al. *Anesthesiology* 2003; 99:1383–6.

A-713

The relationship of combined spinal-epidural analgesia and low-back pain after vaginal delivery

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Background and Goal of Study: In this study, we aimed to determine the effects of combined spinal-epidural block (CSE), performed for labor analgesia, onto low-back pain incidence after vaginal delivery.
Materials and Methods: 198 (ASA I–II) women included to the study. Patients were separated two groups regarding labor analgesia request. CSE analgesia was performed in sitting position, from L3–4 or L4–5 interspinous processes with air to loss of resistance technique for first group (Group CSE, n = 104). In second group no analgesic regimen was performed as patients request, we only follow-up these patients (Group N, n = 94). The patients were visited after the first day of delivery in the hospital and asked for low-back pain. Patients complaining low-back pain were asked about the beginning time of low-back pain (before pregnancy, during pregnancy, after the delivery). We contacted these patients by telephone on the third day, one month and sixth month after delivery and asked them if they had a new onset low-back pain.
Results and Discussions: We determined 60 new onset low-back pains after delivery in all. 32 of them were belonging to CSE group, and 28 of them were belonging to Group N, without any significant differences between groups. We didn't establish any significant differences during long-time follow-ups between the groups.
Conclusion(s): We concluded that, CSE analgesia could be performed safely without increasing the low-back pain incidence after delivery.

A-714

Continuous infusion of epidural sufentanil, neostigmine and clonidine for labor analgesia

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Background: During labor, the goal is to reduce local anesthestics use to have selective analgesia, reducing instrumental delivery rate and increasing parturients' satisfaction (1). Epidural 500 μg neostigmine (N) combined with 10 μg sufentanil (S) or 75 μg clonidine initiates labor analgesia without motor block or side effects (2,3). The study compares the analgesic efficacy of an epidural continuous infusion (CI) combining S to N or C, with traditional ropivacaine (R)-S infusion during labor.
Materials and Methods: After informed consent, an epidural catheter was inserted at the beginning of labor. When VAS was ⩾30/100, after a test dose, patients received epidural N 500 μg and S 10 μg. Then, they were randomly allocated to receive epidural CI with S 2 μg/h combined with R 10 mg/h (group SR; n = 35), N 200 μg/h (group SN; n = 32) or N 200 μg/h and C 60 μg/h (group SNC; n = 25) during 5 h. When CI ended, R 0.1% was used until delivery. Rescue doses of R were available as needed. VAS, time before the first rescue dose (rescue1) as well as number of rescue doses (n), labor duration, instrumentation rate and total R use were noticed. Maternal and fetal vital parameters and side effects were noted. Statistical analysis used ANOVA and posthoc test.
Results: Demographic data were similar in all groups. Analgesia efficiency (= % parturients with VAS < 30/100) differed after 3 hours: SR was significantly more efficient than SN (90% vs 50%). After 4 hours, SR and SNC were both more efficient than SN. Other results are expressed in the Table (mean ± SD); $p < 0.05$ with SR(*); with SN(#).

	SR	SN	SNC
Rescue 1 (min)	179 ± 88	131 ± 63*	178 ± 70
Rescue 1 (VAS)	54 ± 17	54 ± 18	38 ± 15*#
n rescues < 5 h	0.9 ± 0.9	1.9 ± 1.1*	1.3 ± 0.9
L duration (min)	307 ± 150	307 ± 106	336 ± 113
R use (mg/h)	13.9 ± 4	6.7 ± 3.6*	5.8 ± 2.7*
Instrumentation (%)	2.8	7	4

Conclusions: SN CI was less effective than classical SR to alleviate pain during labor. SN CI combined with clonidine 60 μg/h produced similar analgesia to SR CI, without side effects and allowed R sparing effect.
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3 Roelants F. Anesthesiology 2005;102:1205–10.

A-715

Post episiotomy pain relief using levobupivacaine 0.5% or lidocaine 2% for perineal local infiltration prior to episiotomy

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Background and Goal of Study: To study the effect of local infiltration of the perineum with levobupivacaine versus our standard practice of lidocaine 2%.
Materials and Methods: One hundred parturients delivering vaginally with the aid of episiotomy were randomized into two groups, A receiving 10 ml of local lidocaine 2% infiltration, 3 ml pre- and 7 ml postpartum, whereas B 10 ml of 0.5% levobupivacaine in a similar manner. The obstetrician and the anesthetist were blinded to the agent used. Pain ratings were recorded at 1, 2, 3, 4, 6, 12, 24 and 48 hours postpartum using a 10 scale system (VAS 0–10). Need, as well as, first call for rescue analgesia was analyzed.
Results and Discussions: Women in group B reported lower pain scores overall, 1, 2, 3, 4 and 12 hour achieving significance. Need for oral analgesia was higher in group A, while first call for analgesia was delayed in group B. No adverse effects were noted.
Conclusion(s): This study suggests that local infiltration of the perineum with Levobupivacaine 0.5% prior to episiotomy is a superior alternative to lidocaine 2%.
References:
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2 Harrison RF. *Curr Med Res Opin* 1987; 10(6): 375–379.

A-716

Chronobiology of spinal bupivacaine during labor

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Background: A temporal pattern of the kinetics of local anaesthetics has been demonstrated when injected into the epidural space, with an important variation in the duration of action related to the hour of administration (1). The aim of this study was to determine whether the hour of the injection could influence the duration of spinally plain bupivacaine during labor.
Methods: After informed consent, women with singleton term pregnancies in vertex presentation, cervical dilation <5 cm and requesting labor analgesia were enrolled in this study. Spinal bupivacaine alone (2.5 mg, 2 mL) was administered. When additional analgesia was requested (visual analog score >40 mm), the study protocol was terminated and analgesia duration was recorded. The time from study drug administration until a request for additional analgesia was assessed as duration of analgesia. The 24-h period was divided in 4 periods: period 1 (night: from 0:01 to 6:00 AM), period 2 (morning: from 6:01 AM to 0:00 PM), period 3 (afternoon: from 0:01 to 6:00 PM), and period 4 (evening: from 6:01 PM to 0:00 AM). Statistical analysis was performed with Kruskal Wallis test, with $p < 0.05$ considered statistically significant.
Results: Eighty two women were enrolled. Pain assessed by the VAS was not different among groups before the first injection of local anaesthetic. Analgesia duration were greater in the diurnal period compared with the nocturnal period but did not reached statistically significant values (Table 1).

Table 1.

	Period 1 from 0:01 to 6:00 AM	Period 2 from 6:01 AM to 0:00 PM	Period 3 from 0:01 to 6:00 PM	Period 4 from 6:01 PM to 0:00 AM
Analgesia duration (min)	33.14	41.19	39.95	40.05
S.D (min)	10.43	17.82	14.51	14.23

Conclusion: Spinal analgesia duration at the first stage of labor with small doses of plain bupivacaine does not exhibit a temporal pattern throughout

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the day period. This study confirm data published by Scavone et al. (2) who found no chronobiology influence on analgesia duration of a spinal mixture of low doses of fentanyl combined with 2.5 mg bupivacaine.

References:

1 Debon, et al. Anesthesiology 2002;96:542–545.
2 Scavone, et al. ASA meeting 2005; Atlanta A594.

A-717

Complications of labor analgesia: a comparison of epidural versus combined spinal-epidural techniques

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Background and Goal of Study: Epidural and combined spinal-epidural analgesia are popular techniques for labor analgesia. Few date comparing complications of these two techniques are currently available. The purpose of this study was to compare the occurrence of complications in parturients who received labour analgesia with either epidural (group E) or combined spinal-epidural technique (group SE).

Material and Methods: In a prospective observational study, data were gathered from 506 consecutive women receiving labor analgesia. The choice of the analgesia was left to the individual anesthesiologist. In group E, patients received an epidural solution of 8 mL (levobupivacaine 0.125% with fentanyl 5 μg/mL). In group SE, parturients received a spinal solution of 2 mL (levobupivacaine 0.1% with fentanyl 7.5 μg/mL). This was followed in the two groups by the placement of an epidural catheter and connected to a patient-controlled analgesia (PCA) pump with 0.1% levobupivacaine and 2 μg/mL fentanyl (8 mL/h, bolus of 3 mL, lockout time of 30 min). All patients were interviewed using a standardized questionnaire on the first postpartum day by a nurse who did not know which technique had been used. They were asked about occurrence of discomfort during the procedure, nausea or vomiting, pruritus, urinary retention, headache, backache, pain or dysesthesia in the legs, and maternal satisfaction with pain relief.

Results: Labor analgesia was performed with epidural technique in 203 patients (40%), and combined spinal-epidural technique in 303 patients (60%). Complications were similar between the two groups except for the incidence of pruritus (Table 1). Patient satisfaction with pain relief was good in both groups.

Table 1.

	Epidural group (n = 203)	Spinal-epidural group (n = 303)	P
Discomfort during procedure	18 (8%)	16 (5%)	ns
Náusea or vomiting	37 (18%)	64 (21%)	ns
Pruritus	45 (22%)	145 (48%)	<0.05
Urinary retention	38 (18%)	35 (11%)	ns
Headache	13 (6%)	21 (7%)	ns
Backache	55 (27%)	73 (24%)	ns
Pain or dysesthesia in the legs	14 (7%)	32 (10%)	ns
Maternal satisfaction with pain relief	181 (94%)	275 (95%)	ns

Data are mean ± SD or number of patients (%).

Conclusion: The present investigations demonstrated that labor analgesia was effective with both techniques and similar incidence of complications were observed. Only the incidence of pruritus resulted higher using the combined spinal-epidural technique.

References:

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A-718

Parturient controlled labour epidural analgesia (PCEA) with automated synchronized intermittent mandatory boluses (ASIMB) – a comparative study with PCEA + basal infusion

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Background and Goal of Study: The use of continual intermittent boluses (CIB) to maintain labour epidural analgesia has been shown to prolong the duration of analgesia and reduce the incidence of breakthrough pain when compared with a continuous infusion.[1,2] The use of parturient controlled epidural analgesia (PCEA) with a basal infusion has been shown to reduce pain scores when compared with PCEA without a basal infusion in the labouring woman.[3] We compared a novel approach of providing basal intermittent boluses in synchrony with PCEA (called **A**utomated **S**ynchronized **I**ntermittent **M**andatory **B**oluses or ASIMB) with PCEA + basal infusion.

Materials and Methods: After hospital ethics committee approval and informed consent, we randomized 42 healthy parturients in early labour to receive 0.1% ropivacaine + fentanyl 2 microg/ml either via PCEA (n = 21, bolus 5 ml, lockout 10 min, basal infusion 5 ml/H) or ASIMB (n = 21, patient activated bolus of 5 ml, lockout 10 min, basal automated boluses of 5 ml) after successful induction of combined spinal epidural analgesia (CSEA) with intrathecal ropivacaine 2 mg + fentanyl 15 μg. We hypothesized that ASIMB would be a more efficient technique – the sample size was computed to detect a difference of 20% reduction in local anaesthetic consumption compared with PCEA. (α: 0.05, β: 0.2).

Results and Discussions: Even though there was no significant difference in the arthropometric and preanalgesic data between the two groups, there was reduction in the hourly consumption of ropivacaine with ASIMB (Median: 5.73 mg/H, range 3.6–20 vs 7.1, 5–12 for PCEA, p = 0.01) A higher proportion of parturients in ASIMB did not self bolus (6/21 vs 1/21 in PCEA, p = 0.03). The time to the first self bolus after CSE was also longer in ASIMB (Mean survival time 315 min vs 190 min in PCEA group, p = 0.04 by log rank test). There was no difference in pain scores or side effects.

Conclusion: ASIMB is a good alternative to PCEA + basal infusion in maintaining labour epidural analgesia.

References:

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2 Chua SM, Sia AT. Can J Anesth 2004; 6:581–5.
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Intensive Care Medicine

A-720

Expression of CD62P and CD63 on platelets (Plt) of septic patients

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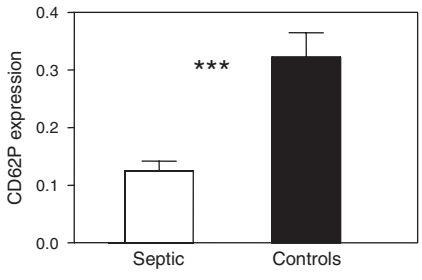
Background and Goal of Study: Platelets (Plt) are suggested to play a crucial role in pathophysiology of sepsis and organ dysfunction (Shcherbina 1999). However, studies on plt activation in sepsis have yielded conflicting results. The aim was to study platelet activation in septic patients, in terms of expression of surface CD62P, CD63, compared to healthy volunteers.

Materials and Methods: 19 septic patients (G1) and 19 healthy volunteers (G2) were enrolled in a prospective study. Blood was collected at day 1 (enrolment), 4,7, and 10. Whole blood samples were processed by flow cytometric assay within 1h. Plt activation was assessed at rest and after stimulation with ADP/epinephrine.

Results and Discussion: Platelet count was normal at all study time points in G1. Plt activation appeared reduced in septic pts, as seen from a depressed CD62P expression at rest (Fig.). However, the normal expression of CD63 at rest and the preserved response of both CD62P and CD63 expression to stimuli *in vitro* indicate the preservation of plt activation in sepsis. The reduced CD62P expression at rest can be explained by the early shedding of this receptor from the plt surface (Michelson 1996).



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Conclusion: Circulating Plt are activated in sepsis, although they express low level of CD62P at rest. Nevertheless, they continue to be functionally responsive after stimulation.

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1 Shcherbina A, O'Donnell E. *Blood* 1999; 93: 4222–4231.
2 Michelson AD, et al. *Proc Natl Acad Sci USA* 1996; 93: 11877–11882.

A-721

Degranulation of circulating platelets (Plt) during sepsis

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Background and Goal of Study: Multiple haemostatic changes occur in sepsis and coagulation is known to be part of the body response to septic process. We prospectively studied platelet degranulation in septic patients in comparison to healthy volunteers.

Materials and Methods: 19 septic patients (G1) and 19 healthy volunteers (G2) were enrolled. Blood was collected at day 1 (enrolment), 4,7, and 10. Flow cytometry was used to process whole blood samples within 1 h from collection. Plt adenine nucleotide content has been measured. Sepsis severity was daily assessed by MOD score.

Results and Discussion: In presence of normal count, Plt content of adenine nucleotide was significantly reduced in G1 in comparison to G2 (Table). Mortality rate in G1 was 21% (4/19). Plt adenine nucleotide content was found to be negatively correlated with MOD score ($r^2 = 0.17$, $p = 0.0006$).

Adenine Nucleotides	Days	Septic patients	p	Volunteers
	1	125.4 ± 13.6	<0.0001	202.3 ± 8.4
	4	124.2 ± 15.2	0.0002	
	7	121.8 ± 9.3	<0.0001	
	10	111.7 ± 15.6	<0.0001	

The reduced content of adenine nucleotide indicates a progressive degranulation of circulating plt during sepsis. This, in turn, asserts an increased Plt activity that might explain, at least in part, multiorgan damage that is known to occur during septic process.

Conclusion: The over-activation of Plt in sepsis appears to have a prognostically unfavourable influence on patient outcome.

A-722

Circulating endothelial progenitor cells (EPCs) in sepsis: preliminary results

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Background and Goal of Study: Damage to endothelial cells often occurs in organs affected by sepsis. For organ repair to occur, a continuous renewal of damaged endothelial cells is needed. Bone marrow has been recognized to be a source of EPCs (Asahara 1997), that could be fundamental for cell repair. This study was undertaken to investigate EPCs mobilisation and release into the circulation during sepsis.

Materials and Methods: 7 septic patients were enrolled in a prospective study. Blood samples were collected every 12 h for consecutive 4 days after enrolment and assessed by flow cytometry. EPCs mobilization have been identified and quantified assessing CD 34^+/$CD133^+$/$VEGFR2^+$/CD 45^- phenotype. 7 age-matched healthy volunteers were chosen to define reference values of EPCs number.

Results and Discussion: The CD 34^+/$CD133^+$/$VEGFR2^+$/CD 45^- cells were found to be significantly increased in septic patients when compared to reference values ($p < 0.05$). The increase in EPCs is associated with an increase in circulating polymorphonuclear cells (PMNs). The increase in EPCs during sepsis could be explained by the release from PMNs of different factors that favour the cleavage of stem cells from bone marrow stroma. The role played by EPCs in the evolution of sepsis and outcome of septic patients still needs to be found.

Conclusion: Sepsis seems to lead to an increase in movement of EPCs from bone marrow. This movement is probably indirectly caused by the increase in circulating PMNs which act as primers for the EPCs mobilization.

Reference:

1 Asahara T. et al. *Science* 1997; 275: 964–7.

A-723

Genetic polimorphism of TNF in sepsis

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Background and Goal of the Study: Genetic polymorphism related with septic patients have been described. Stubert et al. related the tumour necrosis factor (TNF) B2B2 genotype with an increased mortality rate in a series of 40 patients with severe sepsis diagnosis. However, there are very few bibliographic references that confirm this fact, so we intended to corroborate it with a retrospective study of patients admitted in the surgical intensive care unit (ICU) of our hospital.

Material and Methods: Retrospective study of patients diagnosed of septic shock/sever sepsis andmitted in a surgical ICU that signed the informed consent. We studied dianosis, sex, survival rate after 28 days and polymorphism of TNF B gen.

Results and Discussion: Up to now we have enrolled 67 patients, classified in the following chart attending to their diagnosis.

Table 1.

	B1B1	B1B2	B2B2	Hombres	Mujeres	Total
Peritonitis	2	9	13	14	10	24
Urinary	1	7	5	9	4	13
Pneumonia	3	9	6	8	10	18
Mediastinitis	0	1	1	2	0	2
Prosthesis	1	3	1	3	2	5
Other	0	3	2	4	2	5
Total	7	32	28	39	28	67
MOF	2	11	19	18	14	32
Exitus	0	6	15	13	8	21

We found a higher morbi-mortality rate in patients with B2B2 genotype. Acumulated survival after 28 days was lower in that group (Log Rank 13.23 $p = 0.0013$). We didn't find any statistically significant difference between sexes (Log Rank 0.22 $p = 0.6401$).

Conclusion: In our study we obtained similar results to Stubert with an increased mortally rate for TNF B2B2 genotype compared with B1B1 and B1B2 genotypes.

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1 F. Stubert et al. Crit Care Med, March 1996: 24(3). 381–384.
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A-724

Short-time effects of glipizide, an ATP-sensitive potassium channel inhibitor, on cardiopulmonary hemodynamics and global oxygen transport in healthy and endotoxemic sheep

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Background and Goal of Study: In progressed sepsis, haemodynamic support is often complicated by a tachyphylaxis against exogenous catecholamines (1). Since activation of ATP-sensitive potassium channels (K_{ATP}) plays a pivotal role in the pathogenesis of hyperdynamic vasodilatory shock (2), it may be beneficial to administer specific K_{ATP}-channel inhibitors to prevent, or at least attenuate, haemodynamic dysfunction in sepsis.

Materials and Methods: Ten adult female sheep were operatively instrumented to measure haemodynamics of the systemic and pulmonary circulation. After 24 hrs of recovery, healthy sheep received glipzide, a selective K_{ATP}-channel inhibitor, as a bolus infusion (4 mg/kg over 15 mins). Following 24 hrs of recovery, a continuous infusion of endotoxin (*Salmonella typhosa*, $10\,ng \cdot kg^{-1} \cdot min^{-1}$) was started in the same sheep and administered for the next 17 hrs. After 16 hrs of endotoxaemia, glipzide was given as described above. Haemodynamic variables were measured before and every 15 mins after glipzide infusion. Blood gas samples and arterial lactate concentrations were analyzed after 30 and 60 mins.

Results: Administration of glipzide was followed by a significant increase in mean arterial pressure (MAP) in both healthy controls (95 ± 3 vs. 101 ± 2 mmHg; $p < .05$) and endotoxaemic sheep (86 ± 3 vs. 93 ± 3 mmHg; $p < .05$). However, the increase in MAP was longer-lasting in endotoxaemic ewes. Cardiac index (CI), oxygen delivery index (DO_2I), arterial lactate concentrations and arterial pH were not significantly affected by glipzide.

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Conclusion(s): Glipzide improved haemodynamics in ovine endotoxaemia and may represent a beneficial therapeutic option to treat arterial hypotension resulting from sepsis and systemic inflammatory response syndrome (SIRS).

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A-725

Influence of different concepts of heparinisation on gut functionality of *in vitro* hemoperfused porcine jejunum

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Background and Goal of Study: We established a hemoperfused *in vitro* system for isolated organ perfusion giving access to investigations on intestinal function. Since coagulation is an important aspect in research on microcirculation and sepsis we investigated different heparinisation protocols, with respect to both functionality and sensitivity of the system's behaviour.

Materials and Methods: Porcine jejunal segments (191 ± 40 g), normotherm, hemoperfusion for 3h in an isolated perfusion circuit including an oxygenation unit; n = 4–5 per group; anticoagulation with unfractionated heparin was performed in 2–3 steps: 1. animal, 2. blood reservoir, 3. with (w) or without (w/o) priming (P) of the perfusion circuit. Heparin doses in the blood reservoir were high (Hi) versus low (Lo); total heparin doses given in I.U.: group 1: 40.819 ± 910 (HiHep w P), group 2: 15.750 ± 500 (HiHep w/o P), group 3: 10.904 ± 413 (LoHep w P), group 4: 6.375 ± 679 (LoHep w P). Viability criteria were: oxygen consumption, vascular resistance (SVR), edema formation (i.e. organ weights before/after), thromboplastin time (TPZ), fibrinogen, ATIII, and platelets. Non parametric tests, median [inter- quartile range], $p < 0.05$.

Results and Discussion: Groups 1 and 2 (HiHep w P and w/o P) showed massive bleeding (mucosa + serosa and mucosa, respectively), whereas both LoHep groups did not show bleeding. Group 4 (LoHep w/o P) showed significantly higher SVR compared to group 3 (LoHep w P) (0.53 [0.35] vs. 0.17 [0.14] mmHg*min/ml*100 g). Significantly highest oxygen consumption was found in group 3 (143.7 [78.4] vs. 66.7 [39.7] μmol/min*100 g). Group 4 was characterised by a tendency for activated TPZ-INR (1.1 [0.16]) and constant decrease in fibrinogen and ATIII-concentrations. Group 3, in contrast, showed stable values of the coagulation pattern. Platelets were stable in all groups. Group 3 (LoHep w P) provided stable perfusion conditions, and a still maintained functional capacity.

Conclusion: This study shows that each heparinisation protocol is associated with a particular pattern of viability criteria in isolated perfused intestine. The latter should be taken into account for comparison of data obtained from different *in vitro* models and *in vivo* versus *in vitro* comparison.

A-726

IgM-enriched immunoglobulin preparation improves lung histology in a model of gram negative endotoxemia

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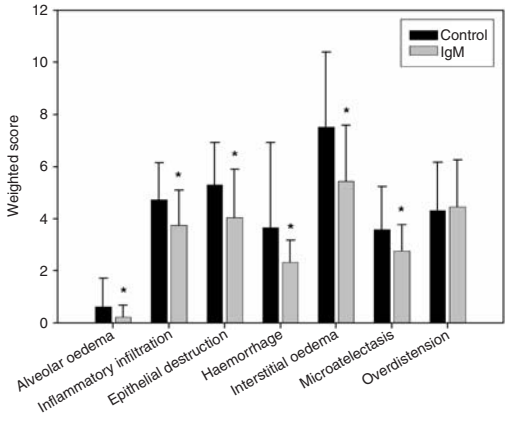
Background and Goal of Study: Immunological interventions in endotoxemia and sepsis have been tested in experimental [1] and clinical studies [2]. Our group evaluated the effects of an IgM-enriched preparation in a model of gram negative bacteraemia.

Materials and Methods: After institutional approval 10 New Zealand White rabbits (2–3 kg) were randomized to a treatment or control group. In the intervention group IgM-enriched solution (Pentaglobin®: 2 ml/kg/h) was applied. In addition, LPS was infused in both groups at a rate of 40 μg/kg/h. After intravenous bolus injection of $1*10^8$ colony forming units of E. coli, bacterial clearance was determined. Baseline hemodynamic and respiratory parameters, blood E. coli concentration (30 min prior to and 1, 15, 30, 60, 90, 120 and 180 min after E. coli injection), PMN oxidative burst and phagocytosis activity (both 30 min before and 1, 15, 60, 120 and 180 min post injection) and diffuse alveolar damage (DAD) were measured. DAD score was characterized by alveolar oedema, interstitial oedema, haemorrhage, inflammatory infiltration, epithelial destruction, microatelectasis and over-distension. Organ colonization (kidney, lung, liver, spleen) was assessed in aseptic organ samples.



Results and Discussions: Hemodynamic parameters did not differ between the two groups. Bacterial clearance was not influenced by IgM application. Lung colonization was significantly reduced in the IgM group. IgM improved lung histology and DAD in comparison to controls (23 ± 5 vs. 30 ± 8).

Conclusion(s): IgM significantly improved 6 of 7 DAD score parameters and reduced E. coli count in the lung. Our results underscore the possible therapeutical effects of an IgM-enriched solution.

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1 Koch T., et al. Anaesthesiologie 1997.
2 Tugrul S., et al. Crit Care 2002; 6: 357–62.

A-727

Cerebral hemodynamic and metabolic changes in porcine endotoxemia

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Background and Goal of Study: Brain dysfunction is common in early sepsis (1). The aim of this study was to assess the time course of systemic (CO) and cerebral blood flow (CBF), arterial (MAP) and intra-cranial blood pressure (ICP) and brain oxygenation in pigs subjected to endotoxemia.

Materials and Methods: Animals (weight: 41.9 kg ± 3.81; mean ± SD) were assigned to E. coli lipopolysaccharide or saline infusion (n = 5, each). Hemodynamics, ICP, jugular ($SjvO_2$) and brain (PO_2br) oxygenation were continuously measured for eight hours.

Results and Discussions:

		CO*,**	MAP	ICP	CBF*	PO_2br*	$SvjO_2$*, **
Baseline	c	6.84 ± 1	103 ± 16	9.3 ± 2.3	384 ± 186	19 ± 6	80 ± 10
	e	7.57 ± 1	97 ± 14	9.4 ± 2.7	338 ± 28	24 ± 10	78 ± 13
4 hours	c	6.74 ± 2	101 ± 11	10 ± 1.6	303 ± 120	28 ± 7	72 ± 6.5
	e	4.96 ± 0.5	95 ± 10	9.6 ± 2.6	349 ± 79	30 ± 9	77 ± 12
8 hours	e	6.24 ± 0.5	93 ± 20	10 ± 2.5	285 ± 68	26 ± 3	76 ± 11
	c	6.4 ± 1	64 ± 1	13 ± 1.7	387 ± 87	31 ± 13	84 ± 6

C: controls, e: endotoxemia. MAP, ICP and PO_2br: mm Hg, flows: ml, $SvjO_2$:%.
*: time effect, $p < 0.05$; **: time-group-interaction, $p < 0.05$.

Conclusion(s): Cerebral blood flow and oxygenation is maintained in early sepsis. Conventional monitoring tools are unable to detect abnormalities during the first eight hours of endotoxemia.

Reference:

1 Bleck TP, Smith MC, Pierre-Louis SJ, et al. *Crit.Care.Med.* 1993;21:98–103.

A-728

ICU-acquired paresis in severe sepsis in an intensive care unit

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Background and Goal of Study: ICU-acquired paresis (ICUAP) is a neuromuscular disorder that consists of difficult weaning from mechanical ventilation, tetraparesis or muscular weakness and muscle wasting. The etiology includes SIRS/sepsis and other conditions such as malnutrition, underlying diseases and drugs (neuromuscular blocking agents or steroids) (1). Objectives:

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to observe septic patients in an ICU searching for incidence of ICUAP and risk factors prevalence and to compare duration of mechanical ventilation between ICUAP and control patients.
Materials and Methods: Prospective and descriptive study for 6 months in an ICU. We studied 24 septic patients with MODS without previous history of polyneuropathy that developed motor deficit. ICUAP was diagnosed by the Medical Research Council (MRC) score <48. It was confirmed by neurophysiological examination (axonal degeneration), no alterations in CT of head and EEG, and muscle biopsy with atrophic muscle fibers in acute denervation. Data collected: Incidence of ICUAP, duration of mechanical ventilation and risk factors.
Results: 24 septic patients (APACHE > 25) were admitted for 6 months. 10 patients presented ICUAP (41.7%). 80% of ICUAP patients had received supraphysiologic dose of steroids, 20% aminoglycosides and none of them neuromuscular blocking agents (NMBA). 100% maintained a glucemic level between 90–140 mg/dl with intensive insulin therapy. Mean albumin at initial moment of ICUAP was 2.03 ± 0.38 gr/dl vs 2.9 ± 0.33 in controls. Mean duration of mechanical ventilation was longer in ICUAP patients than in control: 16.8 ± 3.52 vs 8.21 ± 2.25 days ($p < 0.05$).
Conclusions: Septic patients show a great incidence (41.7%) of ICUAP. Factors that we have found associated were sepsis/SIRS and malnutrition. Although steroids could be a risk factor, the muscle biopsy shows a different pattern. No patients were treated with NMBA and all were submitted to strict glycemic control. ICUAP patients had difficulties in weaning from the artificial respirator, increasing days of mechanical ventilation.
Reference:
1 De Jonghe B, et al. Paresis acquired in the Intensive Care Unit: A prospective multicenter study. JAMA 2002, 288: 2859–2867.

A-729

Impact of high molecular hydroxyethyl starch solutions on plasma volume and haemodynamics in porcine faecal peritonitis

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Background and Goal of Study: Early fluid resuscitation is suggested to be beneficial in sepsis therapy. Using a faecal peritonitis model we tested effects of two new synthetic high molecular hydroxyethyl starches 6% HES 700/0.42/2.5:1 (HES700/2.5:1) and 6% HES700/0.42/6:1 (HES700/6:1) compared to 6% HES130/0.42 (HES130) and ringer's solution (RS) on plasma volume (PV), heart rate (HR), mean arterial pressure (MAP) and mixed venous oxygen saturation (SvO_2).
Materials and Methods: Prospective randomized, controlled animal laboratory study. 25 anaesthetized, ventilated pigs (28.4 ± 2.3 kg) received 1g/kg/body weight faeces into abdominal cavity to induce sepsis and were observed over 8 hours. Animals were randomized (5 each group) to volume replacement therapy with colloids or RS and compared to a non-septic control group receiving RS. Infusion rate was titrated to maintain a central venous pressure of 12 mmHg. PV was determined using chromium-51-tagged erythrocytes. Systemic haemodynamics and oxygenation were obtained before (Pre) and 8 h after induction of sepsis. Statistics were performed with ANOVA.
Results and Discussions: PV was significantly higher at study end with every kind of colloid (HES700/2.5:1: 68.5 ± 11.7; HES700/6:1: 65.5 ± 14.3, HES130: 64.4 ± 4.6) compared to RS (40.6 ± 5.9; $p \leqslant 0.05$). Heart rate rose in all peritonitis groups but not in control group (n.s.). MAP was significantly lower in RS group (67 ± 11) compared to control (92 ± 4; $p < 0.05$), but not in colloid treated groups (HES700/2.5:1: 87 ± 15; HES700/6:1: 88 ± 12, HES130: 86 ± 11). SvO_2 remained stable in all HES treated animals and the control group over 8 hours with significantly higher SvO_2 in all groups (HES700/2.5:1: 69 ± 3; HES700/6:1: 67 ± 16, HES130: 69 ± 8; control 70 ± 5) compared with RS at study end (44 ± 17, $p \leqslant 0.05$).
Conclusion(s): In this model, new high molecular artificial colloids and HES130 could maintain PV and preserve SvO_2 and haemodynamics significantly better than RS.

A-730

Determinants and predictors of outcome in patients admitted to a surgical ICU

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Background and Goal of Study: Outcome in intensive care has primarily been focused on hospital survival and resource utilization adjusted for severity of illness. Mortality is an insufficient measure of ICU outcome and length of stay (LOS) may be seen as an indirect measure of morbidity. The aim of this study was to study determinants and predictors of outcome in patients admitted to a surgical ICU.
Material and Methods: All 187 patients who underwent noncardiac surgery, admitted to a surgical ICU between November 2004 and April 2005 were studied. The following variables were recorded: age, gender, body mass index, ASA physical status, type and magnitude of surgical procedure, ICU and in hospital LOS and mortality, Simplified Acute Physiology Score II (SAPS II), previous cardiovascular disease, renal insufficiency, diabetes or hyperlipidemia, clinical predictors of the Revised Cardiac Risk Index and occurrence of major cardiac complications. Assessment of the relationship between each variable with prolonged ICU stay (LOS > 7 days) and mortality was made by univariate analysis through simple logistic regression with odds ratio (OR) and 95% confidence interval (95%CI).
Results and Discussion: The mean LOS in the ICU was 4.6 ± 8.1 days and 15% of patients had prolonged LOS. Significant risk factors for longer ICU LOS were SAPS II (OR 1.07, 95%CI 1.04–1.09, $p < 0.001$), emergency surgery (OR 4.43, 95%CI 1.89–10.41, $p = 0.001$), high risk surgery (OR 3.13, 95%CI 1.36–7.24, $p = 0.008$), preoperative serum creatinine > 2 mg/dl (OR 5.92, 95%CI 1.82–19.24, $p = 0.003$) and postoperative acute myocardial infarction (POAMI) (OR 8.42, 95%CI 2.11–33.68, $p = 0.003$). Eleven (6%) patients died in ICU and 15 (8%) died during hospitalization. Statistically significant independent risk factors for mortality were ASA (OR 5.79, 95%CI 1.27–26.41, $p = 0.023$ for ASA III/IV patients) emergency surgery (OR 5.20, 95%CI 1.75–15.40, $p = 0.003$), high SAPS II scores (OR 1.09, 95%CI 1.05–1.14, $p < 0.001$), POAMI (OR 6.92, 95%CI 1.54–31.14 $p = 0.012$), troponin on admission (OR 1.38, 95%CI 1.02–1.89, $p = 0.035$) and preoperative serum creatinine >2 mg/dl (OR 6.59, 95%CI 1.75–24.82, $p = 0.005$).
Conclusions: In patients admitted to a surgical ICU, outcome determinants were preoperative co morbidities, surgical procedure, severity of disease, postoperative complications like AMI and elevated troponin on admission.

A-731

Major cardiac complications in a surgical ICU

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Background and Goal of Study: Cardiovascular complications are important causes of mortality and morbidity during the preoperative and postoperative period. The aim of this study was to identify predictors of major cardiac complications after noncardiac surgery.
Material and Methods: All 187 patients who underwent noncardiac surgery, admitted to a surgical ICU between November 2004 and April 2005 were studied. The following variables were recorded: age, gender, body mass index, ASA physical status, type and magnitude of surgical procedure, ICU and in hospital length of stay (LOS), mortality, Simplified Acute Physiology Score II (SAPS II), Troponin values at admission and during the next three days, history of ischemic heart disease, congestive heart failure, hypertension, diabetes, hyperlipidemia, renal failure and cerebrovascular disease. Revised Cardiac Risk Index (RCRI) and major cardiac event (MCE) such as: acute myocardial infarction (AMI), pulmonary edema (PE), ventricular fibrillation (VF) or primary cardiac arrest (PCA) was registered. Assessment of the relation between each variable and major cardiac event was made by univariate analysis performed by simple logistic regression with an odds ratio (OR) and its 95% confidence interval (95%CI). Outcome was compared between patients with MCE and without MCE.
Results and Discussion: 9 AMI (5%), 1 VF (0.5%) with PCA and 4 PE (2%) occurred. Significant risk factors for the occurrence of MCE were high risk surgery (OR 8.26, 95%CI 1.76–38.85, $p = 0.008$), 2 ⩾ risk factors of RCRI (OR 4.0, 95%CI 1.22–13.16, $p = 0.022$), troponin on admission (OR 1.46, 95%CI 1.07–1.99, $p = 0.018$), troponin on postoperative: day one (OR 1.75, 95%CI 1.27–2.41, $p = 0.001$); day 2 (OR 2.23, 95%CI 1.24–3.98, $p = p = 0.007$), SAPS II (OR 1.08, 95%CI 1.04–1.12, $p < 0.001$). Patients with MCE had longer ICU LOS (18.2 ± 5.7 days against 3.7 ± 5.6) (OR 6.96, 95%CI 1.57–30.78, $p < 0.001$) and higher mortality rates (25% versus 5%) (OR 7.0, 95%CI 1.57–30.78, $p = 0.011$).
Conclusions: High risk surgery, risk factors of RCRI, troponin levels and severity of illness were determinants for postoperative MCE. These patients had longer ICU stay and higher mortality rate.

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A-732

Risk factors for delayed graft function after renal transplantation

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Background and Goal of Study: Delayed graft function (DGF) is associated with diminished renal transplant survival [1]. We studied the risk factors that lead to a DGF on the 14th day after renal transplantation, defined as a serum creatinine $>$ 200 μmol/l.

Materials and Methods: All cadaveric kidney transplantations performed in our center between January 2000 and December 2003 were retrospectively analyzed. Variables related to donor (age, gender, weight, brain death diagnosis, organ procurement, serum creatinine level before kidney harvest, co-morbidity, periods of sustained hypotension, cardiac arrest, vasopressor and/or inotropic drugs), recipient (age, gender, weight, previous transplantation) and transplant (cold ischemia time, HLA A, B, DR mismatches, number of arteries of the graft) were collected. Cold ischemia time $>$ 20 hrs was used as cut-off point of long ischemia [1]. The logistic regression model was used to identify independent risk factors related to DGF.

Results and Discussion: Of the 269 recipients, 230 had first renal transplantations and 39 second transplantations. On the 14th post transplantation day, the incidence of DGF was 32%. The risk factors for DGF were: 1) cold ischemia time $>$ 20 hours (OR 3.1; CI 95% 1.8–5.4), 2) cerebrovascular disease as cause of brain death (OR 1.9; CI 95% 1.1–3.3) and 3) recipient male gender (OR 2.6; CI 95% 1.4–4.7). When cold ischemia time was analyzed as a linear variable, the adjusted odds ratio of DGF was 1.5 for every 5-hrs increase in cold ischemia time ($p < 0.0001$).

Conclusion: Cold ischemia time, cerebrovascular disease as cause of brain death and recipient male gender were risk factors for DGF.

Reference:

1 Ojo et al. Transplantation 1997; 63: 968–74.

A-733

Primary graft dysfunction after bilateral lung transplantation

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Background and Goal of Study: The main cause of early death after lung transplantation is the primary graft dysfunction (PGD) secondary to ischemia/reperfusion injury (1). We sought to identify early risk factors associated with PGD.

Materials and Methods: Retrospective review of 147 consecutive patients undergoing bilateral lung transplantation.

PGD was defined as 1) radiographic infiltrate in the graft that develops within 72 h of transplantation, 2) PaO2/fraction of inspired oxygen (FiO2) ratio $<$ 300 beyond 72 h postoperatively, 3) no other secondary cause of dysfunction (2).

Univariate analysis was used to select variables for inclusion in the binary regression model if they exhibited significance at a p value $<$0.20 compared by χ^2.

Results and Discussions: The incidence of PGD was 24.4% (95% confidence interval [CI], 17.3 to 31.4).

On univariate analysis six variables were found associated with PGD : female gender, length of stay $>$ 7 days, age $>$ 40 years, recipient diagnosis, cardiopulmonary bypass, ischemic time for the second lung implanted $>$ 5 hours.

These risk factors following adjustment for confounding were fitted into a binary logistic regression model and the variables eligible to be treated were as follows: recipient female gender (adjusted odds ratio [OR], 2.22; 95%CI, 1.01 to 4.94; $p = 0.05$), use of cardiopulmonary bypass (adjusted OR, 3.20; 95%CI, 1.51 to 6.76; $p = 0.02$), ischemic time for the second lung implanted $>$ 5 hours (adjusted OR, 2.23; 95%CI, 1.02 to 4.86; $p = 0.042$).

Conclusions: PGD is associated with a high mortality rate and lengthy hospitalization.

We demonstrate that three risk factors (recipient female gender, use of cardiopulmonary bypass and ischemic time for the second lung implanted $>$ 5 hours) are independently associated with development of PGD.

References:

1 Thabut G, Vinatier I, Stern JB et al. *Chest* 2002; 121: 1876–1882.

2 Christie JD, Sager JS, Kimmel SE, et al. *Chest* 2005; 127: 161–165.

A-734

Mortality in patients with alcoholic liver disease admitted to intensive care: assessment of a new scoring system

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Background and Goal of Study: Mortality is high in patients with alcoholic liver disease (ALD) who require ICU admission. The Glasgow Alcoholic Hepatitis scoring system (GAHS)[1] is a new objective scoring system which has been validated for predicting mortality in patients with alcoholic hepatitis. It assigns scores for age, white cell count, urea, prothrombin ratio and bilirubin to give a total score between 5 and 12. This system has not previously been assessed for predicting mortality in patients with ALD admitted to ICU.

Materials and Methods: We identified all patients with ALD admitted to our ICU from January '00 to June '05. Case notes/laboratory databases were checked to confirm the diagnosis of ALD and to get details of the admission. The GAHS was calculated. Patients were divided into two groups (scores of 5–8 or 9–12). We also calculated a total score for the Cardiovascular (CVS) and Renal sections of the Sepsis-related Organ Failure Assessment (SOFA) score. Likelihood ratios were calculated for each group.

Results and Discussions: 63 patients were identified. Overall ICU mortality was 63% consistent with previous studies. ICU mortality in the GAHS 5–8 group was 53% (38/63) compared with 80% in the 9–12 group (25/63). Corresponding likelihood ratios (95%CI) for ICU death were 0.6 (0.4–0.9) and 2.3 (1.0–5.3). The total score for the CVS and Renal sections of the SOFA score combined with GAHS gave ICU mortalities as follows:

SOFA score (CVS + Renal)	GAHS	ICU Mortality	Likelihood ratio (95%CI)
0–4	5–8	44%	0.4 (0.2–0.7)
0–4	9–12	80%	2 (0.7–6.2)
5–8	5–8	69%	1.1 (0.4–3.2)
5–8	9–12	100%	

Conclusion(s): Patients with alcoholic liver disease who are admitted to ICU have a high mortality. As reversibility of the acute critical illness is often controversial, GAHS may be useful for predicting those sub-groups who are more likely to survive and who would benefit from aggressive ICU support, particularly when combined with the CVS and Renal sections of the SOFA score.

Reference:

1 Forrest EH. *Gut* 2005: 54: 1174–1179.

A-735

Which ICU-scoring system may be useful for risk estimation in patients with penetrating injuries treated in Intensive Therapy Units?

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Background and Goal of Study: We wanted to establish usefulness of ICU-scoring systems as well as risk factors for Intensive Therapy Unit (ITU) – treated patients with as grave injuries as penetrating injuries.

Materials and Methods: 49 patients (9 women and 40 men; mean age/STD/: 38.3 years/13.1/) were treated in 4 ITUs for penetrating trauma. 35 of them were injured with cutting object (knifes, glass, forks), remaining 14 were wounded with shots. 82% of patients survived and were discharged from ITUs. All of the patients had been operated on before ITU-admission and required post-operative ventilatory support. Comparisons between groups of survivors and non-survivors were performed with Student t-test and Mann-Whitney U-test (data from first 24 hours of ITU stay). Data are presented as mean/STD/or median/range/. Multivariate logistic regression was used for establishing independent mortality risk factors.

Results and Discussions: Significant differences between survivors and non-survivors were detected in: age (36.2/12.7/vs. 47.8/10.5/; $p = 0.01$), mean arterial pressure at admission (69.9/29.4/vs. 43.8/34.8/; $p = 0.02$), SAPS II score (36/6–67/vs. 80/55–95/; $p = 0.00001$), APACHE II score (13/2–33/vs. 35/15–40/; $p = 0.00005$), SOFA score (7/0–15/vs. 12/4–19/; $p = 0.03$), MODS score (5/0–15/vs. 9/4–18/; $p = 0.005$), Injury Severity Score – ISS (21/4–75/vs. 75/6–75/; $p = 0.0004$).

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We did not observe significant differences between delineated groups in gender, number of penetrations, localizations of penetrations and A Severity Characterization of Trauma – ASCOT score.

Multivariate logistic regression revealed two independent risk factors for ITU-mortality in patients with penetrating injuries – APACHE II score ($p = 0.012$, unitary odds ratio – OR 1.27 [95%CI: 1.05–1.54]) and ISS score ($p = 0.033$, unitary OR 1.07 [95%CI: 1.004–1.15]).

Conclusion(s): ICU scoring systems – APACHE II and ISS may be useful prognostic tools for risk assessment in patients with penetrating injuries.

A-736

Comparison of the clinical judgment with SAPS II, ISS-RTS-TRISS, SOFA for prediction of outcome in ICU patients

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Background and Goal of study: The aim of this prospective study was to evaluate the predictive power of SAPS II, ISS-RTS-TRISS, SOFA and compare it with clinical judgments of the medical and nursing staff.

Material and Methods: We determined 160 patients (pts) with SAPS II, ISS-RTS-TRISS, and SOFA scores during one year. SAPS II was used for medical pts, ISS-RTS-TRISS for trauma pts. on admission and at 24th hour. Predicted death rate (PDR) was noted at same times. After 24th hour, pts were determined with SOFA twice a week ($SOFA_1$,$SOFA_2$,$SOFA_3$,$SOFA_4$). Outcome was also guessed by physician (phy.) and nurse. Survival was defined as discharge from the ICU. Demographics were analyzed with chi-square, Mann Whitney U. Receiver Operating Characteristic (ROC) curves were calculated for scores. Kappa (κ) coefficient was used to determine for clinical judgments. ($p < 0.05$ statistically significant). Mc Nemar test was used to compare scores with clinical judgment.

Results and Discussion: ROC values were 0.774 on admission and 0.862 at 24th hour for SAPS II and ISS-RTS-TRISS, and 0.802 ($SOFA_1$), 0.857 ($SOFA_2$), 0.840 ($SOFA_3$), 0.764 ($SOFA_4$) On admission, $\kappa = 0.37$ for SAPS II and ISS-RTS-TRISS($p > 0.05$). Phy.'s judgment $\kappa = 0.68$, nurse's judgment $\kappa = 0.55$ ($p < 0.001$). Clinical judgments were statistically significant on admission. At 24th hour., $\kappa = 0.50$ for SAPS II and ISS-RTS-TRISS, phy.'s judgment $\kappa = 0.66$, $\kappa = 0.57$ for nurse ($p < 0.001$). SOFA scores kappa's were 0.51, 0.83, 0.63 for $SOFA_1$, phy.'s and nurse's judgment respectively. They were 0.55, 0.85, 0.73 for $SOFA_2$; 0.69, 0.85, 0.93 for $SOFA_3$ ($p < 0.001$). $\kappa = 0.41$ for $SOFA_4$ ($p > 0.05$), 0.88, 0.88 for judgments ($p < 0.001$).

Conclusion: Results are preliminary. We have showed that scoring systems had moderate-good discrimination and clinical judgments was better for outcome. It was also indicated that clinical judgment was better than APACHE II for outcome [1].Scoring systems can be valuable,but they are fraught with potential for random and systematic error; the details of how, when, and for whom they are calculated merits ongoing scrutiny. [2]

References:

1 Marks et al. Predicting outcome in intensive theraphy units-a comparison of APACHE II with subjective assessments. *Int. Care Med* 1991;17:159–63.

2 Herridge MS. Prognostication and intensive care unit outcome: the evolving role of scoring systems. *Clin Chest Med* (2003);751–762.

A-737

Prediction and prevention of lethal outcomes after prolonged abdominal surgery

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Background and Goal of Study: The important goal of the intensive care is prediction and prevention of lethal outcomes after the surgery. Registration and analysis of the level of DC-potential (DCP) is one of the methods (Guinjoan SM et al., 1995) for assessing the functional state (FS). The response to surgery stress is determined by the FS. Depending the level of DCP defines the compensated, subcompensated and decompensated FS.

Materials and Methods: 1013 patients underwent elective prolonged abdominal surgery were studied. In an hour after the end of surgery registration of DCP was performed. In group 1 (DCP −15 to −25 mV) all the patients ($n = 780$) was managed only with the basic intensive care (pain management, antibacterial prophylaxis, correction of electrolyte disorders, protein losses, coagulation disorders, parenteral/early enteral nutrition). In group 2 ($n = 233$) supplementary intensive care was added depending on FS. In decompensated FS intensive care was directed on the central nervous system (CNS) activation and/or elimination of tissue hyperhydration, whereas in case of subcompensated FS intensive care was directed on the CNS inhibition and/or elimination of tissue dehydration. The severity of state was assessed by the APACHE III score. Statistical differences was assessed using the Mann-Whitney U-test.

Results and Discussions: Mortality (%) depending on APACHE III score.

APACHE III score	40–49	50–59	60–69	70–79	80–89	90–99	100–109	>110
Group 1	3.0	2.1	3.5	7.2	5.5	12.7	18.3	66.1
Group 2	0	0	0	0	0	0	6.2*	47.7*

* – $p < 0.05$ using the Mann-Whitney test.

There were no lethal outcomes in all patients with APACHE III score less than 40 and in group 2 patients with APACHE III score less than 100. In group 2 using of supplementary intensive care result in less mortality in comparison with group 1.

Conclusion: Registration of DCP and correction of intensive care depending on FS can reduce the lethality rate in patients with a high risk of in-hospital death after prolonged abdominal surgery.

Reference:

1 Guinjoan SM, Bernabo JL, Cardinali DP. J Neurol Neurosurg Psychiatry. 1995 Sep; 59(3):299–302.

A-738

Predictive values of scales used in critical care assessing severity of clinical state of patients after cardiac arrest

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Background and Goal of Study: Because of described predictive values (PVs) of scales used in critical care in patients (pts) in severe clinical state (1, 2) the aim of our study was to compare PVs of them in pts after cardiac arrest (CA).

Materials and Methods: 52 pts after CA in the age 62 ± 13 years. In 34 pts CA occurred during acute coronary syndrome. 26 pts died after CA (CA-D), 26 survived and were discharged from hospital (CA-S). Just after CA (day-1) and in 2 consecutive days (day-2, day-3) state of pts was assessed by scales: Glasgow Coma Scale (GCS), Multiple Organ Disfunction Score (MODS), Simplified Acute Physiology Score II (SAPS II) and Acute Physiology and Chronic Health Evaluation II (APACHE II). Values of the scales in CA-D and CA-S were compared. In regression and survival analysis PVs of survival after CA of the scales were determined.

Results and Discussions: In each scale significant (sign) differences between its values in CA-D and CA-S in 3 consecutive days after CA were found ($p < 0.001$). Sign PVs of all of the scales were confirmed in logistic regression analysis. In day-1 the highest odds ratio (OR) was revealed in APACHE II (OR-39, $p < 0.00002$). In MODS OR were quite great in day-2 and day-3 (OR 30 and 35, $p < 0.00002$). The highest OR in SAPS II was found in day-3 (OR 21, $p < 0.0000002$). GCS revealed high values of OR in day-1, day-2 and day-3 after CA (26, 20 and 41 respectively, $p < 0.000002$). Kaplan- Meyer survival analysis showed that the value of each scale in every day after CA is an important predictor of survival.

Conclusion(s): 1-Values of GCS, APACHE II, SAPS II and MODS in the early stage after CA are sign connected with survival after CA. 2- In the first assessment of clinical state after CA APACHE II reveals the best PV for survival. 3- High PV of GCS in each day after CA proves the pivotal role of state of central nervous system for survival.

References:

1 Batista PB, Cendorogolo Neto M, dos Santos OF, et al. Ren Fail. 2004; 26: 545–52.

2 Cook R, Cook D, Tilley J, Lee K, et al. Crit Care Med. 2001; 29: 2046–50.

A-739

Surgical patients occupation index and mortality in intensive care units

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Background and Goal: 1) To evaluate the need of ICU for postoperative patients versus other patients in a general 6 beds ICU, in our 359 beds hospital (Granollers General Hospital), and to compare our data with global figures from all Catalonian hospitals. 2) To determine mortality rates for surgical patients admitted to IC units related to age and type of surgery.

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Materials and Methods: 1) A retrospective study of all postoperative patients admitted to our hospital ICU during 2004. 2) Analysis of global results obtained by ANESCAT inquiry that was performed at every surgical centre in Catalonia during 2003. 3) Statistics used: $^{A,D}\chi^2$, ^{B}Wilcoxon, ^{C}t Student.
Results: 414 patients were admitted to the ICU during 2004; 28.5% were postoperative, 42% suffered from coronary disease and 29.5% had other medical troubles.

Occupation of IC units related to type of surgery:

	Digestive	Traumatology	Cardiac	ORL	Other
Catalonia	24%	20%	15%	2.5%	30%
GGH	76%	5%		6.7%	12%

Admissions to IC related to urgent or scheduled surgery:

	Urgent	Scheduled
Catalonia	5.1%	3.5%
Granollers Hospital	4.2%	1.6%

Mortality rates of 34 patients over 70 years old (GGH) admitted in our ICU:

Age	APACHE II (mean + SD)	Postoperative mortality
70–74	15.3 ± 2.7	3/12 (25%)
75–79	15.3 ± 4.6	7/12 (58.3%)
>79	16.4 ± 3.4	8/10 (80%)

The postoperative mortality rate in our ICU was 16% and increased up to 23.7% for urgent surgery procedures while in scheduled operations it was 4.9%. Global ICU mortality was 13.2%.
Conclusions: 1) In Catalonia, most postoperative requires for ICU were generated by Digestive and Traumatologic Surgery. Urgent procedures needed more postoperative Intensive Care than scheduled ones $^{A}(\chi^2, p < 0.0001)$. 2) In our hospital, mortality rates in patients over 70 submitted to urgent procedures increased with age ^{B}(W, p 0.02), regardless of APACHE scores APACHE ^{C}(t, p 0.43) and global postoperative mortality rates in the ICU were higher for urgent surgery patients $^{D}(\chi^2$, p 0.01).

A-742

A predictive model of need for mechanical ventilation after major lung resection surgery

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Background and Goal of Study: Respiratory failure is a leading complication after major lung resection surgery. This retrospective study aims at defining predictive factors of prolonged postoperative mechanical ventilatory support (MV).
Materials and Methods: One hundred and fifty-seven patients submitted to lobectomy/bilobectomy (n = 132) or pneumonectomy (n = 25) from January 2003 through December 2004 were taken into consideration for the study. Stepwise regression analysis was used to determine which preoperative parameters (age, PaO_2, $PaCO_2$, ppoFEV$_1$, ppoDLCO, Pulmonary Postoperative Product (PPP), type of operation, extended resection, concomitant cardiac disease, Charlson Comorbidity Index (CCI), diabetes and neoadjuvant chemotherapy) were predictive of postoperative MV. Variables retaining significance ($p < 0.1$) in the multivariate analysis were considered independent predictors of MV. Bootstrap resampling techniques were used to validate the multivariate model. We demonstrated that selecting those variables that were identified as independent predictors of MV in at least 50% of the bootstrap samples resulted in a parsimonious model with good predictive ability.
Results and Discussions: Eighteen patients (11.5%) required prolonged MV (50.4 ± 113.2 hours). Ischaemic heart disease ($p < 0.0001$; bootstrap frequency 85.4%) and an extended resection (en block resection of chest wall and lung) ($p = 0.001$; bootstrap frequency 62.1%) were identified as independent predictors of prolonged MV in more than 50% of 1000 bootstrap data samples.

We also derived a predictive model (R^2 0.175) of need for MV:

$$\text{Length (hours) of MV} = -0.92 + 46.9 \times \text{ischaemic heart disease} + 43.9 \times \text{extended resection}$$

Both variables: 1 = presence/0 = absence.
Conclusions: Ischaemic heart disease and an extended resection are variables independently associated with prolonged MV in a cohort of patients submitted to major lung resection surgery. Knowledge of these variables may assist in clinical decision making regarding perioperative management and interventions.

A-743

Influence of rhDNAse on the duration of mechanical ventilation in intensive care patients – interim analysis of the LUFIT trial

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Background: RhDNAse is effective in the treatment of children with cystic fibrosis [1]. Significant reduction of duration of ventilation by rhDNAse has been reported in children following cardiac surgery [2].
Objective: To investigate wheter rhDNAse is able to reduce the duration of ventilation in adult mechanically ventilated intensive care patients.
Methods: After approval of local ethics committes we conducted a double-blind, placebo-controled, randomized, multicenter national trial. Patients were stratified in two subgroups depending on their status as surgical or non-surgical. Patients in the active treatment group received 2.5 ml of rhDNAse endotrachealy twice a day. Patients in the placebo group received the same amount of normal saline. This interim analysis reviewed 98 non-surgical patients. Data from 85 patients were included in the analysis.
Results: 44 patients in the study group and 41 patients in the placebo group were analyzed. Factors like gender, weigth, smoking habit, chronic preexisting diseases and prevalence of COPD were distributed equally in both groups. Three patients died in the rhDNAse group versus eight in the placebo group. Median duration of ventilation was 140 h (CI 120 to 200 h) in the verum and 324 h (CI 178 to 442 h) in the placebo group.
Discussion: This interim analysis suggests that rhDNAse may have the potential to reduce the duration of ventilation in adult non-surgical intensive care patients. This confirms results obtained in pediatric patients [2]. Data from surgical patients will be presented as soon as the interim analysis in that group is completed.
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A-744

What is the probable mechanisms of tricyclic antidepressant induced acute lung injury?

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Background and Goal of Study: The aim of this study to characterize the potential of amitriptyline, a kind of tricyclic antidepressant (TCA), to induce lung epithelial cell damage and coagulation activation on endothelium.
Materials and Methods: Thirteen rats were randomized in 2 groups offered via gavage either mashed amitriptyline (250 ml·kg^{-1}) in 5 ml saline or only saline 5 ml. After 24 hours, a sternotomy was performed, lungs were removed and prepared for electron microscopy (EM) and immunohistochemistry studies. Blood samples were taken for detection of amitriptyline plasma levels and von Willebrand Factor (VWF) analysis. The lung tissue from the animals were prepared from the paraffin tissues for morphometric study and also evaluated to quantify surfactant protein B (SP-B) expression immunohistochemically. The size of the alveoli in each group was measured using computer-assisted image analysis system.
Results and Discussions: The mean amitriptyline plasma level was 792 ± 11.12 ng·ml. No difference was found between plasma VWF levels. In morphologic study, the lungs appeared normal besides congestion to some extent with regularly-shaped alveoli in the peripheral lung in control group. After exposure of amitriptyline some alveolar damage was present and was characterized by congestion (increased numbers of erythrocytes) in the alveoli, narrowing, alveolar septal thickening and disruption and perivascular swelling. The mean alveolar diameter in the control group (108.74 ± 29.88 μm) decreased after administration of the drug in the study group (72.22 ± 19.74 μm). Immunostaining for SP-B was reduced in the alveoli of the study group (35.71% ± 19.80 vs. 74.00% ± 8.90). Vesicles with abnormal material deposition in Type II pneumocytes were revealed by EM in study group animals.
Conclusion(s): The results obtained in EM, morphometric and immunohistochemical studies showed alveolar epithelial damage induced by amitriptyline. Because no difference was detected among VWF plasma levels, we can say that alveolar damage is more evident than coagulation activation in TCA overdosing.

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A-745

Learning curve for percutaneous dilatational tracheostomy modo Griggs

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Background and Goal of Study: The PDT technique is preferred in critically ill intensive care unit (ICU) patients because it seems to be simple, fast, safe and cost-effective. The evaluation of complications rate (CR) of PDT among the trainee and well-experienced person was estimated and compared. The comparison of CR between first 25 performed procedures and the rest of them has been done.

Materials and Methods: The Griggs technique was applied in the elective PDT procedure which was performed at the bedsides in the ICU on the group of 126 patients, who were over 16 years old, without any observed anomalies in the neck or diagnosed coagulopathy, and were mechanically ventilated for longer than 8 days. The patients were divided into 5 sequential groups of 25 people for institutional experience (A-E) assessment. In every group the PDT was performed by a trainee (II) but assisted by a well-experienced person (I). The CR was evaluated in each group. Fisher's exact test was used for statistical calculation.

Results and Discussions: The amount of complications (C) during the PDT performed in group I and II is presented in the table below.

	Number of PDT procedure	General number of C	Number of C during the procedure
Group I	73	11 (15%)	6 (8.2%)
Group II	54	6 (11%)	4 (7.4%)

It was no statistical differences in general numbers (GN) of C ($p = 0.052$) or technical disturbances ($p = 0.087$) during the procedure in both groups.

GN of C in sequentional groups: A-5 (20%), B-3 (12%), C-2 (8%), D-2 (8%), E-5 (20%).

There were not significant differences in CR among patients in group A and in the other groups.

Conclusions:

1. The PDT technique seems to be easy for learning and can be used by a trainee if the patients selection is proper.
2. No-life threatening complications and no deaths were observed.
3. The CR of PDT is independent of operator and institutional experience.

A-747

Recruitment maneuvers reduce lung oedema in ARDS patients

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Background and Goal of Study: Alveolar fluid clearance in patients with acute respiratory distress syndrome is impaired in the majority of patients. Because experimental study have shown that reduction of tidal volume increase alveolar clearance, we tested the hypothesis that recruitment maneuvers can reduce lung edema.

Materials and Methods: In 15 patients with acute respiratory distress syndrom, pulmonary edema fluid and plasma were sampled before, one and four hours after recruitment maneuver. In the same time, hemodynamic parameters, blood gas analysis and recruited volume were recorded. Recruitment maneuver consist in the application of a PEEP at 10 cmH_2O above the lower inflection point on the pressure-volume curve, during 15 min.

Results and Discussions: In responders, recruitment maneuver improve alveolar fluid clearance ($+19 \pm 13\,mL \cdot h^{-1}$; $p < .05$), oxygenation ($+181\%$; $p < .001$) and recruited volume ($+113\,mL$; $p < .001$), whereas in non-responders, recruitment maneuver decrease alveolar fluid reabsorption ($-24 \pm 11\,mL \cdot h^{-1}$; $p < .05$) and PaO_2 (-9%; *NS*) and poorly increase recruited volume ($+31\,mL$; *NS*). In non-responders, recruitment maneuver is followed by a droop in blood pressure, whereas hemodynamic data are not modified in responders. There is no difference in the onset of mechanical ventilation or in the type of ARDS between responders and non-responders. The CT-scan attenuation were different : responders have a diffuse loss of aeration whereas the non-responders have a focal loss of aeration.

Conclusion(s): Recruitment maneuvers improve alveolar fluid clearance only in patients with diffuse loss of aeration. In patients with focal loss of aeration, recruitment maneuver decrease oxygenation and alveolar fluid reabsorption. An early droop of blood pressure is predictive of a failure of recruitment maneuver.

A-748

The role of Toll-like receptor 9 for the pathogenesis of acute lung injury

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Background and Goal of Study: Inflammatory mediators play an important role for the pathogenesis of acute lung injury (ALI). Bacterial DNA (CpG-DNA) can induce a systemic inflammatory response. Recently, TLR9 was described as the primary receptor for the recognition of bacterial DNA. The molecular mechanisms leading to cytokine production in the lung after CpG-DNA application are not finally understood. Therefore, the purpose of this study was to determine whether TLR9 mediates a CpG-DNA induced inflammatory response in the lung.

Materials and Methods: Wild-type (WT) and Toll-like receptor 9-deficient (TLR9-D) mice were stimulated with CpG-DNA (20 nmol i.p.) for various time points. The pulmonary cytokine mRNA and protein expression was analyzed by RNAse protection assay and enzyme-linked immunosorbent assay (ELISA). The activation of NFκB was determined by electromobility shift assay (EMSA) and the mRNA expression of the inducible NO-synthase (iNOS) was measured by quantitative RT-PCR. In order to differentiate the cellular uptake of CpG-DNA into various pulmonary cells the lung tissue was analyzed by flow absorbance cell sorting (FACS) and histology.

Results and Discussion: In WT mice an increase in pulmonary NFκB activation was observed 1 h after stimulation with CpG-DNA with a maximum in expression after 2 h, but not in TLR9-D mice. Furthermore, the application of CpG-DNA led to a robust increase of the pulmonary cytokine mRNA expression of tumor necrosis factor (TNF), interleukin-1 (IL-1β) and interleukin-6 (IL-6). In contrast, the cytokine response in the TLR9-D mice was significantly lower. A significant increase of TNF (7.0 pg/mg vs. 1.4 pg/mg) and IL-1β (229.3 pg/mg vs. 35.4 pg/mg at 1 h) protein production in WT mice in comparison to TLR9-D mice was detected by ELISA. Furthermore, the mRNA expression of iNOS in WT mice was also significantly greater than in TLR9-D mice. FACS analysis as well as histology indicate that endothelial cells, dendritic cells and macrophages take up CpG-DNA and participate in the immune response leading to pulmonary dysfunction.

Conclusion: Taken together, this study demonstrates that TLR9 plays an important role for the activation of proinflammatory mediators via the pulmonary TLR9 signal transduction pathway and for the induction acute lung injury.

A-749

Impact of the guidelines on clinical practice of artificial nutrition in intensive care unit after cardiovascular and thoracic surgery

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Background and Goal of Study: To analyze the impact of an artificial nutrition program in postanaesthesia intensive care unit by an observational study.

Materials and Methods: Patients with length of stay greater than 8 days after cardiovascular and thoracic surgery: Group 1 : 34 patients (2-month period in 2000); group 2 : 15 patients (2-month period in 2001); group 3:40 patients (4-month period in 2003).

Between these 3 periods, informations of physicians and written protocol in order to improve their nutritional knowledge.

After analysis of variance, student's t-tests were used for quantitative data, and chi-square tests for qualitative data ($p < 0.05$). Newman-Keuls tests to compare themselves each groups

Results and Discussions: Anthropometric, demographic and clinical parameters were similar in the 3 groups. Energic intakes were less than 80% of basal energetic expenditures in 33%, 33 and 22% of patient, respectively (ns). Caloric and nitrogen intakes were less than recommended, respectively 19 ± 6 (mean $\pm$ SD), 21 ± 7 and 21 ± 8 kcal/kg/24 hr and 102 ± 32, 111 ± 31 and 92 ± 40 mg/kg/24 hr (ns).

However enteral nutrition was administered in 49, 40 and 100% of patients respectively ($p < 0.001$).

The glucid/lipid ratio improved from 0.47 in group 1 up to 0.68 in group 3 ($p < 0.0001$). Vitamins, oligoelements and clinical and biological monitoring of artificial nutrition improved ($p < 0.001$).

Conclusions: A clinical audit demonstrated an improvement in artificial nutrition parameters but no significant change in others.

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A-750

B-Type natriuretic peptide indicates intensive care duration after cardiac surgery

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Background and Goals: In cardiac surgery we face a need for accurate and reliable laboratory parameters for prediction of outcome. B-type natriuretic peptide is used for the evaluation of left ventricular function. Thus; we evaluated prognostic value of BNP for estimation of postoperative ICU-duration prior to coronary artery bypass grafting (CABG) and after CABG to identify a prolonged ICU-stay exceeding 48 hours.

Materials and Methods: In a prospective, observational study we investigated 122 consecutive patients undergoing elective CABG. The test kit for BNP is an immuno assay combined with chemiluminescence (BNP Bayer ADVIA Centaur, Bayer Vienna, Austria), Correlations were calculated by Pearson's Rank test and a logistic regression analysis was performed to estimate predictive value. A $p > 0.05$ was regarded as significant. Ranking with the SAPS II score was performed according to the algorithm published by Le Gall et al. Echocardiographic evaluation was performed by the assigning cardiologists.

Results: ICU-duration was correlated with BNP levels, LVEF and SAPS II. The median ICU-stay was 1 day (lower 1/upper quartile 3) ranging from 1 to 23 days. ICU duration exceeding 1 day, was found in 38.5% ($n = 47$). BNP > 99 pg/ml prior to surgery had a sensitivity of 98% and a specificity of 89% for identifying prolonged ICU duration (AUC = 0.933) whereas LVEF had a sensitivity of 24% and a specificity of 100% for (AUC = 0.62) and a SAPS II-score above 29 had a sensitivity of 48% and a specificity of 99% (AUC = 0.73).

Conclusions: Preoperative BNP levels appear to be related to a prolonged ICU stay in patients undergoing CABG and were more accurate than LVEF and SAPS II.

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A-752

Fast track method in cardiac surgery: evaluation of risks and benefits

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Background and Goal of Study: Fast track is defined as a method in which, patients are extubated less than 8 hours postoperatively. This method not only decreases the Patients' length of stay (LOS), but also reduces medical costs. Developments in anesthesia and surgeries have changed definition and methods of fast track including extubation interval.

Materials and Methods: One hundred cases were divided into two groups. In fast track group, fentanyl (0.05–0.15 μg/kg/min) and propofol (10–50 μg/kg/min) infusions were started since induction time. Atracurium infusion started one hour later and no bolus drug was administered during operation. Fentanyl infusion continued up to 12 hours post surgery. The above two groups were evaluated for time of alertness and extubation in intensive care unit, total analgesic dosage administered during 24 hours post operation, ABG and SpO_2 pre- and post-extubation. Inclusion and exclusion criteria for fast track method as well as extubation criteria were explained to intensive care unit staff.

Results and Discussions: Time period between intensive care unit admission and alertness was significantly different in fast track method (1.3 hour) and control group (3.3 hours) ($p < 0.001$) as well as time period between intensive care unit admission time and extubation (4.3 hours vs. 7 hours) ($p < 0.001$). Two groups were significantly different concerning length of stay in critical care ward ($p = 0.009$). No patient of fast track group experienced low PaO_2, low SpO_2, high $PaCO_2$ or need for reintubation in first 24 hours post surgery. Nausea occurred less in fast track group compared to control group ($p < 0.01$).

Conclusion(s): This study shows that considering inclusion and exclusion criteria, fast track method is safe and maintains continuous sedative and analgesic effect this method does not increase respiratory complications.

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A-753

Immediate postoperative treatment with angiotensin-converting enzyme inhibitors in patients with preoperative reduced left-ventricle systolic function

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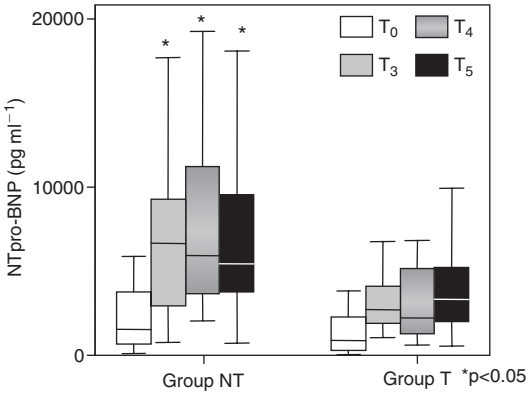
Background and Goal of Study: Angiotensin-converting enzyme inhibitors (ACE-I) could have beneficial effects in improving left ventricular function after cardiac surgery in patients with low preoperative left ventricular ejection fraction (LVEF). B-natriuretic peptide (BNP) is an effective marker of congestive hearth failure and acute coronary syndromes. We studied the utility of ACE-I as early substitutes of dobutamine after cardiac surgery in patients with preoperative LEVF ⩽ 0.4. The left ventricular function was monitored by NT-proBNP levels.

Materials and Methods: 34 patients with preoperative LVEF ⩽ 0.4 undergoing elective cardiac surgery were prospectively randomised into two groups. Group T, (with ACE-I) who received ramipril 1.25 twice a day from the day after the operation (D_2) and group NT (without ACE-I). In both groups withdrawal from dobutamine started at D_3. NT-proBNP levels were determined before (T_0), immediately after surgery (T_1) and on the next 4 days (T_2,T_3,T_4,T_5).

Results and Discussions: In both groups baseline NT-proBNP levels were high while not significantly different and increased postoperatively until T_5, especially in group NT. At T_4, the NTpro-BNP levels were significantly higher in this group while ACE-I had been set for 48 hours (figure 1).



Conclusion(s): ACE-I can be used as dobutamine substitute as early as in the first postoperative day after cardiac surgery without renal consequences and seems to be beneficial in patients with left ventricular dysfunction.

A-754

Opioids and their influence on SOCS-3 expression after CABG surgery

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Background and Goal of the Study: Opioids used in cardiac anesthesia are known to have immune modulating properties. Surgical stress leads to a systemic inflammatory response syndrome after surgery with an increased risk for postoperative infections. SOCS-3 is known to be induced by cytokines (1). We compared the influence of fentanyl versus remifentanil on the postoperative expression of the transcription factor SOCS-3 in patients undergoing CABG surgery.

Materials and Methods: After written informed consent, fourty patients scheduled for elective CABG surgery were included in this ethically approved prospective study. The patients were randomized to: remifentanil group (0.3–0.6 μg/kg/min) and the fentanyl group (0.2–0.3 μg/kg/min). Postoperative analgesia was performed with piritramide and metamizol I.V. Blood samples for gene expression analysis were collected into PAXgene™ Blood RNA

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tubes as well as Concanavalin-A stimulated cytokines in whole blood cells before induction of anaesthesia and on the first and second day after surgery. Total RNA was prepared unsing the PAXgene™ Blood RNA kit and the cDNA synthesized was then analyzed for expression of the transcription factors listed above by quantitative real-time RT-PCR. Statistics: Mann-Whitney-U, Friedman test ($p < 0.05$).

Results: In both groups SOCS-3 expression increased on the first postoperative day. The second day after surgery SOCS-3 expression in the fentanyl group remained increased whereas SOCS-3 of expression the remifentanil group were comparable to baseline values ($p < 0.05$ intergroup). IFN-γ concentrations in Concanavalin-A stimulated whole blood cells were significantly lower in the remifentanil group on the first postoperative day compared to the fentanyl group ($p < 0.05$). In a subgroup analysis ($n = 9$ versus $n = 9$) of the fentanyl group, increased SOCS-3 levels on the second postoperative day were associated with a significant prolonged ICU stay ($p < 0.01$ between subgroups, 34 versus 19.5 hours).

Conclusion: Remifentanil and fentanyl might have different influence on SOCS-3 expression. The lower SOCS-3 expression on the second postoperative day after surgery might be explained as an immunestabilizing effect of remifentanil with respect to a reduced proinflammatory response, i.e. the lower IFN-γ concentrations in Concanavalin-A stimulated whole blood cells after cardiac surgery. This could be clinically relevant with respect to the postoperative infection rate, especially in high risk patients (2).

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A-755

Liver hemodynamics after cardiac surgery in patients with preoperative cardiac failure. Effects of levosimendan

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Objectives: To assess the effects of levosimendan on liver hemodynamics after cardiac bypass in patients with preoperative cardiac failure.

Methods: Double blind randomized study that included 24 adult patients operated upon cardiac surgery with preoperative NYHA Class III or IV cardiac failure and plasmatic brain natriuretic peptide over 100 pg/ml. In levosimendan group , this drug was given in 12 patients as an intravenous bolus of 18 μg/ml in 15 min, followed by a 24 hours infusion of 0.2 μg/Kg/min. In the control group, another 12 patients received a 24 hours infusion of 7.5 mg/kg/ min of dobutamine.

We determinate the following parameters, in baseline conditions and after 24 hours of treatment: heart rate, mean arterial blood pressure, mean pulmonary arterial pressure, pulmonary capillary wedge pressure, cardiac index, stroke volume, central venous pressure, systemic vascular resistance, pulmonary vascular resistance, mean portal vein flow velocity (MPVV), portal vein flow (PVQ), liver resistance index (RI), liver pulsatility index (PI) and liver vascular index (LVI).

Results: The main results in liver hemodynamics evolution in both groups are:

		Control group		Levosimendan group		
	Basal	After 24 h		Basal	After 24 h	
MPVV	13.00 + 2.18	13.15 + 1.73	$P > 0.05$	12.48 + 3.33	15.11 + 2.11	$P < 0.05$
PVQ	386.62 + 152.87	412.32 + 163.99	$P < 0.05$	300.26 + 100.57	547.64 + 129.21	$P < 0.05$
RI	0.86 + 0.07	0.86 + 0.07	$P > 0.05$	0.88 + 0.07	0.66 + 0.06	$p > 0.05$
PI	0.86 + 0.07	2.99 + 0.61	$P > 0.05$	2.81 + 0.41	2.20 + 0.38	$p > 0.05$
LVI	4.43 + 1.49	4.55 + 1.08	$p > 0.05$	4.51 + 1.02	6.96 + 1.04	$P < 0.05$

Conclusion: Levoximendan improved major hemodinamical parameters after cardiac surgery in patients with preoperative cardiac failure. Those hemodynamical effects were accompanied by portal vein and hepatic artery vasodilatation , and an improvement in liver blood flow as well.

A-756

C-reactive protein changes during cardiopulmonary bypass with epidural anesthesia

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Background and Goals: Coronary artery bypass grafting (CABG) with cardiopulmonary bypass (CPB) induces a systemic inflammatory response. Thoracic epidural anesthesia (TEA) may attenuate the CPB and surgery associated stress response (1), the incidence of myocardial ischemia (2) and may improved pulmonary function (3).

Material and Methods: We studied 20 patients scheduled for elective CABG wit CPB in a prospective randomized study. The study was approved by the Local Ethics Committee. One group (GA) received general anesthesia with fentanyl (7–20 μgr/kg) and a morphine infusion (1–0.5 ml/h) in the postoperative period. TEA group received fentanyl (3–6 μgr/kg) and a epidural bolus of 8 ml of bupivacaine 0.33% followed by a continuous epidural infusion of bupivacaine 0.175% until postoperative day 3. Hemodynamic, heart rate, cardiac enzymes, C-reactive protein (CRP), fibrinogen and leukocyte count were measured preoperatively, 2 h, 8 h, 16 h, 24 h and 40 h after termination of CPB. Time to tracheal extubation and cardiopulmonary complication rate were measured postoperatively. Biometric data were analyzed by Mann Whitney's test. Data are presented as mean ± SD.

Results:

		Baseline	2 h post	8 h post	16 h post	24 h post	40 h post
Heart rate	TEA	63.4 ± 8.01	85 ± 11.6	90.7 ± 15	95.5 ± 10*	94.1 ± 10◆	91.3 ± 13.84
(min^{-1})	Control	63.9 ± 11.4	87 ± 13.8	81 ± 9.33	82.5 ± 12*	85.8 ± 12◆	84.4 ± 12.5
TAS	TEA	134 ± 18.5	107 ± 18	109 ± 18	116.8 ± 20	110.8 ± 24	111.4 ± 28
(mm Hg)	Control	123.5 ± 12.4	98.6 ± 11	97.4 ± 10	108.2 ± 11	116.3 ± 12	112.1 ± 15
CRP	TEA	6.7 ± 7.8	5.2 ± 7.0	9.0 ± 10.1	77.6 ± 25◆	162.8 ± 50	203.7 ± 73.1
($mg\,l^{-1}$)	Control	2.8 ± 2.4	1.7 ± 1.6	6 ± 3.6	94.3 ± 24◆	187.6 ± 77	237.7 ± 83
Leukocyte	TEA	7.6 ± 1.3	10.8 ± 4	11.4 ± 4.6	11.5 ± 4.3	12.4 ± 4.9	12.4 ± 4.8
($10^9/l^{-1}$)	Control	7 ± 1.4	10.5 ± 2	13.3 ± 2.5	11.9 ± 2.3	12.3 ± 2.3	11 ± 1.9
Fibrinogen	TEA	518 ± 81	351 ± 80	379 ± 64	528 ± 76	636 ± 101	714 ± 104
($mg\,dl^{-1}$)	Control	480 ± 118	318 ± 75	359 ± 80	532 ± 92	682 ± 228	754 ± 88.4
Troponin I	TEA	0.9 ± 1.60	3.9 ± 2.4	12.8 ± 2.4	44.2 ± 58◆	30.6 ± 42◆	17.8 ± 21.9
($\mu g\,l^{-1}$)	Control	0.5 ± 0.8	2.19 ± 0.7	11.1 ± 6.1	9.87 ± 9.1◆	6.42 ± 5◆	4.73 ± 4.66

* $p < 0.05$ ◆$p < 0.09$

Conclusions: All parameters significantly increased following CPB. TEA for CABG surgery seem to attenuate the inflammatory response to CPB by the decreasing the CRP, leukocyte and fibrinogen levels at 16 h, 24 h and 40 h after termination of CPB. However, this different were not statistically significant ($p > 0.05$). TEA for CABG surgery had no effect on troponin release, time to tracheal extubation and cardiopulmonary complication rate.

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A-757

Relationship between serum magnesium level and post coronary artery bypass graft surgery arrhythmias

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Background and Goals: Atrial and ventricular arrhythmias are among the most common complications after coronary artery bypass graft (CABG) surgery. Previous studies demonstrated that cardiopulmonary bypass itself, results in reduced serum magnesium level.

In this study, we wanted to evaluate the effect of total blood magnesium level (TMG) on preventing perioperative arrhythmias by routine regimens of 2–4 grams supplemental magnesium (SMG).

Materials and Methods: TMG was measured in patients who were scheduled for CABG on 3 occasions [just before anesthesia, just after entering intensive care unit (ICU) postoperatively and on the first morning after operation]. Patients were evaluated for primary cardiac rhythm and other variables that could have an influence on magnesium level (serum creatinine, urine output in operating room and diuretic therapy). SMG was also recorded in operating room and ICU.Then the patients were evaluated for the rate and kind of arrhythmia through next 3 days.

Results: Mean TMG level in 174 cases was 2.2 (0.5), 2.6 (0.6) and 2.4 (0.6) mg/dl on three occasions respectively. Mean SMG was 2.5 (1.2) grams. 47 out of 157 patients developed post-operative arrhythmia (30%) [AF* (6.4%), Non-AF SVA** (14.6%) and Ventricular arrhythmia (16.6%)]. Mean serum creatinine level and urine output were 1.2 mg/dl and 1800 ml respectively. Although there was a significant difference between TMG on three occasions ($P < 0.001$) all values were within normal range. When we stratified TMG of the patients based on administered SMG, Mentel-Haenszel test no significant difference was noted between first and third TMG ($P = 0.6$). Although a significant difference was observed in TMG between arrhythmic patient and those without arrhythmic ($P < 0.001$) both values were in normal range (2.38 vs. 2.17).

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Conclusion: This study shows that routine magnesium administration has no significant effect on serum magnesium level (TMG). Also, it seems that serum creatinine and urine output are not determinant factors for SMG administration. There was no relation between TMG and perioperative arrhythmia. We conclude that though routine regimen of magnesium administration has no effect on incidence of perioperative arrhythmia, it is probably necessary for maintaining normal magnesium level.

*Atrial fibrillation **Supraventricular arrhythmia.

A-758

C-reactive protein levels following cardiac surgery in adults

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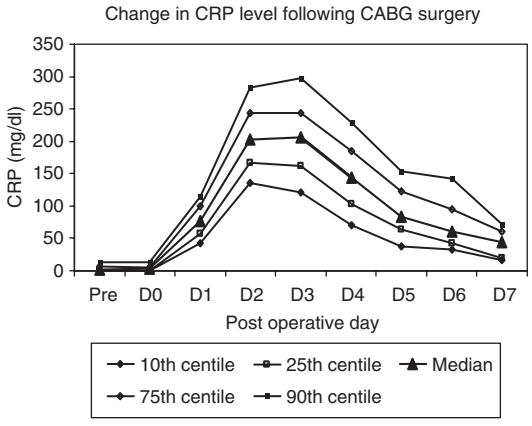
Background and Goals: C-Reactive Protein (CRP) is a non-specific inflammatory marker which increases in response to a variety of insults including cardiopulmonary bypass (CPB) and cardiac surgery (1). The reference range of CRP values (0–5 mg.dL) relates to a normal, including preoperative, population. The expected range in the post-operative patient has not been defined. This study was designed to determine reference values of CRP after uncomplicated coronary artery bypass graft (CABG) surgery requiring CPB.
Materials and Methods: The records of 1147 consecutive patients undergoing isolated CABG surgery were examined. Only patients undergoing elective, first-time procedure with an uncomplicated intra and post operative course were included. Pre and post-operative CRP results were collected from the remaining 573 patients. The results were analyzed in order to obtain mean values and centiles for each postoperative day.
Results: Data (median and centile) are shown in the graph. Median CRP reached peak values in the second and third postoperative days (209 and 210 mg/dL respectively).



Conclusions: CRP values rise following uncomplicated CABG surgery with peak values reached in days 2–3 postoperatively.
Reference:
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A-759

A modified supraclavicular approach of the subclavian vein: assessment of anatomical backgrounds by three-dimensional computed tomography and 100 clinical trials

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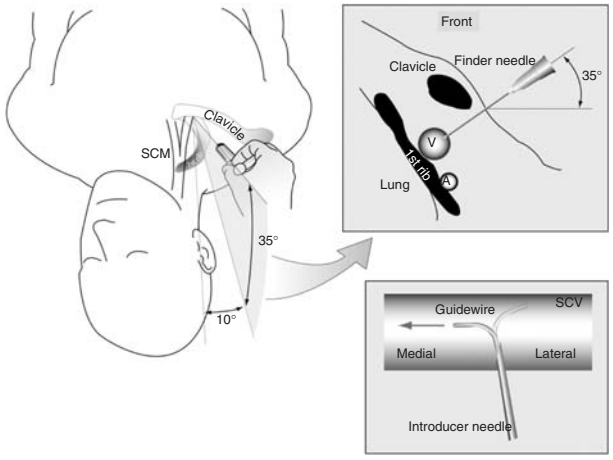
Background and Goal of Study: The current study aimed at elucidating anatomical basis for a modified supraclavicular approach (SC) of the subclavian vein (SCV) using three-dimensional computed tomography (3D-CT) then clinical trials were followed to confirm the efficacy of the technique.

Materials and Methods: Sixty adult patients with normal body build who underwent head and neck CT examinations were randomly selected for 3D-CT investigation. One hundred adult patients requiring central venous catheterization during surgeries were enrolled in clinical trials. In a supine position, the modified SC was performed at the right clavisternomastoid angle, at an angle of 10° medially on the coronal plane and of 35° backward on the sagittal plane.



Results and Discussions: The optimal angle of approach was 35.4° backward and the distance to the SCV was 14.6 mm from the skin entry. There were no failures and no complications. The success rate at the first attempt was 79% and average trial time was 1.2.
Conclusion: The modified SC proved itself to be an easy, safe and efficient method. Complete revelation of spatial relationship for this procedure via 3D-CT investigation and subsequent favorable results in clinical trials will propose this technique as a primary or an alternative central venous catheterization method.

A-760

Pronostic value of central venous oxygen saturation in critical surgical patients: A preliminary report

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Background and Goal of Study: Central venous oxygen saturation ($ScvO_2$) has been shown utility as a guide for treatment of critical patients[1]. In surgical patients, values over 70% are related with a less length of hospital stay (LOS)[2]. We present an observational prospective cohort study. Primary goal is to determine if values of $ScvO_2$ are related with LOS and stay at surgical critical care unit (SCC) expressed in days. Secondary goal is to determine if $ScvO_2$ values are associated to in-hospital mortality.
Materials and Methods: Adult patients (n = 46; age 68.2 ± 17; APACHE II 13.3 ± 5.5) undergoing to abdominal surgery, admitted to SCC according to guidelines of it. Blood samples of superior vena cava were obtained in order to in vitro analyse $ScvO_2$ at admission and at 3 and 6 hours of stay. Statistics: data are presented as a mean ± SD or in percentage form. A simple linear regression was used to determine possible relationship between $ScvO_2$ and both, LOS and stay at SCC (St SCC). Relationship between $ScvO_2$ values and in-hospital mortality was analysed by a logistic regression.
Results and Discussions: Six patients (13%) died. Results of main endpoints are shown in the table.

$ScvO_2$I*	$ScvO_2$3 h	$ScvO_2$6 h	St SCC	LOS
71.2 ± 9.4	73.1 ± 6.9	74.9 ± 6.5	4.02 ± 4.6	15.3 ± 11.9

*$ScvO_2$ at admission. Values $SvcO_2$ in %.

Values of $ScvO_2$ did not show relation with LOS, St SCC or mortality. These results may be due to different profile of our patients[1,2] or because in our work $ScvO_2$ was measured in vitro and in an intermittent form[3].
Conclusion(s): We cannot show any association between in vitro determined $ScvO_2$ and LOS, St SCC or hospital dead in critical patients undergoing to

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abdominal surgery. $ScvO_2$ values obtained might question his utility as a guide for treatment in this type of patients.

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A-761

Continuous intra-abdominal pressure measurement technique (CIAP)

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Background and Goal of Study: Abdominal Compartment Syndrome can develop within the first 12 hours of intensive care unit (ICU) admission in high-risk (shock/trauma, burn, pancreatitis, peritonitis, sepsis) patients. The current standard of intra-abdominal pressure (IAP) measurement via the urinary catheter is time consuming and its intermittent nature could prevent timely recognition of significant changes in IAP (1). We propose that continuous IAP (CIAP) can be accurately measured via the three-way catheter.

Materials and Methods: CIAP was measured via the irrigation port of the three-way catheter transduced to the bedside monitor as a continuous trace without intermittent clamping of the catheter. The measurements were performed at the Department of General Surgery and ICU (ending in November 2005). Patient's demographics, severity of the injury, type of surgery, body mass index (BMI) were recorded.

Results: Thirty-seven patients were involved in the study during its ten-month period. Their mean age was 61.5 years and BMI was 29.2 kg/m^2. With our novel approach we could detect four patients with Abdominal Compartment Syndrome.

Conclusion: According to our results, CIAP measurement with a three-way urinary catheter seems to be a simple and accurate method for monitoring IAP.

Reference:

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A-762

Norepinephrine is superior to Epinephrine in increasing gastric mucosal oxygenation

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Background and Goal of Study: Maintenance of adequate microcirculatory oxygenation is crucial to preserve the integrity of the gastrointestinal mucosa [1]. In this context, the effects of the naturally occurring catecholamines epinephrine (EPI) and norepinephrine (NOR) are unclear. EPI could increase gastric mucosal oxygenation (μHbO_2) by increasing oxygen delivery (DO_2) where as NOR is supposed to decrease μHbO_2 by increasing vascular resistance [2].

Materials and Methods: Six chronically instrumented dogs were repeatedly anaesthetized, mechanically ventilated (sevoflurane 1.5 MAC, FiO_2 0.3, $etCO_2$ 35 mmHg) and randomly received increasing doses (0, 0.05, 0.1 and 0.2 μg/kg/min) of either EPI or NOR. μHbO_2 was measured by reflectance spectrophotometry [3] and the results were related to DO_2 and oxygen consumption (VO_2). Statistics: Means ± SEM, ANOVA, $p < 0.05$.

Results and Discussions: EPI dose dependently increased DO_2 from 12.3 ± 1.0 (control) to 26.5 ± 3.3 ml/kg/min (highest dose) while μHbO_2 remained unchanged (from 57 ± 1 to 57 ± 2%). In contrast, NOR produced only small changes in DO_2 (from 12.3 ± 0.9 to 19.9 ± 2.3 ml/kg/min) but markedly increased μHbO_2 (from 57 ± 1 to 67 ± 2%). Changes in VO_2 were similar in both groups (EPI: from 3.3 ± 0.2 to 3.8 ± 0.2 ml/kg/min; NOR from 3.4 ± 0.3 to 3.9 ± 0.3 ml/kg/min). Furthermore EPI caused a remarkable rise in lactate (from 1.9 ± 0.2 to 4.2 ± 0.3 mmol/l) while NOR slightly decreased lactate (from 2.1 ± 0.3 to 1.7 ± 0.3 mmol/l).

Conclusion(s): NOR is superior to EPI in increasing μHbO_2 despite a higher DO_2 during EPI. These findings may be partly explained by a redistribution of perfusion towards the gastric mucosa which could result from increased vascular resistance in extramucosal tissue during NOR [4]. If our findings apply to the clinical setting, NOR may be preferred to EPI for optimizing gastric mucosal oxygenation.

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4 Adolphs, J et al. (2003) Anesthesiology 99:658–92.

A-764

Non-invasive tissue oxygen monitoring in septic shock patients: an observational study

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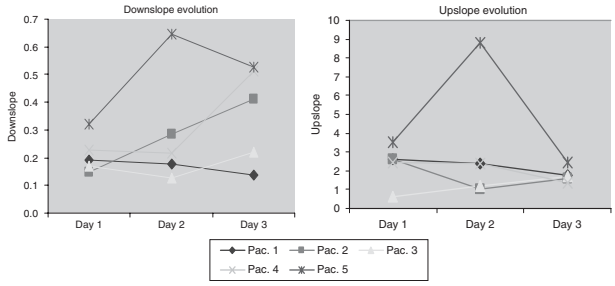
Background and Goal of Study: In shock septic patients is well known that tissue microcirculation is altered despite of an increased tissue oxygen tension (1,2). Probably because of a reduced cellular oxygen consumption. We've done a prospective observational study to determine changes in the rate of thenar muscles tissue deoxygenation during stagnant ischemia in patients with severe sepsis and septic shock.

Patients and Methods: Five shock septic patients were included in a preliminary study during the firsts days of sepsis evolution. Thenar muscle StO_2 was measured noninvasively by NIRS (InSpectra®, Hutchinson Technology, USA) before and during upper limb ischemia. The rate of StO_2 decrease (downslope) and increase (upslope) after limb ischemia were analyzed during the three days measurements. SOFA score, Cardiac output, lactate and the use of vasoactive drugs were also recorded.

Results and Discussions:



Conclusion(s): In septic shock patients, thenar muscle oxygen saturation during stagnant ischemia the rate of StO_2 decrease is slow as well as the increase in StO_2 during reperfusion after cuff release. Both determinations increases during the good evolution and stabilization of Severe sepsis. StO_2 monitoring may be useful as an indicator of septic shock patients.

References:

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2 De Blasi RA, Palmisani S, Alampi D, et al. Intensive Care Med. 2005; 31: 1661–1668.

A-765

Measurement of cardiac output, comparison of two techniques: APCO versus transthoracic echocardiography

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Background and Goal of Study: Pulse pressure analysis (APCO) has recently been proposed to measure cardiac output. This technology, which allows continuous monitoring (Vigileo®; flotrac™; Edwards Lifescience Irvine, CA, USA), uses simple arterial access without thermodilution or calibration. A study validating APCO by thermodilution via a pulmonary catheter has already been published. In intensive care, echocardiography allows a non-invasive but discontinuous measurement of cardiac output. The aim of our study was to assess the agreement of cardiac output measurement between APCO and tranthoracic echocardiography.

Materials and Methods: After informed consent, in ICU, all patients with radial artery catheter for continuous arterial pressure measurement were included. After Vigileo® connection to the arterial catheter for each patient, cardiac output was calculated simultaneously by APCO and transthoracic echocardiography (product of aortic ITV multiplied by aortic surface area and pulse rate and pulse rate). During the study, the same physician carried out echocardiographic measurements. The results obtained with APCO were not communicated to this physician. The agreement between the two methods was assessed by Bland and Altman's method.

Results and Discussions: 72 measurement at different period of time were obtained from 13 patients (age: 65 ± 12 years, IGS II 42 ± 16). Bland and Altman's method noted a mean bias and a precision −0.14 ± 1.2 L/min.

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Conclusion(s): Our preliminary study indicated a good agreement between APCO and transthoracic echocardiography to measure cardiac output in critically ill patients. However our data have to be confirmed by increasing the number of the measurement and patients.

Reference:

1 McGee W, et al. Critical care 2005, 9(suppl 1): P62.

A-766

Influence of running veno-venous renal replacement therapy on transpulmonary thermodilution

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Introduction: In principle, various factors may influence the accuracy of transpulmonary thermodilution. We analyzed whether veno-venous renal replacement therapy (RRT) has impact on the measurement of cardiac index (CI), intrathoracic blood volume index (ITBVI) and extravascular lung water index (EVLWI).

Methods: With ethics approval, we studied 24 critically ill patients (9 female, 15 male) undergoing monitoring by the transpulmonary thermodilution technique for clinical indication and veno-venous RRT. All patients had a 5F-femoral arterial catheter and monitoring system (PV2015L20, Pulsion Medical Systems). 12 patients had a femoral venous 12F-dialysis catheter in situ (Trilyse Expert, Vygon) and 12 patients one placed in the V. cava superior. All patients received heparin for anticoagulation of the extracorporeal circuit. Measurements of CI, ITBVI and EVLWI were performed in triplicate by injecting 15 ml of saline (4–6°C) through the distal port of a triple lumen central venous catheter (Certofix Trio, Braun, Melsungen) into the V. cava superior during RRT, during shortly interrupted therapy (disconnection) and immediately after reconnection.

Results: Global hemodynamics were comparable at the three time points (mean ± standard deviation).

Parameter	RRT	No RRT	RRT
Heart rate [1/min]	99 ± 27	100 ± 27	99 ± 27
MAP [mmHg]	74 ± 14	76 ± 12	74 ± 13
CVP [mmHg]	14 ± 4	14 ± 4	14 ± 4
CI [l/min/m^2]	3.8 ± 1.4	3.9 ± 1.3	3.8 ± 1.3
ITBVI [ml/m^2]	934 ± 254	945 ± 255	920 ± 247
EVLWI [ml/kg]	8.3 ± 3.7	8.3 ± 3.6	8.4 ± 3.6

During RRT, CI (mean change − 0.1 l/min/m^2, $p < 0.01$) and ITBVI (mean change − 18 ml/m^2, $p = 0.02$) were significantly lower. However, EVLWI was not influenced by RRT (mean change + 0.1 ml/kg, $p = 0.42$).

Conclusion: Running RRT had no clinically relevant impact on the accuracy of the measurement of CI, ITBVI and EVLWI by transpulmonary thermodilution.

A-767

Increasing cardiac output by epinephrine after cardiac surgery: effects on indocyanine green plasma disappearance rate and splanchnic microcirculation

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Introduction: In cardiac surgical patients, inotropic support is often necessary for optimizing cardiac output postoperatively. We tested whether increasing cardiac output by epinephrine leads to an improved regional, i.e. hepato-splanchnic, blood flow and function.

Methods: After approval by our ethics committee we studied 12 patients (mean age 71 ± 8 years) after elective coronary artery bypass grafting ($n = 2$) or valve replacement ($n = 10$). All patients had a reduced left ventricular function and underwent extended hemodynamic monitoring by a pulmonary artery catheter. Microcirculation within the splanchnic area was assessed by gastric tonometry, liver blood flow and function non-invasively by transcutaneous measurement of ICG-PDR. Since fluid loading led to no increase in cardiac output, patients were considered non-fluid responsive. Measurements were made on ICU admission and after one hour of epinephrine treatment. Mean epinephrine dosage was changed from 0.02 to 0.08 μg kg^{-1} min^{-1}. All patients were on pressure-controlled mechanical ventilation and respirator settings remained unchanged throughout the study period. Data are mean standard deviation. A $p < 0.05$ was considered as statistically significant.

Results: Heart rate significantly increased from 97 ± 11 to 106 ± 12 min^{-1}. Central venous (10 ± 3 vs. 10 ± 4 mmHg) and left atrial (10 ± 5 vs. 11 ± 5 mmHg) pressure were unchanged. Cardiac index and stroke volume index significantly increased from 2.7 ± 0.5 to 3.2 ± 0.5 l min^{-1} m^{-2} and from 28 ± 6 to 31 ± 5 ml m^{-2}. Although systemic O_2-delivery and O_2-consumption significantly increased, ICG-PDR did not change significantly, i.e. from 18.0 ± 5.6 to 19.5 ± 6.4% min^{-1}. Gastric mucosal PCO_2 and PCO_2-gap (difference between regional and end-tidal PCO_2) significantly increased from 5.4 ± 1.0 to 5.9 ± 1.1 kPa and from 1.2 ± 0.8 to 1.5 ± 0.7 kPa, respectively.

Conclusion: Increasing cardiac output by epinephrine was associated with no change in ICG-PDR but a deterioration in gastric mucosal blood flow.

A-768

Central venous oxygen saturation versus mixed venous oxygen saturation in cardiac surgery

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Background and Goal of Study: Mixed venous oxygen saturation (SvO2) has been established as a useful guide in the assessment and management of the critically ill patients (1). Central venous oxygen saturations (superior vena cava – $ScvO_2$ and right atrium – $SraO_2$) can be monitored with less patient risk. The aim of this study was to investigate whether the values of $ScvO_2$, $SraO_2$ and SvO_2 are interchangeable in cardiac surgery.

Materials and Methods: Between June 2005 and November 2005, all patients undergoing cardiac surgery, who met the criteria for pulmonary artery catheterization (PAC), were included in a prospective study. The values of SvO_2, $ScvO_2$, $SraO_2$ and cardiac index (CI) were simultaneously measured at four time points: after induction of anesthesia (T1), after completion of cardiopulmonary bypass (T2), at 6 hours (T3) and 24 hours postoperatively (T4). The values are expressed as mean and standard deviation. Data were analyzed using Pearson correlation and linear regression (p value < 0.05 was considered significant).

Results and Discussions: Thirty patients (29 males, 1 female) age 60.3 ± 11.2 yrs, weight 79.7 ± 16.2 kg were included. The mean range of CI was 3.6 ± 1.1 L/min/m^2 (range 1.4–6.3 L/min/m^2). The correlation between SvO_2 and $ScvO_2$ as well as between SvO_2 and $SraO_2$ values for each time point are shown in the table:

	T1		T2		T3		T4	
	r	p	r	p	r	p	r	p
SvO_2 *vs.* $ScvO_2$	0.48	0.05	0.82	0.01	0.64	0.01	0.80	0.01
SvO_2 *vs.* $SraO_2$	0.79	0.01	0.75	0.01	0.86	0.01	0.87	0.01

r = the Pearson correlation coefficient.

Conclusion(s): In cardiac surgical patients with PAC, there was a strong correlation between SvO_2 and $ScvO_2$ as well as between SvO_2 and $SraO_2$. For clinical purposes, the $ScVO_2$ and SVO_2 are interchangeable, both intraoperatively and in the first postoperative day.

Reference:

1 Pearse R.M. *Yearbook of Intensive and Emergency Medicine* 2005: 592–602.

A-769

Association of H. Pylori and ventilator associated pneumonia

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Goal and Objective: The most frequent reason of nosocomial pneumonia is tracheal aspiration in which the aspiration of gastric contents to lower respiratory tract is one of the most significant sources. The aim of our study was to evaluate the importance of gastro-pulmonary hypothesis in development of ventilator-associated pneumonia (VAP) in association with the effects of H. pylori on gastro-esophageal mechanisms.

Material and Methods: After the faculty ethical committee approval, 24 patients were included in the study. Each patient's demographic characteristics, hospitalization periods before intensive care unit (ICU) admission,

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APACHE, SOFA and GCS were recorded. They were intubated with an endotracheal tube allowing suctioning of secretions in subglottic area (HI-LO Evac). Tracheal aspirate cultures were taken on 1, 3 and 5 days and the number of units over 10^{-6}cfu/ml were considered as positive. All patients were examined for pneumonia with clinical pulmonary infection score (CPIS) and CPIS scores of >6 were defined as VAP. Additionally, on the first day of ICU admission blood samples were taken for detection of H. pylori Ig M and Ig G antibodies with ELISA method.

Results: Female/male ratio of patients was 59.3/40.7%, mean age was 55 ± 18 years and hospitalization before ICU admission was 4.1 ± 5 days APACHE, SOFA and GCS were 25 ± 7, SOFA 6.3 ± 3, GCS 7.5 ± 4. CPIS scores were calculated as 2.7 ± 1.4 (1.day), 3.4 ± 1.5 (3.day), 3.6 ± 1.6 (5.day). H. pylori Ig M and IgG levels were (−) of 45% of patients. Two patients with (−) H. pylori antibody were thought as VAP, whereas no VAP was recorded in patients with H. pylori antibody.

Discussion: Gastrointestinal system may be an important source for tracheal pathogens in mechanically ventilated patients. In previous studies H. pylori was reported to prevent gastro-esophageal reflux. In the present study, absence of VAP in H. pylori (+) patients supports the effect of gastropulmonary hypothesis in VAP development.

A-770

Which is the most effective method on the selective decontamination of digestive tract in the intoxicated patients?

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Introduction: Selective digestive decontamination (SDD) has been extensively studied for preventing the colonization of respiratory tract (1,2). The risk factors for late-onset colonization of respiratory tract in the intoxicated patients receiving SDD have never been investigated.

Materials and Methods: This randomized blind study was done in 5-bed intensive care unit. The three different methods were randomly studied in the cases. SDD, SDD with systemic antibiotic therapy and only systemic antibiotic therapy were applied on ten patients in each group (Group SDD, Group SDD + AT and Group AT). The SDD regimen consisted of 500 mg ciprofloxacin, 80 mg tobramycin, and 100 mg fluconazole. A mixture of nonabsorbable antibiotics paste was applied with spatula to the oropharyngeal cavity two times in a day. Two gram cefotaxime per day was given to Group SDD + AT and Group AT also. On admission, inventory cultures were taken from the oropharynx and tracheobronchial tree before and every three days during the prophylaxis regimen. Identification of pathogenic microorganisms and testing for antibiotic sensitivity were done. Chest X-Rays and arterial blood gases were examined for pulmonary function at the same time. Chi-Square test was used for statistical analysis.

Results: In oropharingeal and tracheobronchial cultures, Pseudomonas aeruginosa, Klebsiella pneumonia and Staphylococcus aureus colonisation was significantly higher in Group SDD + AT and Group AT than Group SDD ($p < 0.005$, $p < 0.005$).The pulmonary infection and consolidation on chest X-Ray was significantly more apparent in Group SDD + AT and Group AT ($p < 0.05$).There was no significant difference in arterial blood gases between the three groups. In addition; the mortality rate was higher in Group SDD + AT ($p < 0.05$).

Conclusion: Our results show that SDD is an effective method for preventing the respiratory system infection and to decrease the number of microorganisms, colonization rates, incidence of infection, and mortality rate in the intoxicated patients.

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A-771

Selective decontamination reduce methicillin-resistant *Staphylococcus aureus* ventilator-associated pneumonia

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Background and Goal of Study: Systematic decontamination with mupirocin and chlorhexidine body washing reduce methicillin-resistant *Staphylococcus aureus* (**MRSA**) nasal carriage and infections in ICU (1). However, this practice increases nurse working charge and potentially mupirocin bacteria-resistance. An exclusively decontamination of the patient with MRSA nasal carriage may be efficient without these disadvantages. Therefore we prospectively assessed selective decontamination to prevent MRSA ventilator-associated (**VAP**) in ICU.

Materials and Methods: All patients in Surgical ICU under controlled ventilation for >48 hrs were included during two successive periods of 14 months each. The first was without decontamination (**NO D**), the second with decontamination (**D**). During D period, nasal mupirocin with chlorhexidine body washing decontamination were performed exclusively in patients with positive MRSA nasal carriage. For the two periods, MRSA nasal carriage screening was systematically performed at admission and once a week. Number of invasive ventilator (exposure ventilation) before MRSA VAP, incidence rate of MRSA VAP expressed per 1000 days of exposure ventilation and MRSA nasal carriage were noted. Chi 2 and Fisher exact test were used to compare the 2 periods. A $p < 0.05$ was considered.

Results: 431 patients were studied. Data were in the table.

	NO D (n = 190)	D (n = 241)
MRSA nasal carriage (n)	56	17
Exposure ventilation days	1985	1937
MRSA VAP incidence rate in positive carriage patients	**4.5**	**0.5[a]**
MRSA VAP incidence rate in non positive carriage patients	**8**	**2[b]**
MRSA VAP incidence rate in total population	**12.5**	**2.5[c]**

[a] $p = 0.01$; [b] $p = 0.008$; [c] $p = 0.0001$.

Conclusion: Selective decontamination in patient with MRSA nasal carriage decrease MRSA PAV incidence rate in both, positive and negative carriage patients.

Reference:

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A-772

The role of the direct-current potential in assessment of the patient's state severity

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Background and Goal of Study: At the present time, the clinicians utilize many score systems for assess the patient's state severity. The sensitivity and specificity of all the systems are vary depending on the score systems and the different groups of patients. Registration of the direct-current potential (DCP) in a forehead-palm lead allow the clinicians to identify three different functional state of the human body. Important to estimate the prognostic significance of the APACHE II, APACHE III and SAPS II systems in critically ill patients with different functional states subject to the DC potential.

Materials and Methods: A double-blind randomized retrospective study involved 450 ICU patients with severe brain injury and 520 ICU patients with abdominal pathology. All the patients were assessed using the APACHE II, APACHE III and SAPS II systems. Score systems were compared using a Hosmer-Lemeshow test. Three different functional states: compensated, subcompensated and decompensated were specified depending on the DCP level. Then, calculation of severity using the score systems were modified depending on the functional state. The score systems were compared using the Hosmer-Lemeshow test again.

Results and Discussions: The sensitivity and specificity of the APACHE II, APACHE III and SAPS II systems increases, if the functional state of the patient is taken into consideration (see table).

	Original score		Modified score	
	H-L stat	ROC	H-L stat	ROC
APACHE III	0.88	0.6	0.98	0.87
APACHE II	0.83	0.8	0.94	0.5
SAPS II	0.9	0.3	0.96	0.6

Conclusion: The functional state of the body can be determined by the DCP level. The functional state of the patient significantly influences the outcome. The functional state of the patient may be used for improvement of mortality prognosis in each particular case.

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A-773

Comparison between POSSUM, ASA, SAPS II and SOFA scores as predictors for hospital mortality in surgical patients admitted to postoperative acute care unit (PACU)

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Aim of the Study: To compare the predictive value for in-hospital mortality of four scores: POSSUM, ASA, SAPS II and SOFA score in surgical patients admitted to PACU.
Methods: Prospective collection of demographic, clinical and laboratory data of 330 patients admitted to the postoperative care unit following elective and emergency surgical procedure, for a six months period. ASA score was assessed preoperatively, POSSUM score was calculated pre and postoperatively, and SAPS II and SOFA score were computed for the first 24 hours postoperatively. The outcome measure was in-hospital mortality. Receiver operating characteristic (ROC) curve analysis was used to estimate the predictive ability for in-hospital mortality of the various scoring systems.
Results: Among the 330 patients admitted to the PACU, 14 were transferred to the intensive care unit after an interval of time varying from 24 h to 9 days. The median length of stay in the PACU was 3 (1 to 17) days. The observed mortality rate was 3.6%, while expected mortality rates according to POSSUM, ASA and SAPS II scores were 6.8, 6.2 and 5.4%, respectively. The area under ROC curve (AUROC) was 0.63 for POSSUM, 0.57 for ASA, 0.67 for SAPS II and 0.78 for SOFA score. The cut-off values were 47 for POSSUM, 3 for ASA, 21 for SAPS II and 7 for SOFA score.
Conclusions: POSSUM, ASA and SAPS II scores overestimates in-hospital mortality rates for surgical patients admitted to the PACU. The use of organ failure scores might be considered for outcome prediction and might improve the power of predictive scores in these patients.

A-774

Prospective study of central venous catheter colonization and catheter-related bloodstream infection in intensive care unit, echocardiographic follow-up after catheter removal

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Background and Goal of Study: We wanted to assess the incidence of central venous catheter (CVC) colonization and infection in our intensive care unit (ICU) population and we did the echocardiographic follow-up of the patients with positive catheter tip culture results.
Materials and Methods: This is an epidemiologic prospective study. Data was collected over 10 months from the adult 20 bed surgical-medical ICU at the university teaching hospital. All ICU patients who required CVC placement for 48 hours were included in the study. Double and triple lumen in the subclavian (SC) and internal jugular (IJ) sites, were used. After their removal, the tips of the catheters were cultured by the roll-plate method and the quantitative culture technique, Brun-Buisson. Peripheral blood cultures were obtained at the time of catheter removal. The catheter infection and colonization rate were expressed in terms of cumulative incidences and incidence densities. The Kaplan-Meier test was used to compare the risk of positive quantitative culture (PQC) over time between SC and IJ catheters. The PQC from the CVC were not treated. Catheter infections and catheter colonization with the same bacteria in peripheral blood cultures, from another source of infection, were treated. All the patients with PQC results were assigned to undergo echocardiography examination at 28 days after catheter removal.
Results and Discussions: A total of 85 CVC and 749 catheter days in 59 patients were studied. The cumulative incidence of catheter infection was 8.24% and the incidence density was 9.3%. The cumulative incidence of catheter colonization was 25.88% and the incidence density was 29.3. There was no statistically significant difference in the incidence of infection and colonization over time between the SC and IJ catheters ($p = 0.42$). All the patients with PQC and echocardiographic follow-up, were free of valvular infections.
Conclusion(s): In our ICU population the incidence of CVC infection was near the top limit admitted by the American National Nosocomial Infections Surveillance and no difference between SC and IJ sites. All the patients with PQC, treated or not, were free of valvular infections.
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A-775

Poly-urethane cuffed versus conventional endotracheal tube in the prevention of early postoperative pneumonia in cardiac surgery patients: a randomized trial

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Background and Goal of Study: Cardiac surgery patients are at risk for postoperative pneumonia, with peri-operative micro-aspiration of oropharyngeal content as a possible cause. We speculated the use of a poly-urethane cuffed endotracheal tube (PUC) (Seal-Guard®-TycoHealthcare-US) could be protective owing the enhanced sealing of the pharyngo-tracheal barrier, in comparison with a polyvinyl chloride cuffed endotracheal tube (PVC).
Materials and Methods: All patients planned for cardiac surgery during a 50 days period were randomized between PVC and PUC after informed consent and approval of the EC. Excluded were patients with preoperative antibiotic therapy, mechanical ventilation, prior pneumonia or endocarditis. Early postoperative pneumonia was diagnosed as a new infiltrate on chest X-ray, an increase of C-reactive protein, presence of fever and purulent tracheal secretions, within 3 days after surgery. Statistical significance was accepted if $p < 0,05$. Chi-square tests were performed for discontinuous variables; for all other variables ANOVA was used.
Results and Discussions: A total of 59 patients were included. 30 patients received PUC, 29 patients received PVC. Between groups, prevalence of diabetes mellitus, COLD, duration of mechanical ventilation, bypass and surgery time and peri-operative transfusion need were similar.

ETT n = 59	PVC n = 29	PUC n = 30	p
Age (y)	70 ± 9	65 ± 10	NS
Sex (M/F)	22M/7F	17M/13F	NS
Tu score	4.4 ± 2.9	4.2 ± 2.7	NS
EuroSCORE	5.1 ± 3.5	4.7 ± 3.4	NS
Pneumonia	11	4	0.03

NS = not significant.

Conclusion(s): Use of a PUC was associated with a lower rate of early postoperative pneumonia in cardiac surgery patients. Further analysis is warranted to elucidate the link between microaspiration and pneumonia.

A-776

Procalcitonin as marker for aspiration pneumonia in patients with severe head trauma

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Background and Goal of Study: Aspiration pneumonia is a serious complication in severe head injury, difficult to identify in the first 24 h after trauma, which requires immediate and appropriate antibiotic treatment. The aim of this study was to evaluate the relationship between plasma PCT and aspiration pneumonia in patients with severe brain injury.
Materials and Methods: Prospective, observational clinical study of 41 patients with severe closed head trauma (GCS < 8). Demographic data including age, mechanism of injury, time of injury, initial GCS score, prehospital evaluation and therapy and outcome were collected. Plasma PCT concentration was determined by immunoluminometric assay at sequential intervals after trauma (on admission, at 12, 24, 48, 72, 96, 120, 144 and 168 hs). Chest CT scan was done on admission; chest radiographs and routine biochemical laboratory data (including blood gases and standard inflammatory parameters) were performed daily.
Results and Discussions: In 15 patients (group A) with signs of aspiration pneumonia (clinical and radiological) and/or history of gastric content aspiration, PCT levels were higher through the entire study period (7 days), with the highest peak at 24 hours ($p < 0.05$, see chart). In patients without signs of pulmonary aspiration (group B, n = 26), the PCT levels did not increase above 4 ng/ml and decreased after 48 hs < 2.5 ng/ml. In non-survivors, the PCT levels remained higher than baseline.

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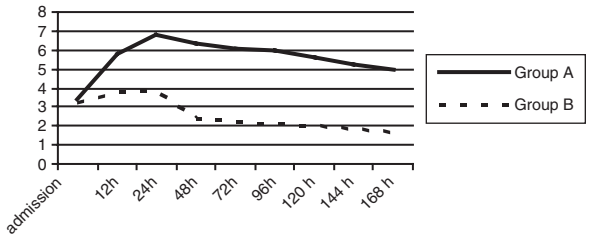

Conclusions: PCT plasma level is a good predictor of pulmonary aspiration in severe head injury patients. It can also indicate a poor outcome, but this observation needs further studies.

A-777

Surveillance of nosocomial infections in a medical-surgical intensive care unit

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Background and Goals: Nosocomial infections (NI) are important causes of morbidity and mortality in intensive care units. The objective is to describe the epidemiology of NI in a medical-surgical intensive care unit (MS ICU).
Material and Methods: Prospective surveillance study performed in a MS ICU at a 3rd-level hospital in Bilbao during 6 months, from February through July 2005. All patients admitted to the MS ICU more than 24 hours were studied. The following data were analysed: The main clinical characteristics of the patients, length of exposure to invasive devices, ICU-acquired infections [ventilator-associated pneumonia (VAP), urinary catheter-associated urinary tract infection (UTI), primary bloodstream infection (BSI), central venous catheter-associated BSI, and secondary BSI (other than catheter-related BSI)] and the micro-organisms isolated. NI were defined according to the Centers for Disease Control and Prevention (CDC) criteria.
Results: A total of 237 patients were studied (mean length of stay: 6.67 ± 5.9 days). 30 NI were identified in 24 patients (10.13%). Site specific incidence-rates and incidence densities were:

Site of infection	Number of infections per 100 patients	Number of infections per 1000 device-days
VAP	4.64	19.50
Urinary catheter-associated UTI	4.22	6.75
Catheter-related BSI	0.84	0.93
Primary BSI	2.11	–
Secondary BSI	0.84	–

The most common pathogens isolated in NI were: *Staphylococcus epidermidis* (20.8%), *Escherichia coli* (16.6%), *Candida albicans* (16.6%) and *Staphylococcus aureus* (12.5%). The mortality in patients with and without infections was 58.3% vs. 9.8% ($p < 0.01$).
Conclusions: NI in the MS ICUs are frequently associated with use of an invasive device. The mortality in patients with NI was clearly higher than those without them. NI surveillance allows performing effective measures in order to prevent and control these infections, reducing the morbidity and mortality.

A-778

Procalcitonin concentrations after major abdominal surgery measured by semiquantitative PCT-Q test

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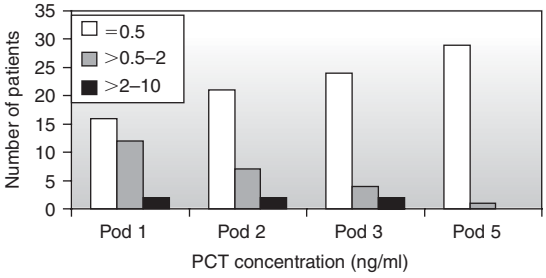
Background and Goals: Postoperative procalcitonin (PCT) concentrations depend on the type of surgery being significantly higher in patients with infectious complications (1). The goal of the study was to determine PCT concentrations with a rapid semiquantitative PCT-Q test early postoperatively after colon surgery and to investigate its potential use in the diagnosis of infectious complications compared to C-reactive protein (CRP).
Methods: 38 adult patients without infection undergoing elective colon surgery were followed up. Leukocytes, CRP and PCT were determined preoperatively and on postoperative days 1–3 and 5 along with clinical signs of infection. PCT was measured with the B.R.A.H.M.S PCT-Q test and classified into one of four semiquantitative categories (⩽0.5, >0.5–2, >2–10, >10 ng/ml). PCT ⩽0.5 was considered normal. CRP and PCT from patients with normal recovery ($n = 30$) were compared to the ones with complications ($n = 8$) (repeated measures ANOVA for CRP and χ^2 test for normal and elevated PCT). $P < 0.05$ was significant.
Results: PCT values in patients with normal recovery are shown as number of patients within each semiquantitative category on different postoperative days (Pod).



The number of patients with elevated PCT in the group with complications was significantly higher than in the group without complications ($p = 0.010$). CRP was elevated in all patients on Pod 1–5 with maximum values on Pod 2 (145 ± 51 mg/L) without a difference between patients with and without complications ($p = 0.58$).
Conclusion: PCT determined by PCT-Q test but not CRP measurements can be helpful in the early diagnosis of infectious complications after abdominal surgery.
Reference:
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A-779

Influence of blood glucose level on acid-base balance

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Background and Goals: Since glucose is largely restricted to extracellular fluid, an increase in its concentration moves water out of cells, causing dilution of extracellular solute which might affect strong ion difference (SID). We hypothesized that blood glucose level would affect SID and acid-base balance.
Material and Methods: We studied 157 patients undergone intra-abdominal operations. These patients were divided into the group 1 ($n = 32$) with postoperative blood glucose level lower than 126 mg/dL, the group 2 ($n = 97$) with glucose level higher than 126 mg/dL, lower than 180 mg/dL, and the group 3 ($n = 28$) with glucose level higher than 180 mg/dL. We investigated the postoperative serum electrolyte, serum chemistry, arterial blood gas values, and base excess by unmeasured anions (BEua). Chi-square test, ANOVA, and linear regression analysis were used to perform statistical analysis.
Results: Arterial blood pH was significantly lower in group 3 (Mean ± SD, 7.33 ± 0.07, $p < 0.05$) than group 1 (7.36 ± 0.05) and group 2 (7.37 ± 0.06) and metabolic acidosis rate was higher in group 3 (85.2%, $p < 0.01$) than group 1 (41.9%) and group 2 (57.4%). SID was significantly lower in group 3 (34.0 ± 3.6 mEq/L, $p < 0.05$) than group 1 (36.1 ± 3.0 mEq/L) and BEua was lower in group 3 (−1.8 ± 4.3 mEq/L, $p < 0.01$) than group 1 (0.6 ± 3.3 mEq/L) and group 2 (0.3 ± 2.8 mEq/L). Regression analysis showed that blood glucose level was significantly correlated with hydrogen ion concentration ($r = 0.265$, $p < 0.01$). The blood glucose level had significant correlations with SID ($r = 0.260$, $p < 0.01$) and Beua ($r = 0.230$, $p < 0.01$).
Conclusions: This finding suggests that increased blood glucose level is related to metabolic acidosis, which may be mediated by decreased SID and BEua.

A-780

Iatrogenic blood loss from diagnostic laboratory tests in the ICU: a prospective study

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Background and Goal of Study: Anemia is a frequent clinical entity in critically ill patients (1). The primary goal of this prospective study was to quantify

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the blood loss from diagnostic laboratory tests in patients staying in the ICU and to explore the influence of main clinical parameters. The overall mean pretransfusion hemoglobin level was also determined.

Materials and Methods: The blood sampling clinical prospective study included 201 critically ill patients treated in the ICU over the 18-month study period. For each patient following data were obtained: demographics, a length of ICU stay, duration of mechanical ventilation, Acute Physiology and Chronic Health Evaluation II (APACHE II) score, volume of blood samples after first, seventh and tenth day of ICU stay, total volume of blood samples and hemoglobin levels before each transfusion.

Results and Discussions: The mean age of patients in this study was 55 yrs with median 60 yrs. A total of 51% of all patients admitted to the ICU had a length of stay greater than one week. The mean (95% C.I. of mean) volume of blood samples was 250.4 (233.1–267.7) ml after 7 days of ICU stay, 350.5 (324–377) ml after 10 days. An average total volume of blood samples during ICU stay was 319 (260–378.2) ml. There was a positive correlation between total volume drawn and length of ICU stay ($r = 0.90$; $p < 0.0001$) and length of mechanical ventilation ($r = 0.90$; $p < 0.0001$). The overall mean pretransfusion hemoglobin level was 81.1 (79.4–82.8) g/l.

Conclusions: Laboratory tests can be an important source of blood loss in critically ill patients. High blood losses were observed in patients with long-term ICU stay and mechanical ventilation. In these patients the iatrogenic blood loss can aggravate anemia in critically ill patients. The transfusion threshold of hemoglobin level does not differ from large prospective multicenter observational studies (2).

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A-781

Measurement of sodium and potassium by a blood gas analyser in intensive care of liver transplantation – evaluation of accuracy of 228 samples

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Background and Goal of Study: Blood Gas Analyzers (BGA) are used to measure seric Sodium (Na) and Potassium (K) concentrations. Liver patients present conditions that can interfere with ion analyses (1). The aim of this study was to evaluate BGA equipment to measure Na and K in liver transplantation (LT) patients.

Materials and Methods: Samples were collected in 15 adults, aged 39.9 ± 10.9 years, treated in ICU during post-operative of LT. In each sampling, two samples were simultaneously collected – one to be analyzed in BAG equipment (Rapidlab 860, Bayer), contiguous to ICU, and another to be sent to a certified laboratory and analyzed in one Aeroset ICT, model B1E485 (Abbott). Agreement limits were estimated as suggested by Bland and Altman (2). When the absolute value of difference was higher than 5 meq/L for Na or 0.5 meq/L for K, three authors, working independently and blindly, were invited to gave a clinical opinion about what value (or both) was right or wrong. To consider that an equipment gave a wrong value, it was necessary to complete agreement among the three opinions.

Results: (Mean ± SD): In a total of 228 pairs of samples, lab values were 140.5 ± 4.2 meq/L for Na and 4.2 ± 0.6 for K. On average, BGA equipment showed very similar results, less 0.04 ± 3.07 meq/L for Na and less 0.08 ± 0.33 meq/L for K. This means that agreement limits (2) were +6.1 and −6.2 meq/L for Na and +0.58 and −0.74 meq/L for K. In true, 95% of differences lied between +5.0 and −6.5 meq/L for Na and +0.70 and −0.80 for K. In 47.6% of the considered discrepant cases, clinical review was unable to consider a specific equipment as wrong. In the remaining, reviewers agreed that lab equipment gave the wrong result in 46% of cases and BGA in 54% (p = ns).

Conclusion: In the great majority of cases, differences between equipments are small enough to not conduce to therapeutic harm. In a small percentage of cases, differences are enough to induce a harmful therapeutic attitude if based on the wrong value. In discrepant analyses, clinical review incriminates similarly both equipments. Consequently, we consider BGA equipment so valuable as central lab equipments to K and Na measurements, but therapeutic attitude must consider the clinical situation and not the isolated biochemistry value.

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A-783

Incidence of postoperative hyperglycemia in brain tumor patients receiving high dose methylprednisolone

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Introduction: Short-term, high dose intravenous methylprednisolone is widely used in the peri-operative period for brain tumor surgery. However, these glucocorticoids give rise to hyperglycemia in patients (pts) undergoing craniotomy (1). Impact of blood glucose levels on ICU is well known and therefore close monitoring of blood glucose in the early hours after the neurosurgical intervention may be warranted. In this retrospective analysis, we evaluated the postoperative blood glucose levels in pts admitted to the ICU after brain tumor surgery.

Patients and Methods: From 2004 to half 2005, 368 pts admitted to the ICU after brain tumor surgery were included. All pts had received 1000 mg methylprednisolone in the early pre-operative phase.

Results: Within the first hours after surgery, 63 pts (17%) were hyperglycemic (blood glucose level higher than 180 mg/dl). In 21 pts (5.7%) iv titration of insulin was deemed necessary to maintain glucose levels within normal ranges. Of the total of 368 pts, 15 pts (4.1%) were known diabetic pts. Peroperative blood glucose levels were only controlled in the latter, and all measurements remained within normal limits. Postoperatively, 3 pts revealed increased postoperative glycemia levels and all 3 necessitated iv insulin.

Conclusion: Postoperative hyperglycemia is a well known and understudied result of peroperative stress. The here reported prevalence of hyperglycemia (17%) was in line with the new hyperglycemia incidence in the general hospitalized population (2).

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A-784

Critical care glycemia control in patients suffering from severe subarachnoid hemorrhage

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Introduction: Strict glycemia control in the critically ill patient, included the patient with isolated brain injury (1), seems intensely related to final outcome (ref). The effectiveness of implementation of neuro-critical care glycemia control is, however, still largely unknown. Therefore, we report patients (pts) suffering from severe subarachnoid hemorrhage (SAH) who were submitted to a strict "glycemia control protocol".

Patients and Methods: 33 pts suffering from severe SAH were included. All pts remained for at least 6 days at the neuro-ICU. None of these pts were known as diabetic, or received glucocorticoids. At the ICU bedside, blood glucose levels were controlled every 2 hours from admission on and were aimed to be maintained between 80–120 mg/dl. When the upper limit was exceeded, intravenous insulin was started as iv perfusion.

Results: Already within the first 24 hrs of admission, 14 of 33 pts developed hyperglycemia, resulting in the start of iv insulin. Significantly more patients (20/33) necessitated iv insulin on day 2, in order to maintain glycemia levels within normal ranges. On day 3, 23 out of 32 pts revealed blood glycemia levels above the upper value, necessitating the iv perfusion of insulin. For the further ICU stay, the number of pts necessitating insulin to control increase blood glucose levels remained the same. During daily ICU care, iv insulin was titrated towards the blood glucose levels obtained bedside every 2 hrs. Analysing the changes in the titration of iv administration of insulin, we observed a significant increase in titration ratio from day 1 untill day 3 after admission. From day 4 on, iv insulin administration hardly needed to be changed. In only one patients, and at one episode, we observed a glycemia level below 60, necessitating the temporarily arrest of insulin administration. Multivariate analysis revealed that day 3, characterized by the highest number of patients necessitating insulin and by the most titrations in insulin administration, did not coincide with pulmonary, infectious or intracranial exacerbations.

Conclusion: Hyperglycemia (>120 mg/dl) is frequently present in pts with SAH. The incidence is the highest on day 3. However, when blood glucose levels are controlled within the first few days, they remain stable afterwards without major hypoglycemic incidents.

Reference:

1 Van den Berghe G. Neurology, 2005; 64: 1348–1353.

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A-785

Perioperative glucose control according to standardised insulin infusion protocol versus non-standardised therapy in cardiac surgery patients – a quality check

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Background and Goal of Study: Studies have shown the importance of tight blood glucose control to reduce mortality and morbidity amongst critically patients (1). However, not only the optimal glucose range but also treatment strategies are still a matter of vivid discussion. We examined the effectiveness of a strictly protocol-guided insulin infusion therapy versus a liberal nursing staff dependent therapy in cardiac surgery patients.

Materials and Methods: Local ethical committee accepted, single-center, prospective study with retrospective controls. After given written consent 164 patients (Protocol Group) admitted to elective open heart surgery were treated according to an hourly-glucose-measurements-based insulin infusion protocol during the operation and within 24 hours after admission to the Intensive Care Unit. Blood glucose management of the control group in 108 patients (Non-Protocol Group) was liberally guided by the nursing staff. The aim in both groups was to maintain blood glucose levels between 80–180 mg/dl. We compared minimum (min), average and maximum (max) glucose levels and the amount of the infused insulin dosages in International Units/hour (IU/h). Statistics: Data presented in mean ± standard deviation, Mann-Whitney-U-Test.

Results and Discussions: In the protocol group glucose levels were significantly lower and insulin infusion rates significantly higher (Glc mg/dl, min: 106 ± 18 vs. 118 ± 25, average: 137 ± 20 vs. 163 ± 26, max: 177 ± 38 vs. 212 ± 56 mg/dl, $p < 0.001$; Insulin IU/h, min: 2.0 ± 5.2 vs. 2.9 ± 5.2, average: 3.7 ± 5.3 vs. 5.0 ± 5.3, $p < 0.001$, max: 6.5 ± 6.0 vs. 7.9 ± 6.0, $p < 0.05$). We could not find a significant difference in total insulin dosage between groups.

Conclusion(s): To achieve beneficial tight glucose control clinicians may not sufficiently rely on "common practice" but use strict standardised insulin infusion protocols. According to our data the potential of hourly adjusted insulin infusion rates in a protocol guided concept may not even lead to a significant higher total consumption of insulin.

Reference:

1 van den Berghe G, Wouters P, Weekers F, et al. N Engl J Med 2001 Nov 8; 345(19):1359–67.

A-786

Posterior reversible encephalopathy syndrome (PRES) in intensive care medicine

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Background and Goal of Study: Posterior Reversible Encephalopathy Syndrome (PRES) is characterized by acute-onset headache, altered mental status, cortical blindness and seizures, with white and grey matter involvement of parietal-occipital lobes[1]. Although PRES is usually reversible upon clinical treatment, delayed diagnosis and therapy can result in chronic neurological sequelae[2]. Here we report all cases of PRES identified in our Intensive Care Unit (ICU) during last 4-years. Moreover, the evaluation of their outcome based on different medical treatments is also reported.

Materials and Methods: From January 2001 to January 2005 we identified 10 female patients with PRES. In addition, we retrospectively identified, from the medical records of our Epilepsy centre, 2 patients with symptomatic partial epilepsy which could be attributed to a previous PRES. All patients underwent basal and follow-up EEG and brain MRI using 0.5 or 1.5 Tesla superconductive magnet.

Results and Discussions: All patients except one (case 6) developed PRES in association with pregnancy or puerperium. Patient 6 developed PRES after an acute hypertension, during an immunosuppressive treatment. In all patients MRI analysis showed the presence of oedema mainly in temporal-parietal-occipital areas. In 4 out of 6 cases (case 5 and 6) neurological and radiological abnormalities resolved after appropriate treatment. Lowering blood pressure was found to be mandatory. Our experience indicated that treatment of seizures deserves special attention since intravenous antiepileptic drugs may induce severe adverse effects.

Conclusions: Widespread use of MRI technology has made PRES familiar to many clinicians. Delayed diagnosis and therapy can result in a worse prognosis. Treatment of seizures deserves special attention since intravenous antiepileptic drugs, currently used in status epilepticus management, may induce severe adverse effects. We obtained seizure remission by administrating i.v. sodium valproate in three of our patients. Further studies are needed to assess the usefulness of this drug to control seizures in PRES.

References:

1 Hynchey J et al. *N Engl J Med* 1996; 334:494–500.
2 Antunes NL et al. *Pediatr Neurol* 1999; 20:241–3.

A-787

Early administration of sympathomymetics for optimization of hemodynamic disturbances in patients with SIRS after severe multitrauma and traumatic brain injury

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In patients (pts) suffered multitrauma/brain injury (TBI) and secondary SIRS often challenging control of hemodynamics (HDNX) and oxygen (O_2) balance traditionally was achieved with infusion therapy as first line of treatment with pressors support as rescue therapy. We propose early use of sympathomymetics (SPTMTX) could improve control of HDNX and outcome in this.

Methods: This prospective randomized clinical study included 83 pts with SIRS post severe multitrauma/TBI. Trauma severity assessed according to APACHE-II and SOFA. SIRS diagnosed according to ACCP/SCCM conference guidance. Pts were randomly assigned to group I (GrI) – early SPTMTX or group II (GrII) – infusion therapy. Invasive monitoring (CVP, arterial line, PA cath) and tissue O_2 balance were used to guide correction of HDNX. Mortality was reported within 28 days. GrI (38 pts) – early SPTMTX to support systemic HDNX as follow: CVP > 6–8 mmHg, SBP > 70 mmHg, CI > 3.0 l/min/m^2; SVRI > 1100 din · s/m^2. Total volume of infusion (TVI) was kept below 35–40 ml/kg/day to avoid volume overload. In GrII (45 pts) IV infusion was predominant treatment, SPTMTX were added when SBP reached critically low numbers (≤60 mmHg).

Results: There was no statistically significant difference in pts' demographics in both groups. In GrI SPTMTX were used 3 to 10 days till HDNX stabilization. Average TVI was about 2.7 L/day. Sepsis and septic shock diagnosed in 20 (52.6%) and 8 (21%) pts. Mortality was 10.5% (4 pts). In GrII TVI was 45 to 70 ml/kg/day and averaged 4.5 L/day. Despite this, 28 pts (62%) continued to have significant drop in systemic HDNX with SBP ⩽ 60 mmHg required SPTMTX. Sepsis and septic shock diagnosed in 28 (62%) and 14 (31%) of this pts. Mortality reached 17.7% (8 pts). Statistical analysis used: ANOVA. Results were statistically significant with 95% confidence intervals.

Conclusion: Earlier administration of SPTMTX resulted in prevention of critical disturbances of HDNX, better overall HDNX control, optimization of O_2 balance, and morbidity/mortality decrease in pts with multitrauma/ TBI.

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2 Redl-Wenzl E.M. Intens Care Med 1993; 19: 151–4.

A-788

Tumor necrosis factor-alpha (TNFα), intereleukin-6 (IL-6) and interleukin-10 (IL-10) levels after severe trauma: Correlation with infusion of exogenous catecholamines during the initial 24 hours

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Background and Goal of Study: Tumor Necrosis Factor alpha (TNFα), interleukin-6 (IL-6) and interleukin-10 (IL-10) are important mediators involved in the post-traumatic immune response (1,2). The aim of this study was to determine TNFα, IL-6 and IL-10 plasma levels, in patients with severe trauma during the initial 24 hours after injury. In addition, this study investigated the possibility of correlation between cytokine levels, infusion of exogenous catecholamines, severity of trauma, ARDS development and final outcome.

Materials and Methods: The study included 24 patients, with multiple injuries. All patients had full documentation of Revised Trauma Score (RTS), APACHE score and haemorrhage level according to standard trauma management protocol immediately after admission, and blood samples were collected at 0, 2, 4 and 24 hours time points. Patients were divided into two

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groups: Group 1 (adrenergic, n = 12) and Group 2 (non adrenergic, n = 12), depending on the use of exogenous catecholamines during the initial 24 hours. Six patients with superficial wounds without haemorrhage, served as controls.

Results and Discussions: There was significant elevation of all cytokines studied, with group 1 showing the greatest values of IL-6 and IL-10, and the lowest values of TNFα. No correlation was found with RTS and APACHE scores at admission, but this correlation was clear regarding IL-6 and IL-10, 2 hours later. IL-6 and IL-10 also correlated with the use of adrenergic drugs at 2 hours, while TNFα at 4 hours after admission. ARDS development correlated only with IL-6 levels at 2 hours. There was no significant statistical difference regarding final outcome between the two groups.

Conclusion(s): Catecholamine infusion during the early phase of haemorrhagic shock can influence TNFα, IL-6 and IL-10 expression. IL-6 and IL-10 levels at 2 hours correlated with the severity of injury, but not with final outcome.

References:

1 DeLong WG, Born CT. *Clin Orthop* 2004; 422: 57–65.
2 Rose S, Marzi I. *Langenbecks Arch Surg* 1998; 383: 199–208.

A-789

Concomitant assessment of depth of sedation with auditory evoked potentials monitor and Richmond Agitation-Sedation Scale in traumatic brain injury patients

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Background and Goal of Study: The assessment of sedation level remains a challenge for the intensivist in order to avoid over- or under-sedation phenomena. The introduction of the mid-latency auditory evoked potentials monitor (A-AEP; Alaris Medical Systems, Hampshire, UK) could bring potential advantages in monitoring sedation. According to the reports, the Richmond Agitation-Sedation Scale (RASS) has been shown to be highly reliable among multiple types of health care professionals. The RASS has an expanded set of scores at pivotal levels of sedation that are determinated by patients' response to verbal vs physical stimulation, which will help the clinician in titrating medication.

Materials and Methods: This is a prospective, nonrandomized, observational study in a surgical and trauma tertiary intensive care of an universitary hospital. Twenty-six consecutive traumatic brain injury patients (age range 17–75 yrs, mean age 47 yrs) were included. They were sedated (with propofol by continuous infusion at an initial dose of 2 mg/kg/h, which could be modulated with steps of 0–5 mg/kg/h), in order to maintain an adequate RASS score. Mid-latency auditory evoked potentials values (A-AEP INDEX or AAI) were continuously recorded, and manually calculated on a mean average of a minute during the measuring of RASS score, and every 10 minutes for 6 hours on par with RASS score. ECG, SpO_2, invasive arterial pressure, ventilatory module, $_{ET}CO_2$, FiO_2, temperature were also recorded. For the statistic analysis, Friedman test and Spearman coefficient were utilized.

Results and Discussions: Nine hundred and thirty-six observations were carried out. The variation range of RASS score was between 0 and −5. A-AEP index or AAI range varied from 04 to 98. Statistics analysis of the data obtained pointed out a significative correlation between RASS score and A-AEP index or AAI ($p < 0.01$).

Conclusion(s): According to the reports, mid-latency auditory evoked potentials monitor values (A-AEP index or AAI) correlates with levels of sedation on the sedation scales. In our personal experience, this study demonstrates the utility of A-AEP and RASS score to track levels of sedation in traumatic brain injury patients.

A-790

Comparative study of lethality under different functional states determined by direct-current potential recording

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Background and Goal of Study: The score systems used for assessment of severity of patient's state allow to predict the lethality. Registration of direct-current (DC) potential in forehead-palm lead allow to identify three different functional state of the body. Therefore, it is important to compare lethality in similarly severe patients with different functional states.

Materials and Methods: A double blind randomized retrospective study involved 450 ICU patients with severe brain injury (group 1) and 520 ICU patients with abdominal pathology (group 2). Severity of the state was assessed using the APACHE II, APACHE III and SAPS II score systems. Depending on the level of the DC potential, each group was divided into three subgroups: A – compensated, B – subcompensated, and C – decompensated functional state. Then the severity of condition and lethality was tested in each subgroup.

Results and Discussions: In similarly severe group 1 patients, the highest lethality was observed in the decompensated patients, and the least lethality was seen in the compensated patients. Similar observations was found in group 2.

Table 1. The APACHE II, APACHE III, SAPS II, Glasgow coma scale scores and lethality.

Score system	Group 1 (n = 450)	1A (n = 66)	1B (n = 112)	1C (n = 272)
APACHE III	67.8	64.4	73	63.2
APACHE II	16.1	15.2	18.4	14.8
SAPS II	28.0	27.8	30	22.4
GCS	7.6	7.9	6.8	8.2
Lethality, %	52.0	29.4*	55*	76.9*
Score system	Group 2 (n = 520)	2A (n = 178)	2B (n = 212)	2C (n = 130)
APACHE III	58.5	59.0	63.1	61.9
APACHE II	12.5	12	13	13
SAPS II	29	27	30.3	27.4
Lethality, %	15.8	13.0	14.2	26.6*

*$p < 0.05$ using χ^2 test.

Conclusion: Probability of the lethal outcome correlates with severity of decompensation in similarly severe patients. The prognostic value of the APACHE II, APACHE III and SAPS II may be improved, allowing for the functional state.

A-791

Respiratory complications in patients suffering from severe subarachnoid hemorrhage seem not directly related to hypervolemic therapy

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Introduction: Respiratory complications occur frequently after subarachnoid hemorrhage (SAH) and are a main predictor of death or morbidity (1). They are reported to be related to initial neurological state of the patient (Hunt and Hess classification). However, their correlation to vasospasm and its treatment (hypervolemic therapy) is still a matter of debate.

Patients and Methods: 30 pts, admitted over the last year and suffering from severe SAH were included All pts required intensive neuro-critical care management. Clipping or coiling was performed whenever any amelioration in neurological state was observed. All pts remained for at least 10 days at the neuro-ICU. 11 of them had an admission GCS below 8 and the rest of them developed neurological worsening during the first hours after bleeding, necessitating admission to the neuro ICU. For this paper, we analysed all pulmonary data (including the PaO_2/FiO_2 ratio and the Lung Injury Score) for a period of 10 days ICU stay and we correlated them to all other hemodynamic, infectious or neurological parameters.

Results: Overall mortality in this group of pts was 30.3%. We found a strong correlation between the PaO_2/FiO_2 ratio and the Lung Injury Score and mortality (r:0.85). In this group, mortality was more strongly related to pulmonary complications (as measured by PaO_2/FiO_2 ratio and LIS) as to initial Hunt and Hess grade (r:0.62), as to vasospasm (r:0.66) or as to infectious complications (r:0.60). Daily analysis of the PaO_2/FiO_2 ratio, revealed the worst conditions at a mean of 7 days after ICU admission, worst LIS scores occurred at the mean of day 8. Correlating the pulmonary indices to daily fluid balances (use of hypervolemic, hypertensive therapy in case of cerebral vasospasm) we found no correlation between pulmonary complications and positive fluid balances.

Conclusion: Pulmonary complications occurring after severe SAH remain largely correlated to final outcome. The cause of these pulmonary complications seems mainly related to the severity of the initial bleed and its consequences (cerebral vasospasm). However, from this group of patients, we could not find any correlation between the occurrence or grade of pulmonary complications and the hypervolemic treatment, directed against cerebral vasospasm.

Reference:

1 Friedman, et al, Neurosurgery 2003,52:1025–1032.

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A-792

Elevated levels of shed membrane microparticles with procoagulant potential in the peripheral circulating blood of patients with subarachnoid haemorrhage

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Background and Goal of Study: Microparticles (MP) are fragments released from the plasma membrane of most stimulated or apoptotic cells. MP have procoagulant and pro-inflammatory properties. We hypothesized that elevated levels of procoagulant MP could circulate in the peripheral blood of patients who recently underwent subarachnoid haemorrhage (SAH).
Materials and Methods: Consecutive patients admitted with SAH were prospectively enrolled. Demographic (age, sex) and neurological (GSW, Hunt-Hess, WFNS and Fisher scores) factors were recorded at admission. The Glasgow Outcome Scale (GOS) at 3 months was evaluated. We isolated the circulating MP by capture with annexine V and determined their procoagulant potential with a prothrombinase assay, at the day of the enrolment (D0) and five days later (D5). The cellular origin of MP was determined by antigenic capture with specific antibodies. As control, circulating MP were measured in 67 healthy patients. Results were expressed as median [Min;Max]. Statistical analysis was performed using Student's *t* test and Mann and Whitney test as appropriate. $P < 0.05$ was considered significant.
Results and Discussions: We included 16 patients with recent SAH. The mean age was 55 years. The median of the WFNS score was 1 and the median of GCS was 15. The complications were 2 rebleeding, 3 symptomatic vasospasms and 8 acute hydrocephalus (AH). MP levels were significantly higher in SAH group (8.4[2.1–24.7] nMPhtSer Eq) compared with control group (1.57[0.14–9.1] nMPhtSer Eq), $P < 0.001$. Released MP in patients with recent SAH had platelet origin. MP levels decreased significantly between D0 and D5 in patients without rebleeding ($P < 0.01$), and increased in patients with rebleeding. MP were significantly increased in patients with lower Fisher score ($P < 0.01$), lower AH incidence ($P < 0.05$) and better clinical outcome evaluated by GOS ($P < 0.05$).
Conclusion: High levels of procoagulant platelet MP are present in circulating blood of patients with recent SAH and are associated with a lower bleeding, a decrease of AH incidence and with a good clinical outcome.
Reference:
1 Zwall RF, Schroit AJ. Blood 1997; 89(4):1121–32.

A-793

Comparison of quality of life in resuscitated and polytraumatized critical care patients

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Background and Goal of Study: Medical sciences studies on the quality of life may be considered as a kind of meta analysis of interdisciplinary intensive therapy (1).

The aim of study was comparison of quality of life after cardiac arrest and severe trauma as well evaluation of global quality of life, quality of life in basic domains (D) and assessment of emotional states.
Materials and Methods: WHO-QOL Bref questionnaire, validated by Wolowicka and Jaracz and HAD questionnaire were used. The study was done one year after ICU outcome. Patients with Persistent Vegetative States (PVS) were excluded. We included patients in age 36–65 and divided into 3 groups: I – after cardiac arrest (R), n = 110, RN 52.2%, II – after polytrauma (P), n = 110, RN 57.8%, III – healthy persons (C), n = 110, RN 70.3%.
Results: Quality of life results

	I (R)	II (P)	III (C)
GQOL	14.5 ± 2.5**	12.4 ± 3.1**	14.8 ± 2.9**
SAH	13.9 ± 2.6***	11.5 ± 2.8***	14.3 ± 3.8***
Physical D.	13.5 ± 2.5***	11.5 ± 2.7**	15.9 ± 2.9***
Psychol. D.	12.9 ± 2.1	11.7 ± 2.9	13.7 ± 2.9**
Social D.	13.6 ± 2.2	13.4 ± 2.6	15.5 ± 2.7***

*** $p < 0.05$, *** $p < 0.001$, a Cronbach QOL 0.883–0.789.

We found no significant difference in QOL according to place of resuscitation and mechanism of cardiac arrest (2). Positive correlation between QOL and GCS ($p < 0.05$), psychological domain of QOL and depression and fear in group I and II (Spearman coeff. 0.83) were evaluated.
Conclusions: Global quality of life and self-assessment of health after cardiac arrest and polytrauma was on the relatively good level. GQOL, SAH and domains of QOL were better evaluated by resuscitated patients.

References:
1 Wolowicka L., Quality of Life in Medical Sciences, 2001, 202–220.
2 Granja C, et al, Quality of life 6-months after cardiac arrest, Resuscitation 2002, 55: 37–44.

A-794

Factors influence on transferring of ICU nurses to other wards on their own request

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Background and Goals: Factors influencing turnover of intensive care nurses had been studied previously (1). The aim of this study was to explore the reasons why nurses left the ICU.
Materials and Methods: In this study, viewpoints of 75 nurses who were transferred from the ICU to other wards in a 5-year period, on their own request, were sought. They completed a questionnaire containing demographic data, the duration of work in the ICU, and personal, environmental and managerial reasons for the transference (12, 21, and 16 reasons respectively). The weight of each reason was scaled as 0 = not effective, 1 = moderately effective, and 2 = perfectly effective, and finally scales summation (SS) was calculated. Validity and reliability of the questionnaire were confirmed using content validity and test retest.
Results: From among all other reasons, the lack of appreciation and encouragement on behalf of the managers had the highest scale (SS = 114). As for personal and environmental reasons, feeling emotionally depressed due to work in the ICU (SS = 86) and inadequate workplace and closed environment (SS = 76) had the highest scales. The mean record of the service of single and married nurses in the ICU were 1.8 ± 1.3 and 3.2 ± 2.3 years respectively ($p = 0.01$). There was a positive correlation between both age and total record of service of nurses with the duration of occupation in the ICU.
Conclusions: Appreciation and encouragement of nurses may act as an important factor to motivate them to continue their work in the ICU.
Reference:
1 Cartledge S., IntCritCareNurs, 2001,17(6): 348–55.

A-795

Plasma selenium concentrations and kidney function after orthotopic liver transplantation

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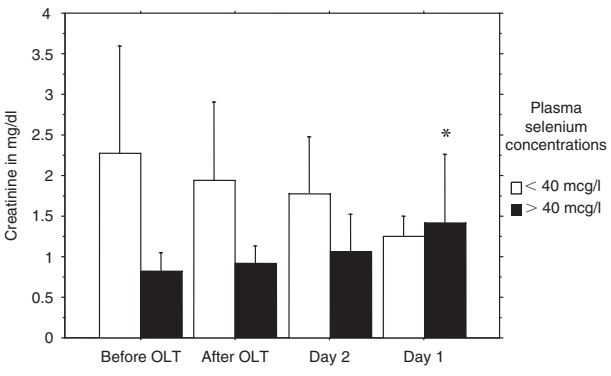
Background and Goal of Study: Plasma selenium concentrations are known to be decreased in chronic renal disease and liver cirrhosis (1). The selenium-dependent gluthation peroxidase, synthesized in the kidney, is a main reactive oxygen scavenger. We studied the influence of renal function on plasma selenium concentrations in patients undergoing orthotopic liver transplantation (OLT).
Materials and Methods: Measurement of selenium concentrations and standard laboratory tests were performed in 11 patients undergoing OLT (mean age ± SD: 51.8 ± 8.9 years, m/f: 9/2) before and immediately after completion of OLT and on postoperative days 1 and 2. ANOVA was used for statistical analysis. Data are reported as means ± SD. $p < 0.05$ was considered significant.
Results and Discussions: Plasma selenium concentrations increased significantly two days after OLT from 40.5 ± 9.8 μg/l to 49.9 ± 16 μg/l. Patients with selenium concentrations <40 μg/l had significantly higher creatinine levels before OLT which decreased to normal levels after OLT (Figure).



*$p < 0.05$

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Conclusions: Plasma selenium concentrations tend to normalise after OLT with only regular daily substitution therapy of 25 μg. The preoperative kidney dysfunction observed in patients with very low selenium concentrations also normalised after OLT.

Reference:

1 Hepatology 1998; 27: 794–798.

A-796

Impact of brain dead donor resuscitation with hydroxyethylstarches on kidney graft outcome: results of a monocentric analysis

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Background and Goals: Kidney graft outcome depends on many influences among which insults stemming from donor brain deaths. As it remains a controversy about hydroxyethylstarch (HES) use (1,2) we studied the role of gelatin and HES 200/0.5 on renal function after renal transplantation.

Patients and Methods: From 1990 to 2003 the impact of 20 donor parameters (with volume of gelatin and HES) and 9 recipient factors (extracted from a prospective data base) on the occurrence of delayed graft function (DGF) and graft loss was studied in 449 recipients of kidney graft coming from 262 brain dead donors. A marginal logistic model was used to analyse donor and recipient parameters impact on the occurrence of DGF and a frailty Cox model on graft outcome.

Results: Adrenalin use during donor resuscitation ($p < 0.001$, OR = 4.35), cold ischemia time (CIT) duration longer than 16 hours ($p = 0.01$, OR = 2.16) and recipient older than 55 years ($p = 0.003$, OR = 2.75) were associated with increased risk of DGF. HES >1500 ml ($p = 0.09$, OR = 0.49) increased risk of DGF whereas gelatin >2150 ml decreased it ($p = 0.0002$, OR = −0.92). Urine volume after brain death higher than 6000 mL ($p = 0.0191$), use of a large volume >2000 ml of HES ($p = 0.0025$), and CIT above 16 hours ($p = 0.0001$) increased the risk of graft loss within 50 months after transplantation.

Conclusions: This study based on the largest cohort ever published of renal transplanted patients, identifies several donor parameters with a major impact on early and late kidney graft outcome. Limiting the volume of HES 200/0.5 infusion after brain death and avoiding CIT longer than 16 hours, particularly in old recipients, should decrease DGF and prolong graft survival.

References:

1 Cittanova ML. *Lancet* 1996;348:1620–22.
2 Deman A. *Nephrol Dial Transplant* 1999;14:1517–20.

A-797

Predictive outcome of toxicity with organophosphate based on APACHE II scoring system in intensive care unit

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Background and Goals: The most commonly used insecticides in the United States are organophosphates. In the past 3 years, 21 reported deaths were caused by organophosphate poisoning, and 1973 people were classified as having moderate or severe morbidity. Predicted outcome of the poisoned patients preparing better evidence for clinical management (1). The purposes of the study were to evaluate the scores of the APACHE II regarding to outcomes; and to find prognostic value of individual elements of the APACHE II in predicting outcome in organophosphate poisoning.

Materials and Methods: In an analytical cross-sectional study 246 patients with organophosphate poisoning investigated. In each patient APACHE II score and outcome were evaluated. Data analysed with ANOVA and logistic regression test in SPSS software.

Results: The organophosphate poisoning was more common in male (72.6%). The age range was between 11–30 years in 64.7%. The duration of hospitalization was 3.9 ± 3.4 days. 15.7% of patients were complicated and 4.2% were died.

APACHE II score in died, complicated and noncomplicated patients was 15.5 ± 9.1, 12.9 ± 4.8 and 4.2 ± 3.5 respectively ($P < 0.05$). Plasma Na, potassium level, white blood cell, age and GCS predicted complication though body temperature and age predicted mortality in organophosphate poisoned patients.

Conclusions: APACHE II score was highest in died patients and correlated with poisoning complication. Prediction of complications and mortality according to this system is possible.

Reference:

1 Lee P, Tai DYH. Intensive Care Med 2001; 27:694–9.

A-798

Fluid management in Switzerland: current practice and trends

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Background and Goals: After many years of debate, evidence-based recommendations about the ideal type and rate of infusion therapy is still lacking (1–3). To assess current practice of fluid management, a postal survey has been conducted.

Materials and Methods: A panel of experts in anesthesiology and intensive care medicine from 10 European countries implemented a standardized survey questionnaire consisting of 16 queries about the current volume replacement strategies in the operating room (OR) and on the ICU. In Switzerland, 296 questionnaires were sent out to chairpersons of all major anesthesia departments and intensive care units.

Results: 91 questionnaires (31%) were returned. Only 25% of the responders have standard operation procedures (SOPs) for fluid management in the ICU, 21% have respective SOPs for the OR. Hydroxyethyl starch (HES) is the predominant colloid used for perioperative and ICU fluid management. Suggested negative effects of some HES specifications on coagulation and kidney function are the main reasons for not using HES. 52% of responders consider HES to be the most effective substance for correcting hypovolemia, and 69% consider HES to improve patient outcome. 56% of responders reported on changes of their existing fluid management practice during the last 5 years. 69% switched from other infusion fluids to HES, only 8% did it vice versa.

Conclusions: HES is the most commonly used colloid in Switzerland. Reasons to use other substances, e.g. albumin, are worries about impaired coagulation and deteriorating kidney function. SOPs do not exist in most anesthesia departments and ICUs in Switzerland. They may become an important requirement in the future to optimize perioperative fluid management.

References:

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A-799

Is hospital mortality associated with staff workload and the time of day of admission to the academic Intensive Therapy Unit?

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Background and Goal of Study: Patients admitted to the intensive therapy unit (ITU) could be at greater risk of mortality when admitted during the night and when the medical workload on admission is high. We investigated hospital mortality of patients admitted to the ITU in reference to the time of day of admission and nurse workload on day/night shifts.

Materials and Methods: There were 1438 admissions to the mixed medical/surgical adult ITU in academic medical center between 01.01.2001 and 31.12.2004. 251 patients were excluded. Exclusion criterions for mortality assessment were: <8 hrs stay in the ITU, donors, missing data in documentation, readmission to the ITU. However, these patients were included for calculation of nurse/patient ratio on admission. Retrospective cohort study included 1187 admissions (821 in a day group, 366 in night one). ITU mortality, hospital mortality (ITU mortality + mortality after discharge from ITU), APACHE II score, predicted death rate (PDR) calculated using APACHE II score were estimated. For assessment of workload on admission nurse/patient ratio (N/P) on day/night shift was evaluated. Statistical analysis was performed using Welch's test, t-Student's test and χ^2 test.

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Results: are presented in table below.

Time of admission	Mean N/P (STD)	Mean APACHE II (STD)	Mean PDR (STD)	Mean ITU mortality (%)	Mean hospital mortality (%)
Day: 07.00–18.59	0.67 (0.21)	15 (10.2)	26.9 (24.9)	17.1	27.4
Night: 19.00–06.59	0.75 (0.25)*	19 (10.4)**	34.8 (26.0)***	26.8#	40.2##
24 hours	0.71 (0.23)	16 (10.4)	29.3 (25.5)	20.05	31.3

*$p < 0.000005$, **$p = 0.000001$,***$p = 0.000001$, #$p = 0.0001$, ##$p < 0.0005$ – all compared with day group.

Conclusions: 1. Night admissions to ITU is not associated with higher ITU and hospital mortality compared with day admissions. 2. Hospital mortality of ITU patients is not associated with nurse workload on the shift of patients' admission to the ITU.

A-800

Gelatine turns to renal impairment during CVVH in anaesthetised ventilated pigs

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Background and Goal of Study: Gelatine (GEL) is described to show beneficial effects on renal function in critically ill patients (1). However, GEL is also reported to deteriorate biocompatibility of haemofiltration under *in vitro* conditions (2). Thus, we investigated whether *in vivo* effects of different colloids remain constant during CVVH.

Materials and Methods: Healthy pigs (35–45 kgBW, n = 5–7/group) underwent general anaesthesia without (w/o) or with (w) CVVH (recirculation and open mode). Baseline measurements were followed by volume-load (14 ml/kgBW) of albumin (ALB) (3.5%), or hydroxyethyl starch 130 kD/0.4 (H130), or GEL, respectively. Colloid infusion was continued with a rate of 2.6 ml/kgBW. Diuresis, renal clearance for total protein (TP) and creatinine were determined. Non parametric tests; data are given in median (25/75 percentile).

Results and Discussions: GEL infusion w/o CVVH led to increases in diuresis [ml/h] from 41 (24/48) to 77 (71/87). In contrast in wCVVH, diuresis [ml/h] decreased from 102 (37/111) to 36 (32/50), which was below the values of animals w/oCVVH ($p = 0.001$) and even below values of ALB-wCVVH ($p = 0.002$). Creatinine clearance was similar in all groups, but TP clearance and thus renal loss of TP was high during GEL infusion w/o- and wCVVH in recirculation mode. Initiation of CVVH-open mode (additional pathway for GEL elimination) led to reduction of proteinuria [TP mg/ml] within 2 h from 243 (82/342) to 70 (53/132), $p = 0.047$. However, this tended to negatively correlate with a decrease in diuresis ($r = -0.476$, $p = 0.006$). ALB and H130 led to stable, physiological values in all animals.

Conclusion: In anaesthetised, ventilated pigs, GEL infusion was associated with unfavourable changes of *in vivo* effects on the kidneys when animals were treated with CVVH. This is indicating an adverse interaction between CVVH-biocompatibility reactions and GEL.

References:

1 Schortgen F, Lacherade JC, Bruneel F, *Lancet* 2001;357:911–916.
2 Unger JK, Haltern C, Dohmen B, *Nephrol Dial Transplant* 2005;20:1922–1931.

A-801

Assessment of critically surgical ill patients undergoing interunit transfer

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Background and Goal of Study: Due to historical reasons, our 700-bed University Hospital has two separate surgical intensive care units (ICU), one of short-stay (<48 hours, level 1) and the other for longer stay (level 2). Both these units manage surgical critically ill patients with similar expertise and support. Resource limitations, as lack of level 2 ICU beds, often carries delay in patient's transfer between both units. The purpose of the study was to assess the characteristics and outcome of this group of intrahospital transferred patients.

Methods: One year retrospective study based on review of patients' medical records. Mortality risk was predicted using the APACHE II method.

Results: During the 12 months, 2630 patients required intensive care services at the level 1 ICU. Of these, 3% underwent a transfer to the level 2 ICU. Primary diagnosis was sepsis in 58% of cases and multiple organ failure (MOF) in almost 50%; more than 60% of patients underwent emergency surgery. Demographic data for the transferred patients, as well as APACHE II and length of stay (LS) in both units, are shown in table I.

	Alive	Dead	p
Patients (%)	71.6	28.4	
Age (years)	57 ± 17 (21–86)	61 ± 12 (26–83)	0.19
Sex ratio (%)	79:21	84%:16%	0.21
APACHE II	18.2 ± 6.5 (8–30)	19.3 ± 7 (5–30)	0.57
Level 1 LS	4.1–4.1 (1–21)	5 ± 2.9 (1–12)	0.28
Level 2 LS	17.4 ± 17.2 (2–78)	11.3 ± 7.9 (2–24)	0.04
Sepsis	58.3%	58%	0.59
MOF	41.7%	63.2%	0.09

Conclusions: Most transferred patients primary diagnoses was sepsis with MOF with a high mortality risk. Outcomes of patients undergoing interunit transfer was similar to the one observed in patients not transferred. However, a case-control comparison of outcome, identifying a suitable control group, may be better to quantify the morbidity and mortality associated with interunit transfer of surgical critically ill patients requiring intensive care services (1).

Reference:

1 Duke GJ, Green JV. MJA 2001; 174:122–125.

A-802

Heparin dosage for CVVH may be reduced by infusion of Albumin or HES130 kD/0.4 – experimental study in pigs

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Background and Goal of Study: Improved biocompatibility of *in vitro* plasma- and haemofiltration (1) due to substitution of albumin (ALB) and HES130 kD/0.4 (H130) were already discussed. We performed a CVVH study comparing normal saline (SAL)-, H130-, and ALB-treated pigs with respect to the heparin dosage required to operate CVVH.

Materials and Methods: Healthy pigs (35–45 kgBW, n = 5–6/group) underwent general anaesthesia (in total 10 h) and CVVH (5 h returning filtrate to the pigs; 2 h using open mode with usual filtrate substitution). Prior to CVVH, a volume load (14 ml/kgBW) with ALB (3.5%), or H130 or SAL was given and consecutively continued with 2. 6 ml/kgBW. Bolus of unfractionated heparin (Hep) was given (100 I.U./kgBW), heparinisation was maintained adjusted to activated clotting time (ACT) scheduled with 200–250 sec. Control groups (ALB, H130 or SAL/control) w/o CVVH were performed analogue but except CVVH. ATIII, fibrinogen concentrations, and platelet counts were measured. At the end of experiment, blocked filter capillaries were investigated by light microscopy. Statistical analysis: Non parametric tests, multiple comparison (Kruskal Wallis and Dunn's method). Data are given as median (Min/Max).

Results and Discussions: Platelet counts maintained stable in all groups; cell aggregation was the main reason for filter blockage (clogging); ATIII activity decreased in all groups ($p < 0.013$); H130-infusion led to a fibrinogen saving effect during CVVH ($p < 0.001$). Hep consumption [total I.U.] to maintain ACT-thresholds during CVVH was lower in ALB- and H130-treated animals [ALB: 71 (47/79) and H130: 51 (46/105); $p < 0.05$] than in the SAL CVVH group [78 (67/147)]. Interestingly, in the ALB-CVVH group Hep consumption was also lower than in its respective control without CVVH [72 (50/95), $p < 0.35$].

Conclusion: Conclusions drawn from the *in vitro* settings were confirmed. Probably the anti-aggregatory features of ALB and H130 led to the reduced Hep consumption.

Reference:

1 Unger JK, Haltern C, Dohmen B, *Nephrol Dial Transplant* 2005;20:1922–1931.

A-803

HES130 kDa/0.4 and albumin improve CVVH-biocompatibility while gelatine and HES200/0.5 lead to adverse side effects of CVVH in anaesthetized pigs

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Background and Goal of Study: In a recent *in vitro* study (1) it was shown that specific interactions of different colloids and haemofilter-biocompatibility

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occur during continuous veno-venous haemofiltration (CVVH). The present study was performed to compare five common fluids for volume resuscitation, i.e. normal saline (SAL), HES130 kDa/0.4 (H130), HES200 kDa/0.5 (H200), albumin (ALB), and gelatine (GEL) with respect to their interaction with CVVH in anaesthetized domestic pigs.

Materials and Methods: Healthy pigs (female, 35–45 kg BW, n = 5–6/group) were treated with CVVH (FH6S®; 5 hrs returning filtrate to the pigs followed by 2 hrs using open mode with filtrate substitution) under general anaesthesia. Prior to CVVH, a volume-load (14 ml/kg BW) with one of the five volume substitutes was given and continued during CVVH (2.6 ml · (kg BW)$^{-1}$ h^{-1}). Unfractionated heparin was used for anticoagulation. In all groups, haemodynamics (MAP, PAP, PWCP, CVP, CO) and pulmonary function (airway pressures, pulmonary O_2-delivery) were monitored. Pulmonary histomorphology was investigated. Control groups for time dependency were performed similarly but without CVVH. Non parametric tests; data are given as median ± SD.

Results and Discussions: Cardiac output decreased in GEL-CVVH but not GEL-control animals (CVVH: from 5.1 ± 0.7 to 4.4 ± 0.7 L/min, $p < 0.05$; Controls: from 4.6 ± 0.4 to 4.9 ± 0.1 L/min). GEL infusion decreased the p_aO_2/FiO_2 ration (CVVH: from 495 ± 80 to 458 ± 77 mmHg; Controls: from 589 ± 92 to 535 ± 95 mmHg; both $p < 0.05$). Peak inspiratory airway pressures and pulmonary oedema formation were highest in GEL-CVVH ($p < 0.001$). In contrast, H130 and ALB were associated with stable parameters within physiological ranges (i.e. CO, SVR, MAP, PWCP, pulmonary oxygen delivery). H130 was the only volume substitute that was not associated with significant formation of pulmonary oedema.

Conclusion: Biocompatibility and therapeutic efficiency of CVVH can be influenced by the infusion regime. GEL appeared to be unsuitable to parallel CVVH.

Reference:

1 Unger JK, Haltern C, Dohmen B, *Nephrol Dial Transplant* 2005;20:1922–1931.

A-804

Propofol clearance is altered in major burns

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Background and Goal of Study: Burned patients often have increased requirements for sedative/analgesic drugs. Major burns could alter the pharmacokinetics of these drugs, commonly used during the perioperative period including the ICU. This study was conducted to define the pharmacokinetics of propofol in burned patients during the subacute hyperdynamic convalescent phase of recovery.

Materials and Methods: Twenty adults, aged 43.7 ± 2.3 years, with total body surface area 44.0 ± 22.2% burn, were studied at 14.1 ± 2 days after the injury. An equal number of healthy subjects, matched for age, weight and sex, served as controls. Propofol 2 mg was given intravenously over 10 seconds as bolus. Blood samples (n = 20) were collected at predetermined intervals. Noncompartmental approach was used for pharmacokinetic analyses of propofol concentrations because of some irregularities in the points, determined by HPLC. Cardiac index (*CI*) was measured by esophageal echocardiography.

Results and Discussions: The burned patients had significantly higher *CI* (4.1 ± 0.1 vs. 2.5 ± 0.1 L/min/m^2, $P < 0.001$). The clearance (*Cl*) and total volume of distribution (*Vd*) of propofol were greater in burns, compared to controls (64.6 ± 3.7 vs. 28.2 ± 1.3 ml/kg/min, $P < 0.001$; 8.9 ± 0.8 vs. 3.9 ± 0.3, $P < 0.001$, respectively), yielding smaller area under the curve (567.3 ± 34.7 vs. 1244.1 ± 79.0, $P < 0.001$). Total half-life incorporating both distribution and elimination was similar in two groups (1.6 ± 0.1 vs. 1.7 ± 0.1 minutes, $P > 0.05$).

Conclusion(s): There is a large increase in volume of distribution and clearance in the burned patients compared to controls. Increased *CI* in burns is most likely related to the increased *CI* resulting from increased hepatic blood flow. The increased total *Vd* suggests a body composition shift due to intravenous fluid replacement, tissue edema and loss of drug through burn wounds. The similar $t_{1/2}$ reflects the interplay of *Vd* and *CI*. Since propofol clearance is in the range of hepatic blood flow, the difference probably can be explained by the increased cardiac output in the burned patients. Because of the increased *CI* and *Vd* of drug, the initial bolus dose and maintenance infusion may have to be increased in burned patients, provided pharmacodynamic sensitivity is unaltered.

A-805

The higher lactic acidosis, the higher morbility and mortality in postoperative patients

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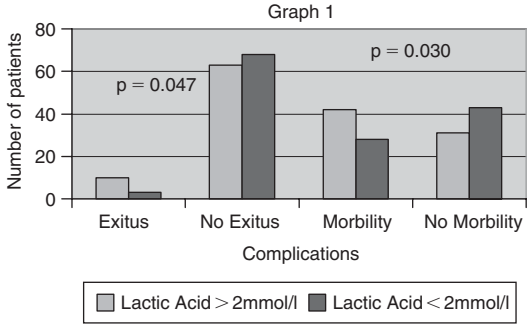
Background and Goal of Study: High values of lactic acidosis are shown to be correlated with bad outcomes in septic shock (1). We have studied whether postoperative patients with lactic acid values higher than 2 mmol per litre (2) had more complications (heart failure, wound infection…) and mortality than those with lower values.

Materials and Methods: We studied 144 patients that underwent scheduled surgery with standard anaesthesia. The mean age was 63 years old (40.7% females, 59.13% males). We included ASA I-III patients without acute liver failure who were sent to the Critical Care Unit. We registered lactic acid values from the moment the patient arrived at the Unit for 24 hours, or till the patient was sent to the corresponding ward. We also registered complications and mortality until the patient left the hospital. We analyzed our data with SPSS version 10.0 and used a Chi-Square test for non-dependent samples with a type error of 0.05.

Results and Discussions: Data (number of patients who died or had complications with lactic acid values higher and lower than 2 mmol per litre) are shown in the graph:



Conclusion(s): Postoperative patients with lactic acid values higher than 2 mmol per litre: 1) had higher mortality and morbidity than those with lower values; 2) should have more aggressive diagnosis and therapeutic approaches.

References:

1 Nguyen HB, Rivers EP, Knoblich BP. Crit Care Med 2004; 32: 1637–1642.
2 Rivers E, Nguyen B, Havstadt S. NEJM 2001; 345: 1368–1377.

A-807

Perioperative changes in liver function tests following hepatic resection surgery

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Background and Goal of Study: Hepatic resection surgery for isolated colorectal metastases results in alterations in liver function (1). We have characterized the changes in liver function after hepatic resection.

Materials and Methods: 21 patients undergoing hepatic resection surgery ranging from segmentectomy to hemi-hepatectomy for isolated metastases were studied. Serum albumin, bilirubin, alanine transaminase (ALT) and alkaline phosphatase (ALP) were measured before and up to 10 days after hepatic resection. A standard anaesthetic technique was used (2).

Results and Discussions:

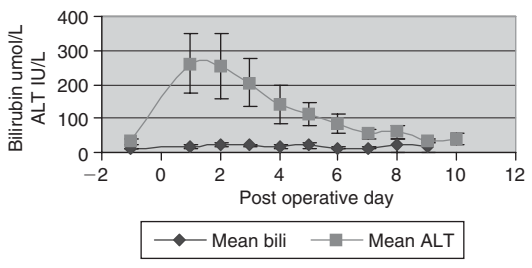

Figure 1. Mean Bilirubin and ALT changes following hepatic resection (95% Confidence Interval shown).

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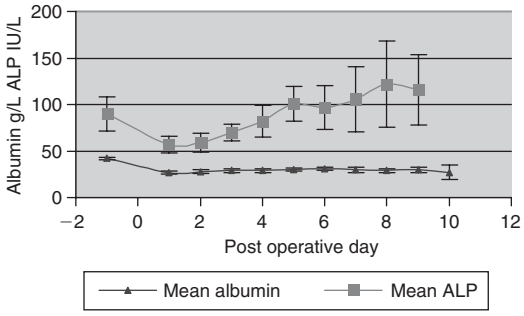

Figure 2. Mean Albumin and ALP changes following hepatic resection (95% Confidence Interval shown).

There is a small rise in bilirubin and small fall in albumin post hepatic resection. ALT levels peak day 1 post resection and return to normal by day 9. ALP levels fall immediately post resection and then progressively rise.

Conclusion: Hepatic resection results in a distinctive pattern of changes in liver function tests.

References:

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A-808

The metabolic responses during postanesthesia recovery after prolonged abdominal surgery under total intravenous anesthesia

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Background and Goal of Study: The metabolic responses during postanesthesia recovery has not been clearly revealed. At the same time, the earlier postoperative period in many respects determines the prevalence of healing or sickness. The goal of the study is to assess the metabolic changes during the postanesthesia recovery.

Materials and Methods: Forty five patients (23–68 years old) underwent abdominal surgery under total intravenous anesthesia were studied during the postanesthesia recovery. The anesthesia and surgery lasted for 4–11 hours. At the end of the operation, all the patients had a mild hypothermia (34–36 degrees C core temperature). Depending on the oxygen extraction ratio (ERO2) at the admission into ICU, all patients were divided in three groups: group 1 ($n = 12$) – ERO2 10–15%; group 2 ($n = 6$) – ERO2 was constant at 24–30%, and group 3 ($n = 27$) – ERO2 35–40%.

Results and Discussions: Significant core-peripheral temperature gradient (dT) was seen in groups 1 and 3 at admission (see Table) and was present in group 3 as a result of slow recovery of peripheral temperature. Group 1 and 2 patients has shown the slight hyperglycemia, hypoproteinemia and slightly negative nitrogen balance; normodynamic normotonic circulation pattern provide that patients with normal or decreased delivery of oxygen. Group 3 patients differ in the form of hypodynamic hypertonic circulation and signs of sympathetic activation. Such pattern together with the decreased DO2 and decreased VO2 formed the negative nitrogen balance.

Parameter	Group 1	Group 2	Group 3
dT on arrival, degree C	3.8	2.4	3.3
DO2, ml/min · kg	7.6	8.2	4.5*
VO2, ml/min · kg	2.8	4.2	1.8*
Glucose, mmol/l	7.4	7.1	11.2*
Total protein, g/l	54	52	45*
Nitrogen Balance, g/day	−5	−4	−16*

*$p < 0.05$ using Kruskall-Wallis test.

Conclusion: The low extraction rate of the oxygen at the end of the prolonged abdominal surgery is coupled with short-term hypometabolic phase in the earlier postanesthesia recovery. High ERO2 was accompanied by the deficiency in the hemodynamic branch of the oxygen transport system.

A-809

Mortality and recovery after inhalational compared to intravenous ICU sedation

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Background and Goal of Study: The new anaesthetic conserving device (ACD) AnaConDa™ (Sedana Medical, Sweden) stores exhaled isoflurane (ISO) and resupplies it during the next inspiration similar to a heat and moisture exchanger[1]. In our 10 bed ICU we sedated 30 patients for 4800 h with the ACD starting January 2004. Patients after inhalational ICU sedation show shorter wake-up times than after intravenous sedation (IV)[2,3]. The aim of this retrospective analysis was to compare mortality, SAPS II scores, ventilation time and recovery of patients sedated with the ACD in 2005 compared to a group of patients sedated IV.

Materials and Methods: A gas scavenging system was connected to the gas outlet of an ICU ventilator (Evita 2, Dräger, Lübeck; or Bennett 840, Tyco Healthcare, Neustadt, Germany). Endtidal concentrations were monitored with a Vamos® gas monitor (Dräger). The ACD was set up according to the manufacturer's instructions and liquid ISO was applied via a syringe pump. Only one patient could be offered the new method at a time.

Results and Discussions: In 2005 190 patients were ventilated via tracheal tube or tracheostomy, 50 for longer than 4 days (96 h). Of these, 8 had been sedated with the ACD and 42 IV. Mortality was significantly different between groups (ACDIV: 3/8 ↔ 30/42, χ^2, $p < 0.001$), although age (mean ± SD: 73 ± 13 ↔ 65 ± 14 yrs) and initial SAPS II (44 ± 12 ↔ 45 ± 15) were similar (t-test, ns). Survivors after ACD were ventilated longer (367 ± 226 ↔ 266 ± 155 h), but thereafter made a quicker recovery (time to ICU discharge 182 ± 111 ↔ 224 ± 123 h). The ratio recovery/ventilation time was significantly lower after ACD (0.5 ± 0.3 ↔ 1.0 ± 0.6 t-test, $p = 0.041$). In the current German hospital finance system, this ratio has great economical impact.

Conclusions: In this non-randomized retrospective analysis patients ventilated for >96 h showed a decreased mortality and a quicker recovery after inhalational compared to IV sedation. Although these results may be due to selection bias, they warrant a prospective Multicenter study comparing inhalational and IV sedation focused on outcome parameters.

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A-811

Chronic administration of pyridostigmine improves muscle function after intermediate-term immobilization of the tibialis cranialis muscle

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Background and Goal of Study: Immobilization is a relevant cause for muscle weakness in critical ill patients. Pyridostigmine increases acetylcholine concentration in the synaptic cleft by reversibly blocking acetylcholine esterase. The increased acetylcholine concentration improves muscular weakness in patients with neuromuscular disorders like myasthenia gravis. We hypothesized that chronic pyridostigmine administration improves muscle function after immobilization.

Materials and Methods: In 40 rats, one hind-limb was immobilized. Rats received either continuous pyridostigmine (15 mg/kg/day) or normal saline as a subcutaneous infusion via implanted osmotic pumps. Osmotic pumps were removed 24 h before measurements to exclude direct effects of pyridostigmine on muscle function. After 7 or 14 days of immobilization muscle forces of tibialis cranialis muscle (M. tib.) after supramaximal single twitch (ST) and 100 Hz tetanic (Tet) stimulation of the ischiadic nerve were recorded. Thereafter muscles were weighed to calculate specific muscle forces (spST, spTet).

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Results and Discussions: Data of the immobilized leg are presented as Mean ± SD (n = 10 each group):

	Saline 7 d	Pyridostigmine 7 d	Saline 14 d	Pyridostigmine 14 d
M.tib. [g]	0.43 ± 0.04	0.50 ± 0.05*	0.46 ± 0.09	0.48 ± 0.10
ST [N]	2.01 ± 0.59	2.96 ± 0.56*	2.30 ± 0.33	2.56 ± 0.72
spST [N/g]	4.61 ± 1.12	5.95 ± 1.04*	5.21 ± 1.18	5.28 ± 0.93
Tet [N]	5.16 ± 1.88	7.15 ± 0.69*	5.71 ± 1.26	6.23 ± 1.93
spTet [N/g]	11.83 ± 3.85	14.40 ± 1.04	12.56 ± 1.53	12.72 ± 2.06

*$p < 0.05$ vs. Saline 7 d.

Conclusions: Chronic pyridostigmine infusion improves muscle function after intermediate-term (7 days) immobilization. This effect can not be solely explained by the prevention of atrophy as specific single twitch response is increased significantly after pyridostigmine infusion. After long-term immobilization (14 days) these effects were no longer significant, which can be explained by development of tolerance towards pyridostigmine.

A-812

The increased score of pharmaceutical pangreatitis during administration of prppofol in ICU patients

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Backround and Goal of Study: The pharmaceutical pangreatitis is one of the side effects of propofol administration. Aim of this study was to register the events of pharmaceutical pancreatitis in patients receiving propofol for sedation in intencive care unit (ICU).

Materials and Methods: Registering 171 patients in ICU from June 2004 to November 2005, aged 53 ± 18, admitted days in ICU 17 ± 24, APACHE II in admission. Registering the laboratories and evaluating clinically all patients in time of their hospitalization in ICU. All of the patients had normal rates of amylase and normal kidney function in admission.

Results and Discussions: The 104 patients, aged 51 ± 19, Apatche II 17 ± 5 in admission, admitted days 17 ± 15, received continuous infusion of propofol for sedation till maximal dose 45 γ/kg/min. The 17 (16%) had increased amylase (109–446 IU/L) from the second to 19th day of their continuous infusion. No increase in rates of hepatic enzymes and kidney function was noted. The rest 87, aged 51 ± 18, 67, aged 51 ± 18, APACHE II 16 ± 6, had amylase in normal rates. The 68 patients did not receive propofol, mean age 56 ± 17, APACHE II 17 ± 9 in admission, and 2 (3%) of them showed pancreatitis.

Conclusions: The frequency of pharmaceutical pancreatitis was notable increased in patients receiving propofol. In patients receiving propofol in ICU for sedation is necessary having control of amylase in routine laboratory control.

Reference:

Intensive Care Unit of Metaxa Hospital.

A-813

Both the dose and the ratio of omega 3 vs. omega 6 fatty acids affect ICU stay in severely ill patients

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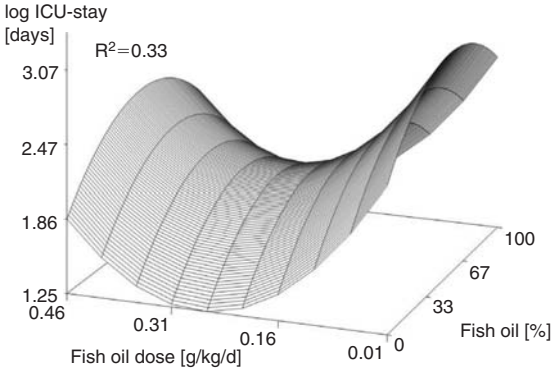
Background and Goal of Study: Supplementation with fish oil (FO) rich in omega 3 fatty acids, may reduce mortality, infections and length of stay in both postoperative and critically ill patients (1,2).

Materials and Methods: After institutional Ethic Review Board approval we evaluated the effect of different dosages and percentages of FO emulsion (Omegaven-Fresenius-Kabi) on the clinical course of 661 severely ill patients from 82 German hospitals who received total parenteral nutrition (TPN) for at least 3 days in an prospective observational multicenter trial. Individual FO doses were to the discretion of the attending physician. Multiple quasilinear regression models were fitted for the two quantitative outcome variables logarithm of length of ICU stay, and logarithm of length of hospital stay. The aim of this step was to find an omega-3 FA dose associated with a minimal (unfavorable) outcome. Additional independent co-variables were included in the regression models to adjust the regression coefficients relating to confounding effects, if significant.

Results and Discussions: The patients of this survey were 62 ± 17 years old (SAPS II 32 ± 14). TPN including FO had most favorable effects on length of ICU stay when administered in a dose of 0.26 g/kg/d. It appeared that very low and very high ratios of fish oil/soybean oil (SO) at the same dosages had the best effect on shortening ICU stay.



Conclusion: Fish-oil administration may reduce length of ICU and hospital stay. Optimum FO are not only dose dependent but are also related to the ratio of FO vs. SO emulsions.

References:

1 Gadeck JE, et al. Crit Care Med 1999.
2 Heller AR, et al. Crit Care Med 2006 in press.

Resuscitation and Emergency Medicine

A-814

Knowing potentially reversible causes of cardiac arrest does not influence adequate treatment in PEA

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Background and Goal of Study: Potentially reversible causes (4 Hs, 4 Ts) of cardiac arrest should be considered performing CPR. Particularly it is important treating a victim with PEA (pulseless electrical activity) [1].

The goal of the study was to check if medical students and graduated medical doctors know 4 Hs, 4 Ts and try to find them treating a victim with PEA in real scenario.

Materials and Methods: A group of 50 four year medical students and 50 graduated medical doctors were tested in one of the University of Medical Sciences in Poland. A written test contained open questions was constructed. The tested group was asked to write 4 Hs, 4 Ts and to solve two different clinical scenarios with PEA. Four year students were tested at that moment when they finished advanced CPR classes. Graduated doctors were tested 5 month after they finished the study. The idea of comparison between these groups was to check the best effectiveness of teaching in the group of four year students and the decrease of knowledge in graduated doctors.

Results and Discussion: Effectiveness of teaching (%):

	4 year students (%)	Graduated doctors (%)
They know 4 × H, 4 × T	89.5	8
They solve clinical problem (PEA) – "1"	40	28
They solve clinical problem (PEA) – "2"	44	2

Medical students know 4 Hs, 4 Ts, but less than 50% think about them treating a victim. A very big decrease of knowledge is observed in doctors group. Based on the results, a method of teaching needs modification.

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Conclusion: Four year medical students and graduated doctors know 4 Hs, 4 Ts, but they forget them (they are unable to find them) treating a victim in real scenario.

Reference:

1 Nolan JP, Deakin ChD, Soar J, et al. *Resuscitation* 2005;67S1:39–86.

A-815

Time spent for chest compressions in one minute of CPR is prolonged if a number of chest compressions is increased in a cycle

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Background and Goal of Study: Time for performing cardiopulmonary resuscitation (CPR) is spent for breathing, chest compressions and breaks between them. To receive the best effectiveness of circulatory support we should prolong time spending for chest compressions in one cycle of CPR [1–3].

The goal of the study was to check how much time (counting in seconds) for chest compressions is spent in one minute CPR, if the cycles are different.

Materials and Methods: 100 healthcare providers were divided into 4 groups to perform CPR on Ambu Man manikin. Each group performed CPR based on one of different cycles (15 or 30 chest compressions and 1 or 2 breaths). CPR procedure was tested with the use of a computer programme (Ambu Mega Code Simulation Software).

Results and Discussion: One-minute CPR:

	Medium time (in seconds) for		
Cycles	Breathing	Chest compressions	Breaks
15 : 2	18.3	25.4	15.2
15 : 1	19.8	27.3	12.7
30 : 2	15.8	34.5	9.6
30 : 1	7.0	40.4	12.5

The prolonged time spending for chest compressions was observed if 30 chest compressions were performed in the cycle. In this case more than 34 seconds in one minute CPR were spent for chest compressions, while less than 28 seconds if 15 chest compressions were performed in the cycle. Comparing the cycles 30:2 and 30:1, the longest time for chest compressions was observed in 30:1 cycle, but in this case time for breathing was less than 7 seconds.

Conclusion: The best effectiveness of circulatory support, with prolonged time spending for chest compressions occurs when 30 are performed in one cycle of CPR.

References:

1 Babbs CF, Kern KB. *Resuscitation* 2002;54:147–157.
2 Heidenreich JW, Higdon TA, Kern KB, et al. *Resuscitation* 2004;62:283–289.
3 Fenici P, Idris AH, Lurie KG, et al. *Curr Opin Crit Care* 2005;11:204–211.

A-816

The instruction how to use AED needs modification

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Background and Goal of Study: Automated external defibrillators (AED) are spread around the word and can be used by lay or non-healthcare rescuers [1].

The aim of the study was to check if the procedure of the use of AED based on the connected instruction is safe.

Materials and Methods: 100 first year Medical Faculty students were involved in this study. After short theoretical introduction how to use AED they were asked to demonstrate on a manikin BLS-AED procedure. Their skills were tested when they relied on the instruction belonging to AED (500 T Lifepack).

Results and Discussion: When the students were performing AED procedure, some important errors were observed. The most frequent errors were connected with the attachment of the electrode pads and the use of AED. The errors students made while attaching the electrode pads were:

– they did not disconnect the back part of the stick;
– they attached them on the victim's clothes;
– when attaching them, they stuck the AED's cables;
– they switched the position of the electrodes;

The errors students made when using the AED were:

– AED was located on the opposite side to the rescuer place;
– they went forward the vocal and visual instructions;
– they were touching the victim during the use of AED;
– they did not decide to use AED in pregnancy;

The observed errors indicate the need to change the instruction of the use of AED because it lacks important information. The tested students had problems with the use of AED based on the connected instruction, so we can conclude that lay rescuers without theoretical introduction and any practice can use AED in inappropriate way.

Conclusions: The instruction of the use of AED can lead to dangerous performance like not defibrillation of the victim and self defibrillation of the rescuer. The instruction should be modified with e.g. the numbered pictures showed the steps of the procedure.

Reference:

1 Handley AJ, Koster R, Monsieurs K, et al. *Resuscitation* 2005;67S1:7–23.

A-817

Using thirty-five thousand simple resuscitation manikins to disseminate BLS training

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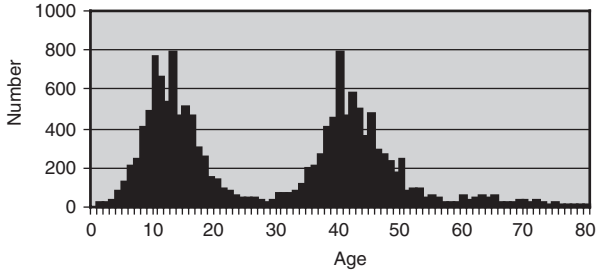
Background and Goal of Study: As 70–80% of cardiac arrests occur at home, widespread training is needed to increase the likelihood of Basic Life Support (BLS) being performed before the arrival of EMS personnel (1). Can a simple resuscitation manikin distributed among school children disseminate BLS training in a population?

Materials and Methods: We distributed 35.002 inflatable resuscitation manikins (MiniAnne™, Laerdal Medical, Norway) to pupils (age 12–14 yrs) in 1.606 classes on 806 public schools. Using the manikin and the enclosed 24 min instructional DVD they trained BLS and subsequently took home the training-kit. They were encouraged to use it to train family and friends (2nd generation). After three weeks they were asked to fill in a questionnaire on who had trained BLS using the kit.

Results and Discussions: In total 6.947 questionnaires were returned (19.8%) within the deadline. The 6.947 kits had been used to train 17.140 persons from 2nd generation; mean 2.5 persons pr. pupil (95% CI: 2.4–2.5). The boys had trained significantly fewer persons than the girls; mean 2.1 vs. 2.8 (95% CI: 2.1–2.2 vs. 2.7–2.9).

The figure shows age distribution in 2nd generation:



The kit was primarily used to train friends at same age, siblings, and parents. Thus more than 120.000 laypersons may have trained BLS using the 35.002 manikins.

Conclusion: Basic Life Support training can be effectively disseminated in a population using a simple resuscitation manikin distributed among school children.

Reference:

1 AHA in collaboration with ILCOR. Guidelines 2000 for CPR & ECC: International Consensus on Science, Adult BLS. Circulation 2000; 102(suppl I): 1–9.

A-818

Differences in out-of-hospital and in-hospital cardiac arrest mortality outcomes: preliminary results

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Background and Goal of Study: Since the Utstein style [1, 2] was established for cardiac arrest studies, several investigations have been published for both in-hospital (IHCA) and out-of-hospital (OHCA), but none of them has tried to study if there are any differences between both populations.

Materials and Methods: With the data available from our hospital and influencing area for 2002–2003, 196 IHCA's and 99 OHCA's were reviewed.

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Utstein style [3] was applied to both populations, dividing them into cardiac or non-cardiac etiology, and then into shockable or non-shockable initial rhythm. Cardiac arrests without any attempt on resuscitation, and those happening in ICU or surgery area, were discharged from the study for homogenizing purposes.

Results and Discussions: There were no significant differences in any group for sex, return of spontaneous circulation (ROSC), nor to first 24 h, hospital discharge, sixth month and 1st year survival. The IHCA population was older than the OHCA for the "cardiac etiology with a shockable rhythm" group ($p < 0.05$) being IHCA 69.5 (95%CI: 64.8–74.2) and OHCA 60.6 (95%CI: 52.6–68.5), and the "non-cardiac etiology with a non-shockable rhythm" group ($p < 0.001$) being IHCA 68,6 (95% CI: 65.3–72.0) and OHCA 53.0 (95% CI: 46.2–60.0). The "non-cardiac with a shockable rhythm" group had a low number, not permitting its analysis.

Conclusions: The IHCA group has the same mortality rate than the OHCA group, being the first significantly older, and probably having more previous morbidity due to other hospital influencing factors. This difference could be due to time-interval delays.

For some groups, it should be necessary to increase the number to analyze. Nevertheless, a prospective study should be started to cover any differences affecting both populations, which could influence decision taking in resuscitation attempts.

References:

1 Cummins RO, et al. Circulation. 1991; 80 (2): 960–75.
2 Cummins RO, et al. Circulation. 1997; 95 (8): 2213–39.
3 Jacobs I, Nadkarni V and ILCOR Task Force on Cardiac Arrest and Cardiopulmonary Resuscitation Outcomes. Circulation. 2004; 23: 3385–97.

A-819

Out-of-hospital cardiac arrest and survival in Szczecin, years 2002–2004

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Background and Goal of Study: Out-of-hospital cardiac arrest, with its high fatality rate, is a significant public health issue. The aim of the study was to asses the causes of cardiac arrest and factors influencing the outcome of resuscitation.

Materials and Methods: It was investigated survival of 613 patients – 405 (66.07%) males, 208 (33.93%) females with out-of-hospital cardiac arrest in the city of Szczecin (population – 415 000) between years 2002–2004. All data were computed with Microsoft Excel for Windows and were analyzed according to the Utstein style template.

Results and Discussions: In the analyzed group 472 (77%) patients had a cardiac etiology of the arrest. Ventricular fibrillation (VF) as an initial rhythm was observed in 234 (38.17%), asystole in 188 (30.67%), other and not documented rhythms 191 (31.16%). 418 (68.19%) incidents occurred at home, 195 (31.81%) at other places. Bystanders started resuscitation in 207 (33.77%) cases. The rate of undertaken resuscitation was 53/100 000 inhabitants. Return of spontaneous circulation was achieved in 227 (37.03%) patients. A total of 67 (10.93%) patients were discharged from hospital alive, most of them in good general condition without any neurological defects. The survival was strictly associated with early defibrillation. Patients with VF as an initial rhythm had an almost four times higher chance of being successfully resuscitated and discharged alive. Time to first defibrillatory shock was significantly shorter for survivors (median 7 min) compared to nonsurvivors (median 10 min). 27 (6.14%) patients remained alive after 1 year from cardiac arrest (in the period of 2002–2003).

Conclusion(s): The outcome of out-of-hospital resuscitation in the city of Szczecin is still unsatisfactory. The results of the present study indicate that the rate of bystander resuscitation should be increased. The low number of resuscitation attempts by laypersons indicates that there is an urgent need to promote better prehospital cardiopulmonary resuscitation.

A-820

Evaluation of a short-course training program on basic life support (BLS) and automatic external defibrillator (AED) among 355 lay rescuers

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Background and Goal of Study: 84% of sudden cardiac arrests (SCA) are Ventricular Fibrillations (VF)[1]. The treatment of VF is early defibrillation. The survival rate depends on the time between SCA and defibrillation. To reduce this time, the population needs to be trained to the basic life support and automatic external defibrillation (AED) maneuvers. The goal of this study is to evaluate the lay rescuers' competencies 6 months after 3 hrs training.

Materials and Methods: This study is prospective cohort. The study population is composed of volunteer people ($n = 355$) without any AED knowledge. The training is 3 hours, divided into two parts: first for basic life support and second for AED. Training is delivered by a BLS-AED instructor. The majority of the training time is hands-on. An evaluation at 6 months by simulation is organized. One anesthesiologist and one BLS-AED instructor complete an evaluation. The position of the electrodes is controlled by the Cardiff classification[2]. The training and evaluation follow the ERC guidelines (2000).

Results and Discussions: The average age is 40 years old (SD $\pm$ 14). The sex ratio was 42.3% female 58.7% male. 110 volunteers came back after 6 months with no epidemiologic difference with the cohort. 79.7% called the emergency service within 64 seconds. Participants looked for consciousness 87%, open airways 60.9%, check signs of a circulation 79.8%. The AED was taken in 103 s (sd $\pm$ 83), the first shock was delivered within 236 s ($\pm$78). The electrodes were correct in 74.1%. The younger rescuers (<25 years) were significantly better. During shock the rescuer did not the victim in 96.6%

Conclusion(s): This study shows defibrillation occurs under the recommended time (<300 s) with safety for the victims and the rescuers after short training. This training facilitates the distribution of AED and BLS knowledge.

References:

1 Bayes de Luna A, Coumel P, Leclercq JF – Ambulatory sudden cardiac death: mechanisms of production of fatal arrhythmia on the basis of data from 157 cases. Am. Heart. J., 1989; 117 (1): 151–159.
2 ILCOR Advisory Statement Education in Resuscitation 59 (2003) 11_/43.

A-821

Resuscitation of cardiac arrest and deep hypothermia under extracorporeal circulation: Procedure of a Paris teaching hospital in association with the out-of-hospital emergency medical teams, police and fire brigades

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Case report: On a cold winter morning, a 46-yr-old male was found on the street in cardiac arrest and profound hypothermia. Chest compressions, endotracheal intubation and mechanical ventilation were rapidly instituted. ECG trace: fine ventricular fibrillation.

Without any attempt to warm him, the patient was transported to our unit.

On arrival, the first esophageal temperature recorded was 22.1° Celsius. Percutaneous cannulation of the right femoral artery and vein were performed and, in the meantime, hypothermia was maintained. An extracorporeal circulation (ECC) was instituted (Biomedicus* centrifugal blood pump, Jostra* membrane oxygenator, Medtronics* tubing and cannulas, priming: Ringer Lactate with heparin, 200 UI/kg body weight).

Progressive rewarming could then be started. Correct position of the venous cannula and cardiac function monitoring was assessed by transesophageal echocardiography.

After two previous attempts, a third 200 J defibrillation shock at 30°C restored a sinus rhythm. However haemodynamic instability and poor left ventricular function led to the introduction of inotropic agents. Complete weaning from the ECC was only possible after 50 hours; and from inotropic support at D5. Severe rhabdomyolysis and haemodynamics events induced a renal failure: CVVHDF was required up to D9. The patient was able to leave the ITU on D15. He progressively recovered all the neurological functions, and when he left our unit no obvious neurological deficit could be detected.

Discussion: Our teaching hospital is located within Paris nearby the river Seine (we have our own pier). In 2004, we created a programme to receive as quickly as possible patients in cardiac arrest with deep hypothermia, especially when the mechanism has been water (drowning) or snow. In these cases the prognosis is better, as it is more likely that profound hypothermia could be developed before severe cerebral hypoxia has occured.

Rewarming following ECC has several advantages and provides inmediately an adequate circulatory support. During transportation to the hospital it is important to maintain hypothermia.

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A-822

The effects of drotrecogin alfa (activated) on the neurological outcome after cardiac arrest in rats

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Background and Goal of Study: Recent data indicate that the ischaemia reperfusion syndrome after whole body ischaemia following cardiac arrest (CA) shows similar pathological findings as septic patients (1). Drotregocin alfa (activated, rhAPC) is the first licensed drug to treat patients with severe sepsis (2). As neurological outcome plays a pivotal role after CA, we underwent the following study to examine the effects of rhAPC on neurological outcome after CA in rats.

Materials and Methods: After approval of the animal care committee, male wistar rats were subjected to 6 min CA (2). Following restoration of spontaneous circulation (ROSC) animals were randomized into three groups (n = 12): (1) high dose rhAPC (2 mg/kg bolus, 0.1 mg/kg/h for 6 h); (2) low dose rhAPC (0.5 mg/kg bolus and 0.025 mg/kg/h for 6 h); (3) placebo (rat albumin). To assess the neurological outcome the Katz neurological deficit score (NDS) and a modified tape removal test (4) were applied pre CA and at 1, 3 and 7d after ROSC.

Results and Discussions: The NDS showed a clear neurological deficit in all groups with a significant recovery from 1d to 7d. The tape removal test also showed a marked neurological deficit in all groups at 1d. On 3d animals treated with low dose rhAPC removed the tapes significantly faster than placebo animals (24.8 vs. 48.0 s; $p = 0.013$). This effect was no longer apparent at 7d after CA.

Conclusion(s): This study demonstrates for the first time positive effects of rhAPC on the neurological outcome after 6 min of CA in rats. Applying the tape removal test a significant improvement can be seen at 3d after ROSC. The lack of an effect at 7d after ROSC might be due to the delayed type of neuronal death after cardiac arrest.

References:

1 Adrie Ch, et al. Circulation 2002;106:562–568.
2 Bernard GR, et al. N Engl J Med 2001; 344: 699–709.
3 Böttiger BW, et al. J Cereb Blood Flow Metab 1998; 18:1077–1087.
4 Alberstmeier M, et al. J Neurosurg Anesthesiol 2005; 17:226.

A-823

The effects of drotrecogin alfa (activated) on the inflammatory response after cardiac arrest in rats

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Background and Goal of Study: Recent data indicate that the ischaemia reperfusion syndrome after whole body ischaemia following cardiac arrest (CA) shows similar pathological findings as septic patients (1). Drotregocin alfa (rhAPC) is the first licensed drug for patients with severe sepsis (2). Therefore we examined the effects of rhAPC on the inflammatory response after CA in rats.

Materials and Methods: After approval of the animal care committee, male wistar rats were subjected to 6 min CA (3). Following restoration of spontaneous circulation (ROSC) animals were randomized into three groups (n = 12): 1. high dose rhAPC (2 mg/kg bolus, 0.1 mg/kg/h for 6 h); 2. low dose rhAPC (0.5 mg/kg bolus and 0.025 mg/kg/h for 6 h); 3. placebo (rat albumin). To assess the inflammatory and anti-coagulatory effects of rhAPC blood analyses were done pre CA, 6 h and 72 h after ROSC for the following parameters: IL-1β, IL-6, IL-10, TNFα, sICAM-1, PMN elastase and TAT-complexes.

Results and Discussions: At 6 h after ROSC all groups showed significantly elevated pro-inflammatory markers (Il-1β, IL-6, TNFα, sICAM-1, PMN elastase) indicating a severe SIRS. At 72 h after ROSC all values reached baselines again, besides the PMN-elastase in the high dose rhAPC group. Approximately 40% of the animals showed elevated TNFα values. TAT-complexes were massively elevated in all groups up to 72 h ROSC. Interestingly the anti-inflammatory IL-10 was elevated in all groups at 6 h but continued elevated in the high and low dose treatment groups at 72 h ROSC. The difference between the low dose and the placebo group reached significance at 72 h ROSC.

Conclusion(s): The increased cytokines and activated coagulation strongly support the hypothesis of a "sepsis-like-syndrome" (1) after CA. Drotrecogin alfa (activated) has significant anti-inflammatory properties as shown in the elevated IL-10 levels at 72 h after ROSC.

References:

1 Adrie Ch, et al. Circulation 2002;106:562–568.
2 Bernard GR, et al. N Engl J Med 2001; 344: 699–709.
3 Böttiger BW, et al. J Cereb Blood Flow Metab 1998; 18:1077–1087.

A-824

Peripheral pulse oximetry monitoring under the influence of stellate ganglion TENS in prehospital trauma care

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Background and Goal of Study: Continuous monitoring of the peripheral hemoglobin saturation (SpO_2) has become standard in the prehospital emergency medicine. This monitoring requires adequate plethysmographic pulsations. Circumstances, as cold ambient temperature, diminish signal detection quality due to vasoconstriction. Ganglion stellatum blockade has shown to improve peripheral vascular perfusion. (1) TENS has shown to be capable of blocking ganglion stellatum. (2) Thus, we tested if TENS would reduce vasoconstriction by blockade of the stellate ganglion and thereby improve signal quality of peripheral pulse oximetry.

Materials and Methods: We enrolled 53 patients with minor trauma in this study. We recorded vital signs, core temperature and skin temperature (forearm and a finger on both sides) before and after transport to the hospital. Pulse oximetry was attached at the patients' second finger on both hands and conducted continuously. One upper extremity of the patient was treated with blockade of the stellate ganglion performed by TENS started after the beginning of the transport. The number and duration of the pulse oximeters' alerts were recorded for each side separately.

Results and Discussions: Vital signs and core temperature stayed the same before and after transport. On the hand treated with TENS we detected a significant reduction of alerts compared to the other side (mean alerts TENS 3.1 ± 2.3 vs. mean alerts control side 8.8 ± 7.5 $p < 0.001$). The duration of dropouts was shorter as well. (mean duration TENS 77 s ± 61 s vs. mean duration control side 333 s ± 170 s).

Conclusion(s): The blockade of the stellate ganglion with TENS is easy to apply and improves signal quality of peripheral pulse oximeters in a prehospital setting.

References:

1 Boas RA. Sympathetic nerve blocks: in search of a role. Reg Anesth Pain Med 1998; 23:292–305.
2 Larsen B, Macher F, Balte M, et al. [Stellate ganglion block with transcutaneous electric nerve stimulation (TENS): a double-blind study with healthy probands]. Anaesthesiol Intensivmed Notfallmed Schmerzther 1995;30:155–62.

A-825

Correct prehospital diagnosis of ST-elevation myocardial infarction by anaesthetists compared to physicians from other specialties – results from the PREMIR registry

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Background and Goal of Study: In the German PREMIR registry, all patients treated by emergency physicians with a diagnosis of prehospital ST-elevation myocardial infarction (STEMI) based on clinical symptoms and 12-lead-ECG were enrolled during an 18-month period in 64 participating German ambulance systems. In this analysis of the registry data, the reliability of the emergency physician's diagnosis of STEMI was assessed with regard to doctors' specialties to judge anesthetist performance.

Materials and Methods: In the 2.470 patients enrolled, the emergency physician's prehospital diagnosis of STEMI and the final diagnosis at discharge (STEMI; other acute coronary syndromes; other cardiac disorder; no cardiac disorder) were compared for the complete population and with regard to the physician's specialty: anesthetists, internists, surgeons, general practitioners, or others. Percentage of correct diagnosis of STEMI was calculated to judge reliability of prehospital diagnosis.

Results and Discussions: The overall correctness of the emergency physician's diagnosis was 84.7% for STEMI, 12.8% of patients had a discharge diagnosis of other acute coronary syndromes, 2.9% of other cardiac disorders, and 1.3% no cardiac disorder. Anesthetists treated 919 patients, the correct diagnosis of STEMI was made in 83.2% (other acute coronary syndromes 12.8%; other cardiac disorder 2.9%; no cardiac disorder 1.3%; $p > 0.1$ for all groups compared to total population). Internists correctly diagnosed STEMI in 88.5% of 937 patients, surgeons in 74.6% of 256 patients, general practitioners in 84.8% of 145 patients, and physicians from other specialties in 85.6% of 111 patients. In patients treated with prehospital fibrinolysis (32.1% of patients treated by anesthetists, 24.9% of patients treated by physicians from other specialties), the diagnosis of STEMI was correct in 93.0% of

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patients treated by anesthetists, 98.8% treated by internists, 91.2% by surgeons, 88.9% by general practitioners, and 91.7% by others.
Conclusion(s): In patients presenting with chest pain and ECG-changes indicating STEMI, emergency physicians' diagnosis was correct in a high percentage, with a tendency to overestimate severity of illness. Anesthetist performance was acceptable, but could be improved.

A-826

Foreign body in the right ventricle and its sequels

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Background and Goals: The injury of Inferior Cava Vein [ICV] has a mortality rate of 30–55%. It is the first case we have seen with embolisation of the foreign body from injured ICV into right ventricle.
Material: The patient 32 years old was admitted in the emergency department after a gun shot abdominal injury. The event had happened 6 hours before. In admission, patient felled weakness and dull abdominal pain. He was active, BP 120/80 mmHg, HR 90 per minute. In thoracic-abdominal CT, bullet was seen in the right ventricle of the heart, without hemopericard. Free air in the abdomen and a not clear shape of ICV below renal vessels was revealed. The patient was taken immediately in the operating room. Left thoracotomy and abdominal median incision was performed. In abdomen we found partial laceration of ICV, laceration of terminal ileum. Lateral suture of ICV and resection of 15 cm of terminal ileum with primary anasthomosis were done. On the other hand we could not evidence any injury of the diaphragm neither from the abdomen, or from thorax. We did not see, as well, any injury of the pericardium. The bullet was removed from the right ventricle.
Results: After the operation patient suffered ARDS and he stays in mechanic ventilation for 4 days. Also an increase of ST wave in V1, V2, V3 was seen. Two days later ST wave became normal. On fourth day one of our colleagues made improper extubation, under surgical pressure, because the patient represented ARDS, the patient was again put under MV and PEEP of high FiO_2, 0.5. Extubation in the seventh postoperative day. The patient left the hospital in very good healthy condition 12-th postoperative day without electrocardiographic & echocardiological changes.
Conclusion: We could not find in the literature any other report of embolisation of a bullet from injured ICV. The challenge in our case was from where to start the intervene, from the abdomen or from the thorax. Our decision to start simultaneously in thorax and abdomen resulted in excellent outcome.
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A-827

In emergency setting, small-dose ketamine reduces morphine requirement in severe acute pain

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Background and Goal of Study: Recommended initial analgesia of patients with severe acute pain in emergency setting in France consists of morphine administration. Nevertheless the high percentage of patients perceiving pain intensively, despite administration of ample amounts of IV morphine, suggest a failure of analgesia. In postoperative setting, there was evidence to suggest that the lack of morphine effectiveness was due to the activation of N-methyl-D-aspartate receptors. A marked decrease in opioid consumption and in pain intensity accompanied intravenous coadministration of ketamine and morphine in immediate postoperative setting. We studied the efficiency of ketamine with morphine for severe acute pain in emergency setting.
Materials and Methods: We compared in a randomized double blind method Ketamine with Morphine (K) and Placebo with Morphine (P). Written, informed consent approved by our human studies committee was obtained from each patient. Consecutive trauma patients with severe acute pain defined with Visual Analogic Scale (VAS) equal or upper than 60/100 were included. At T0, K group received 200 microgram per kilogram intravenously in 10 minutes of ketamine and P group received physiologic serum intravenously in 10 minutes. All patient received morphine by initial intravenous injection of 0.1 mg/kg (T0), then 3 mg every 5 minutes until VAS $\leqslant$ 30/100. The primary end points were morphine requirement and VAS at T30 minutes.
Results: 65 patients were included, 33 in K group and 32 in P group. Characteristics data of patients were similar in the 2 groups. At T30, morphine requirement was significantly lower in K group than in P Group (10.9 mg [9.7–12.2] versus 14.8 [13.1–16.6]; $p = 0.0008$). Evolution of VAS variations (Delta VAS = VAS T0 – VAS T30) was not significantly different between the 2 groups. There were significantly more neuropsychological side effects in K group than in P group, respectively 37.5% versus 3.2%. ($p = 0.0023$). Theses side effects were brief and did not require any treatment.
Conclusion: Ketamine allowed to obtain reduction of morphine requirement but did not shown significant decrease of VAS at T30.

A-829

No neurological impairment after a case of lazarus phenomenum

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Background and Goal of Study: The Lazarus Phenomenon is the spontaneous re-establishment of haemodynamic function after failed cardiopulmonary resuscitation (CPR) attempt (1,2).
Materials and Methods: An 83-year-old male with ischemic cardiopathy and atrial fibrillation, was admitted to Emergency because of dyspnea. He had arrhythmic pulse, jugular ingurgitation, rhonchus and a state of lowered consciousness. Under monitoring, bradycardia without pulse and respiratory arrest were observed and, therefore, a resuscitation protocol was begun. Adrenaline, dobutamine and atropine were administered. Application of an external pacemaker was not successful in re-establishing pulse. After analytical readings of pH 7.06, pCO_2 27 mmHg, urea 336, creatinin 6.6, and potassium 9.4 mE/ml, a hyperkalemia treatment was implemented. Using an intracavitary pacemaker, no pulse was recovered and after 60 minutes of $EtCO_2$ 7 mmHg and non-reactive bilateral mydriasis, resuscitation was stopped. However, after 7 minutes, pulse was noted in the pulsioxymeter and CPR was restored. 24 hours later, the patient was extubated and the integrity of neurological functions was confirmed.
Results and Discussions: The Lazarus phenomenon has been explained by several mechanisms, but the most accepted is a circulatory collapse due to a progressive increase in intra-thoracic pressure in ventilation with positive manual pressure (1). Stopping cardiopulmonary resuscitation favors cardiac filling and the restoration of spontaneous circulation. Suspending manual ventilation intermittently and maintaining a slow breathing frequency are recommended. Thoracic trapping explains failure in the distribution of drugs during resuscitation. Neurological recovery after prolonged arrests is often seen. Pulmonary oxygen reserves and the restoration of microcirculation before being detected by monitoring can help explain this rare phenomenon (2).
Conclusion(s): 1) It is recommended to intermittently stop manual ventilation; 2) Cardio-circulatory monitoring should be maintained at least 10 minutes after stopping a resuscitation protocol.
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A-830

Patients 90 years and older – an increasing challenge in modern prehospital emergency service

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Background and Goal of Study: With the aging society the demand for prehospital emergency service (EMS) is on the rise. In general, the reported 3–5 fold age-associated increase in EMS-utilization is primarily due to medical conditions rather than incidents caused by trauma (1). The purpose of this study was to identify frequency and reasons for EMS demand as well as pre- and in hospital mortality in patients $\geqslant$90 yrs.
Materials and Methods: The EMS system, in which the study was done, is serving a population of 500 000 urban residents of whom approximately 0.5% are older than 90 yrs. The EMS system is run by the department of anaesthesiology and intensive care and consists of 4 ground based units and 1 rescue helicopter. Both systems have standard emergency equipment and comprise 1 emergency physician (mostly intensivists) and 1 paramedic.

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In a retrospective cohort study in 18 000 EMS data sets (Period 01/2003 to 11/2005) all patients being ⩾90 yrs. were analysed.

Results and Discussions: Altogether 477 patients (m/f 106/371, mean 95.2; 90–104 yrs.) could be included. 91.3% of all emergency calls were between 6am and 10pm. 6.7% (32pts.) were transported by helicopter. Time from alarming the emergency team to entering the scene was 3–9 min. (mean 3), from scene to hospital 13–73 min (mean 37). 62 Patients died on scene (NACA 7), in 20 patients no further treatment was necessary and transportation to hospital was not performed (2). Out of 13 pts. who had to be intubated on scene only 2 survived.

NACA	1	2	3	4	5	6	7	I	II
Trauma	3	12	44	13	4	0	4	3	71
Neurol.	3	10	56	21	6	0	0	18	73
Medical	14	42	95	65	24	3	58	36	188
TOTAL	20	64	195	99	34	3	62	57	332

I inhospital death, II discharge from hospital.

Conclusion(s): Emergency treatment in very old patients can be successful. The favourable results, however, may be at least partially due to low morbidity levels of the cohort study group. This may also reflect a high level of care provided by this emergency system.

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A-832

Comparison of the effectiveness of scoring systems for the poisoning cases admitted to emergency department

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Background and Goal of Study: This study was planned in order to compare the performances of APACHE (Acute Physiology and Chronic Health Evaluation) II, SAPS (Simplified Acute Physiology Score) II and GCS (Glasgow Coma Scale) scoring systems in determining mortality rates of poisoning cases who were followed up and treated in the emergency care unit.

Materials and Methods: The records of 214 patients who were admitted to the emergency department because of poisoning with GCS: 14–15 between January 2002 and August 2005, and who were followed up and treated in the emergency care unit (but not in the reanimation service or intensive care unit) were retrospectively investigated. Demographical data, hospitalization time, prognosis, APACHE II, SAPS II and GCS scores were numerically determined. Estimated mortality rates were calculated for each score by using original regression formulas. Standardized mortality rates (SMR) were determined in order to compare the performances of the scoring systems. ROC (Receiver Operating Characteristic Curves) analyzes were performed to identify the performance of scoring systems in distinguishing deaths from alive.

Results and Discussions: The mortality rate of 214 patients who were followed up and treated in the emergency care unit was 0 (0%). Estimated mortality rates were calculated by using each of the three scoring systems and results were found as follows: 3.8% for APACHE II, 2.6% for SARS, and 2.9% for GCS. In consequence of SMR analyzes, no difference was found among scoring systems in terms of comparing real mortality rates with estimated mortality rates. After performing ROC analyzes, no statistically significant difference was found in terms of performance of scoring systems in distinguishing deaths from alive.

Conclusion(s): In our previous study, we stated that SAPS II and GCS scoring systems were effective in determining estimated mortality rates of poisoning cases which were followed up and treated in the ICU (1). In this study, we found that all of the three scoring systems could effectively be used in order to determine estimated mortality rates for poisoning cases which were followed up and treated in the emergency care unit. Although none of these three scoring systems has any statistically advantage above others, GCS may be superior as it can easily be performed, and there is no need to obtain physiological parameters and laboratory examinations for calculation.

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A-833

Analysis of German Rescue-Helicopter Accidents in a Five-Year Period (1999–2004)

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Background and Goal of Study: In Germany, about 80.000 rescue-helicopter missions are accomplished annually for seriously ill or heavily injured patients. In comparison to commercial transport of passengers, the risk for aviation accidents increases clearly during rescue missions [1]. The aim of this study was to analyze all registered accidents with rescue-helicopters in Germany during a five-year period (1999–2004).

Materials and Methods: Flight accidents were identified in the annually published flight accident reports of the Federal Agency for Flight Accident Investigation (BFU) between 1.1.1999 and 31.12.2004 [2]. Framework data of the accidents and all carriers involved (ADAC, Team DRF, Bundeswehr, BMI, and other private organisations) were completed by additional internet information (accident reports, newspaper articles etc.).

Results and Discussion: During the five years analysed n = 24 rescue-helicopter accidents were identified (n = 22 during the day, n = 2 at night). 54% (n = 13) were reported during landing and 17% (n = 4) during ground run. 29% (n = 7) occurred in the remaining flight sections (takeoff, departure, and cruising). In five flight accidents a total of seven crew members were killed, three injured heavily and two slightly. A further person was heavily and two slightly injured. Patients were not hurt. The accident rate was 0.54 per 10.000 missions and 10.88 per 100.000 flight hours. Compared to previous data a significantly lower accident rate per 10.000 missions was found (0.91, P = 0.04) [3], whereas data per 100.000 flight hours was comparable (10.9, n.s.) [1].

Conclusion: The majority of accidents occurred during daytime and during landings. In comparison to previous data, the incidence of flight accidents might be lower, but analysis depends strongly on the criterion used (missions or flight hours).

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A-834

The early gastrointestinal tonometry and plasma volume expansion effects of hemorrhagic shock resuscitation in dogs with hypertonic saline 6% hydroxyethyl starch solution

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Background and Goal: Hypertonic solutions used to treat hemorrhagic shock, as 7.5% hypertonic saline associated with hydroxyethyl starch solution (HHES), may cause lesser plasma volume expansion (PVE) (1) and tissue oxygenation than conventional plasma expanders. In a model of hemorrhagic shock in dogs, we studied the PVE and systemic and gastrointestinal oxygenation effects of HHES in comparison with lactated Ringer's (LR) and 6% hydroxyethyl starch (HES) solutions.

Materials and Methods: Twenty-four mongrel dogs were anesthetized, mechanically ventilated, and subjected to splenectomy. A gastric air tonometry was placed in the stomach for intramucosal gastric CO_2 ($PgCO_2$) determination and for the calculation of intramucosal pH [pHi = pHa – log ($PgCO_2/PaCO_2$)] and gastric-to-arterial PCO_2 difference (PCO_2 gap). The dogs were hemorrhaged (42% of blood volume) to hold mean arterial pressure from 40 to 50 mmHg over 45 min and were then resuscitated with LR (n = 8) in a 3:1 relation to removed blood volume; HES (mean molecular weight, 130 kDa; degree of substitution 0.4) (n = 8) in a 1:1 relation to removed blood volume; and HHES (n = 8); 4 mL/kg. Hemodynamic, systemic and gastric oxygenation variables were measured at baseline, after 45 min of hemorrhage and 5, 60, and 120 min after intravascular fluid resuscitation. We measured baseline blood volume by using Evans blue and PVE by Hct dilution. Data were compared among the groups by using analysis of variance.

Results: After 120 min fluid resuscitation HHES determinated lower PVE, pHa, pHi, and mixed venous PO_2 and higher PCO_2 gap and systemic oxygen extraction than LR and HES ($P < 0.05$); hemodynamic variables were similar among groups ($P > 0.05$).

Conclusion: The lower volemic state from HHES solution after resuscitation during hemorrhagic shock in dogs may not improve the splanchnic circulation, in comparison to HES and LR solutions.

Reference:

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A-835

Medical emergency team in an outpatient polyclinic, necessary or not?

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Background and Goal of Study: Analysis of intervention frequency, NACA score and consecutive hospitalisation of the Medical Emergency Team (MET) in an Outpatient Polyclinic.

There are 30 medical specialists, a dental ambulatory, an outpatient surgical department including a PACU and observation ward.

In accordance with the guidelines and calling criteria of the ERC a MET was created to provide early access to expert medical support in the case of emergency. The MET consists of one cardiologist or anaesthesiologist and two special trained nurses.

Materials and Methods: All interventions of the MET were documented with the DIVI 4.2 Protocol. The period of 6 month was analysed retrospectively for intervention frequency, NACA-score and consecutive hospitalisation.

Results and Discussions: The MET was called 56 times in 6 month. There were 50 internal calls and 6 trauma calls. 43 calls were recognised as serious emergency and 13 calls were classified as no emergency.

There were NACA 4: 1 pat., NACA 3: 12 pat., NACA 2: 19 pat., NACA 1: 11 pat. 13 pat. were transferred to hospital after MET intervention, 30 pat. could be stabilized on scene and were discharged at home after a short period of monitoring on the observation ward.

Conclusion(s): Intervention frequency and NACA scores justify the creation of a MET in accordance with the ERC guidelines even in an outpatient medical setting.

A-836

The effect of venous cannula length on fluid flow rate

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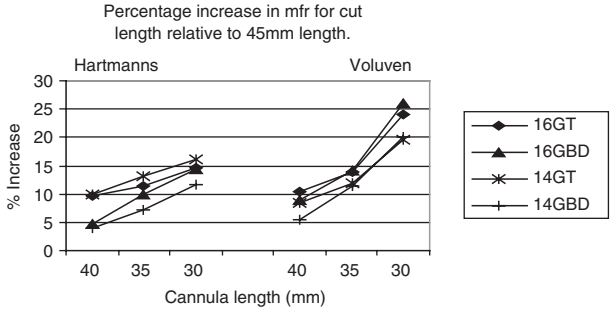
Background and Goals: The Terumo Company produce a 32 mm length venous cannula claimed to have a greater flow rate than the standard 45 mm Terumo (T) and Becton Dickinson (BD) cannulae. Many other factors influencing flow rate have been studied (1). This study investigates the impact of shortened venous cannula length on flow rate.

Materials and Method: In an in-vitro study, venous cannulae from two manufacturers (T and BD) were investigated. 1000 ml bag of Hartmanns solution and 500 ml bag of Voluven were hung at a height of 100 cm above the tip of each cannula investigated. Fluid was allowed to run freely under gravity at a temperature of 22°C. The time taken to run 150 ml of fluid was recorded for 16 and 14 gauge cannulae of 30 mm, 35 mm, 40 mm and 45 mm lengths. Measurements were taken in triplicate and the mean flow rate (MFR) was calculated (2). The percentage increase in MFR for each cannula length compared to the usual 45 mm length was calculated.

Results: MFRs for the standard 45 mm cannulae (14G T, 14G BD; 16G T, 16G BD) were 222, 231; 179, 161 ml · min^{-1} for Hartmanns solution, respectively and 174, 178; 137, 120 ml · min^{-1} for Voluven, respectively.



Conclusion: There was a progressive increase in MFR with shortening cannula length. A clinically important percentage increase in MFR of 26% (1) was achieved at 30 mm. The percentage increase in MFR was greater with the Voluven than with Hartmanns solution.

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A-837

Influence of mild hypothermia and rewarming on near infrared spectroscopy derived tissue oxygen saturation

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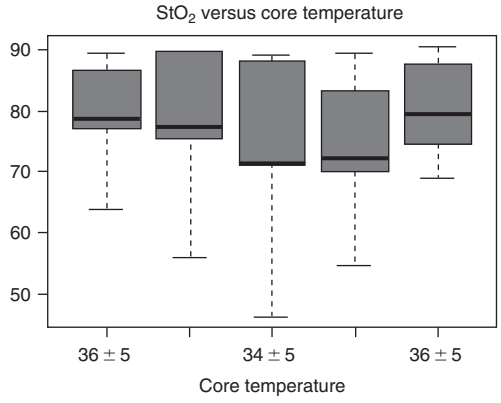
Background and Goal: Near infra-red spectroscopy (NIRS) has been shown to be a non-invasive method for determining tissue oxygen saturation (StO_2) [1, 2]. In an observational study, we investigated the influence of mild hypothermia and rewarming on NIRS-derived StO_2.

Materials and Methods: We studied six healthy volunteers (age 23 ± 4 yrs, weight 71 ± 10 kg) during general iv anesthesia with propofol and mivacurium; and an FiO_2 of 0.35. Maintenance iv fluids were given. They were cooled from approx. 36°C to target core temperature of 34°C. They were approx. 34°C for 1 hr before being rewarmed to normal all with circulating water garment.

Results: Data analysis was at five temperature periods ie, 36.5 ± 0.5; 35.5 ± 0.5; 34.5 ± 0.5; 35.5 ± 0.5; 36.5 ± 0.5°C. The means (± SD) of StO_2 (%) at these periods were 73 ± 8, 71 ± 11, 67 ± 14, 68 ± 11, 74 ± 7. Figure below shows the StO_2 in box plot, with boxes as interquartile range, horizontal dark lines as medians, vertical lines as minimum and maximum. Friedman rank sum test showed statistically significant changes in StO_2 ($p < 0.05$) at the end of both cooling (to 34.5 ± 0.5) and rewarming phase (to 36.5 ± 0.5).



Conclusions: NIRS can be used to serially assess the changes in StO_2 during mild hypothermia and rewarming. Higher inter-individual variability occurred during mild hypothermia.

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A-838

Therapeutic hypothermia after cardiac arrest – 1-year experience

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Background and Goal of Study: There is a growing evidence that mild hypothermia in patients surviving cardiac arrest improves neurological outcome. Hence, we have started the cooling of reanimated patients at target temperature 33 to 34°C since 2005. The aim of this study was to assess effectiveness and safety of this procedure.

Materials and Methods: All patients admitted to the ICU after cardiac arrest between January and November 2005 were reviewed. Exclusion criteria were secondary admission and cardiac arrest due to asfyxia. Implementation of hypothermia, ICU survival and neurological outcome by Glasgow Outcome Scale (GOS) were assessed. Data are presented as median (range). Chi-square test was used for statistical analysis.

Results and Discussions: Seventy four patients after cardiac arrest were admitted to the ICU and 63 passed exclusion criteria. The primary rhythm was ventricular fibrillation (VF) in 26 patients and asystole/PEA in 37 patients. 22 patients (41.3%) survived with favourable outcome (GOS 4–5), 2 patients (3.2%) remained in vegetative state (GOS 2) and 35 died (55.5%). Only 7 patients were admited after in-hospital CPR: 2 died and 5 survived with favourable outcome. Patients whose primary rhythm was VF had favourable outcome in 52% and patients in asystole/PEA group in 35.1% (n.s.).

The cooling was performed in 36 patients surviving more than 24 hours. Target temperature < 34°C was reached after 3 (0–11) hours; in 3 patients was not achieved during 24 hours. The lowest temperature achieved was 33

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(31.3–36.3) °C; in 3 patients dropped below 32°C. Eleven of 36 cooled patients (30.6 %) required relaxation (shivering or ventilator interference). The difference in favourable outcome between cooled (54.3%) and non-cooled (71.4%) patients was not significant. No severe complications of cooling were observed.

Conclusion: This group of patients surviving cardiac arrest have a good outcome in comparison to other results. No severe adverse reactions were observed. The fact that non-cooled patients had also favourable outcome can be affected by small numbers.

A-839

Hyperglycaemia as a predictive factor in the outcome of polytraumatized patients

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Background and Goal of Study: Recent studies noted in specific trauma situations an association between blood glucose concentrations and overall outcome. Based on these observations, the present study was designed to determine the impact of blood glucose levels measured on admission as a potential predictive factor in the outcome of polytraumatized patients.

Materials and Methods: Between 2002 to 2004 all "trauma alert" patients (>16 years) admitted to the emergency centre of the university hospital of Berne were retrospectively evaluated. 593 polytraumatized defined by an ISS >16 and >1 severely injured organ system were included in the study (mean ISS 30,3). Patients were stratified by serum glucose level (⩽9 mmol, 9–15 mmol, ⩾15 mmol). Outcome was measured by mortality, hospital and ICU length of stay, and infectious complications. Multiple linear regression models were used to determine level of significance controlling for age, gender, and injury severity (reflected by commonly used trauma scores). Investigations of subgroups with head injury, abdominal trauma and thoracic trauma were additionally performed.

Results and Discussions: In all groups, hyperglycemia was highly associated with increased mortality and infectious complications independent of injury severity ($p < 0.001$). After multiple logistic regression analysis controlling for age, gender and severity of injury, hyperglycemia proved to be an independent predictor of mortality, hospital and ICU length of stay.

Conclusion(s): These results suggest, that inclusion of blood glucose levels on admission may increase the calculated predictive precision of common trauma scores. The further impact of these significant findings on prediction and therapy of polytraumatized patients need to be prospectively evaluated.

A-840

Effects of small volume resuscitation and vasopressin versus standard fluid resuscitation on cerebral histopathology during haemorrhagic shock

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Background and Goal of Study: Chance of survival after penetrating torso trauma may be better when aggressive fluid resuscitation (FR) is replaced by small volume resuscitation until surgery (1). Vasopressin (AVP) may be an alternative vasopressor to control hypotension (2). The purpose of this study was to evaluate the effects of FR vs. a hypertonic-hyperoncotic starch solution (HHS) combined with AVP, on cerebral haemodynamic variables and histopathology in an animal model of uncontrolled haemorrhagic shock with near fatal hypotension.

Materials and Methods: Following approval of the Animal Investigational Committee, 16 anaesthetised pigs (42 to 46 kg) underwent a simulated liver trauma. At haemodynamic decompensation, the pigs were randomly assigned to receive either HHS and AVP (Hyperhaes®, 4 ml/kg; AVP, bolus 0.2 U/kg, continuously 2 U/kg/hr; *HHS/AVP group*; n = 8), or FR (HES, 30 ml/kg, and Ringer's solution 30 ml/kg; *FR group*; n = 8). 30 min after drug administration, bleeding was controlled manually, surviving animals were observed for 1 hr. Cerebral perfusion pressure (CPP) and mean cerebral blood flow velocity (FV_{mean}) were recorded. After death, the brain was fixated and removed. Histological damage of the hippocampus was evaluated in microsections stained with hematoxylin and eosin, and graded according to the percentage of necrotic neurons: normal (0); minimal (1–10); moderate (11–30); severe (31–80); and maximal (81–100).

Results and Discussions: All animals (8/8) in the HHS/AVP group survived compared to 6/8 in the FR group. Both CPP and FV_{mean} were stabilised after 1 min in the HHS/AVP group compared to 20 min in the FR group, but reached comparable levels 60 min after resuscitation (*HHS/AVP vs. FR*: CPP: 55 ± 6 vs. 40 ± 5 mm Hg; FV_{mean}: 27 ± 4 vs. 29 ± 5 cm/sec). Histopathology revealed only small brain damage with no differences between groups (*HHS/AVP vs. FR*: normal 5 vs. 2; minimal 3 vs. 3; moderate 0 vs. 1; no grade severe or maximal).

Conclusion(s): Following uncontrolled haemorrhagic shock in this porcine model, small volume resuscitation with HHS and AVP restored cerebral haemodynamics faster than fluid resuscitation, but resulted in comparable histopathological outcome two hours after trauma.

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A-841

Use of brain natriuretic peptide in evaluation off left ventricle dysfunction in brain death

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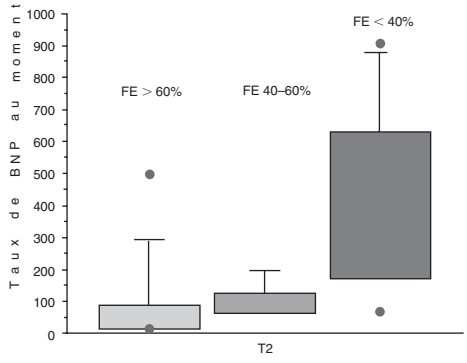
Background and Goals: Brain death is associated with heart failure which could contra-indicate heart harvesting (1). Transthoracic echocardiography (TTE) is used in brain death to evaluate left ventricle (LV). Tension on the ventricle wall is well studied with Brain natriuretic peptide (BNP) during heart failure (2–3).

The aim of the study was to evaluate the concentration of BNP and determine a correlation with LV dysfunction.

Material and Methods: this prospective study was performed in a teaching hospital, all brain death patients were included for 8 month. BNP T1 was made after brain death, T2 during TTE. Echocardiographic ejection fraction (FE) was divided in 3 groups G1: FE >60%, G2: FE 40–50% and G3: FE <40%. Linear regression and box plot has been made to determine significant relation between BNP (T2) and FE, ROC curve in order to determine cut off and test performances.

Results: 22 patients were include, linear regression found significant relation p = 0.0012 (<0.05) ROC curve: cut off = 167.41 ng/ml Se = 80% SP = 82.4% ppv = 57.7% npv = 93.3%



Conclusions: We found good correlation between BNP and FE. BNP used as a test to screen LV dysfunction in brain death is probably useful.

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A-842

Treatment and evolution of patients with complex pelvic fracture: prognosis factors of morbidity and mortality

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Background and Goal of Study: Evaluate the evolution of patients with complex pelvic fracture admitted in an intensive care unit (ICU) who needed an embolization and/or an external fixation. Determine the morbidity and mortality and their related factors.

Materials and Methods: All patients with pelvic fractures admitted in ICU from 1999–2004 were evaluated. Variables studied were: age, sex, kind of

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accident, associated injuries, hemodynamic stability, risk index (APACHE, ISS and Modified TS), pelvic fracture management, blood transfusion and use of vasoactive drugs in the first four hours from the admission and in the following 24 hours, complications, mortality and causes, prognosis factors. Results were presented as mean ± standard deviation. A p value ⩽ 0.05 was considered statistically significant.

Results and Discussions: 22 patients were studied. 10 unstable pelvic fractures were found and 16 politraumatized. 16 arteriographies were done in the first 24 hours and 13 patients needed embolization. 6 only embolization, 7 needed embolization and external fixation and 9 patients needed external fixation in the first 24 hours. 8 patients were exitus: 3 died for haemorrhagic shock in the first 24 hours and 5 from the six day of the admission by multiorganic failure. The existence of politraumatism (100%) in dead patients vs 64.3% in the survivors, risk index (APACHE 22.9 ± 10.9 vs 14.3 ± 5.9; ISS 51.7 ± 17.6 vs 27.7 ± 14.1), blood transfusion (12.7 ± 7.7 vs 4.5 ± 4.1), platelets (7.3 ± 10.3 vs 1.9 ± 3.4) and need of noradrenaline (4 vs 1 patient) in the first four hours were significant factors related to mortality.

Conclusion(s): Venous bleeding is controlled by external fixation. Arteriography and embolization is a good method of management when arterial bleeding exists. Haemorrhagic shock is the mean cause of mortality in the first 24 hours and multiorganic failure during the late period. The existence of politraumatism, need of blood transfusion and need of vasoactive drugs in the initial hours increase mortality.

Acute and Chronic Pain Management

A-843

Antiemetic effect of ondansetron 200 mcg/ml in PCA morphine solution

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Background and Goal of Study: Patient controlled analgesia (PCA) is always used to control postoperative pain with low complication. Patients always have nausea/vomiting associated with PCA. Ondansetron is used prevention and treatment. Our study wants to reduce incidence and severity of nausea and vomiting by ondansetron 4 mg IV plus ondansetron 200 mcg in morphine 1 mg/ml in adults.

Materials and Methods: After receiving approval from our institution's Research Ethics Board, written informed consent was sought from patients scheduled for elective surgery (orthopedics, gynecology, general surgery). We included patient aged between 18 and 65 year-old, with an ASA class of I–II. Patients who smoked, received antiemetics within 24 hours, and had hormonal therapy, a history of motion sickness and gastrointestinal disease, a BMI over 35, menstruation, the inability to operate PCA pump, and any known allergy to morphine were excluded. Patients were divided into ondansetron and controlled group by block randomization. At end of anesthesia, all patients received ondansetron 4 mg intravenous and PCA regimen; morphine 1 mg/ml, lock out interval of 5 minutes, one hour limit 10 mg. Ondansetron group received ondansetron 200 mcg when requested morphine every 1 mg (ondansetron 20 mg in 100 ml of solution). After anesthesia, nausea score, vomiting score, sedation score, ondansetron requested dose were evaluated at 1 hr (T1), 2 hr (T2), 6 hr (T6), 12 hr (T12), and 24 hr (T24) by a nurse anesthetist who did not apprise the identity of the persons in the patient group. Patient satisfaction for nausea/vomiting control was recorded at the end of the study.

Results and Discussions: Demographic data (sex, age, weight, BMI, ASA status, numeric rating scale, type of surgery, and morphine consumption) was comparable. Ondansetron group had less nausea score (at T2, T6, T12, and T24), vomiting score (at T6, T24), and ondansetron requested dose (at T1, T2, T6, T12, and T24) (p value < 0.05). Patient satisfaction for nausea vomiting control was indifferent (p value > 0.05).

Conclusion(s): Ondansetron 4 mg plus 200 mcg/ml given with PCA morphine to adults can reduce nausea score, but cannot improve patient satisfaction.

A-844

Epidural blood patch in the treatment of headaches by spontaneous CSF leak

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Background and Goal of Study: To evaluate the efficacy of epidural blood patch (EBP) in the treatment of headache by spontaneous CSF leakage (SCSFL). Spontaneous intracranial hypotension (SIH) generally results from spontaneous spinal CSF leakage. Treatment is usually conservative but EBP has emerged as the most important nonsurgical treatment for SCSFL.

Materials and Methods: We observed 30 patients with SCSFL between 1992 and 2005. 11 patients (6 women and 5 men; age range 31–66 years, mean age 40) received EBP. All patches were performed in lumbar region, using 15 to 30 ml (mean 23) of autologous blood. All patients maintained a 30 degree Trendelemburg position during the procedure and for 24 hours after the procedure. Follow-up ranged from 6 months to 2 years.

Results and Discussions: All patients had orthostatic headaches. Other manifestations were nausea, vomiting, mild neck stiffness, tinnitus, blurred vision, diplopia and bilateral upper limb numbness. CT myelography or spinal RMI or brain RMI or radionuclide cisternography showed CSF leakage sites in 6 out of 11 patients, 2 sites were at the cervical level, the others at the lumbar level. In 10 out of 11 patients brain RMI showed diffuse pachymeningeal gadolinium enhancement (neuroimaging of intracranial hypotension). All patients failed an initial conservative treatment which consisted of bed rest and rehydration over a period of 1 to 13 months. All treated patients became asymptomatic, 1 responded only after 3 EBP and 1 had a residual headache during the Valsalva manoeuvre for 2 months. Untill now none has had a relapse.

Conclusion(s): Our data confirm the efficacy of EBP in the SCSFL headache and suggest also the importance of a prolonged Trendelemburg position when the leak site is at the cervical level and we perform the autologous blood patch in the lumbar region.

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A-845

Optimal fentanyl regimen for parent-controlled analgesia in preverbal children undergoing cleft palate repair

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Background and Goal of Study: This prospective study was performed in preverbal patients who underwent cleft palate repair to obtain optimal fentanyl regimen and the efficacy of parent-controlled analgesia (PrCA) for postoperative pain managements.

Materials and Methods: Thirty children under 2 years of age, ASA I or II, were enrolled. Intravenous PCA device was set with basal infusion rate of 2 ml/hr and bolus of 0.5 ml with lockout time of 15 minutes. Fentanyl regimen was initially set with basal infusion rate of 0.3 μg/kg/hr. A predetermined fentanyl regimen was obtained by the response of previous patient to a larger or smaller dose of fentanyl (0.1 μg/kg/hr as the step size), using an up-and-down method. Parents were taught to inject 'as-needed' based bolus dose and to evaluate the face rating pain scores and degree of sedation assessed by using four-point patient sedation score (PSS) as well as to monitor adverse effects of fentanyl such as respiratory depression and vomiting. Completing the study, a questionnaire on parents' satisfaction of PrCA was obtained. For statistical analysis, ANOVA and multiple comparison using Bonferroni's correction was used with P value < 0.05.

Results and Discussions: The observed ED_{50} of fentanyl regimen was 0.66 ± 0.08 μg/kg/hr. ED_{50} and ED_{95} by probit analysis were 0.63 and 0.83 μg/kg/hr, respectively. Three patients (10%), who were managed with fentanyl regimen 0.7 or 0.8, experienced vomiting on the day of surgery. None of the patients was over-sedated (PSS < 2), nor respiratory activities

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were depressed. Eighty seven percent of parents were satisfied with this postoperative pain control modality.
Conclusion(s): PrCA using fentanyl regimen can effectively be applied to preverbal children, who undergo cleft palate repair.
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A-846

A prospective randomized study of two ropivacine doses in combination with fentanyl for single-shot caudal postoperative analgesia in children undergoing hypospadias surgery

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Background and Goal of Study: The aim of this study was to compare the efficacy of two doses of 0.2% ropivacaine 1 ml · kg^{-1}and 2 ml · kg^{-1} in combination with 1 μg kg^{-1} fentanyl administered via single-shot caudal infusion on postoperative pain relief after hypospadias surgery in children
Materials and Methods: We studied 78 ASA I–II children undergoing hypospadias surgery were randomly allocated to receive single-shot caudal infusion with ropivacaine 0.2% 1 ml · kg plus fentanyl 1 μg · kg^{-1} (group A, n = 37) and ropivacaine 0.2% 2 ml · kg^{-1} plus fentanyl 1 μg · kg^{-1} (group B, n = 41). Single-shot caudal infusion was performed after induction in anaesthesia with propofol 2.5 mg · kg^{-1} and atracurium 0.5 mg · kg^{-1} Postoperative pain and motor block of the legs was assessed and recorded hourly. As duration of effective analgesia was set the immediate postoperative period at that pain score was less than mild.
Results and Discussions: There were no significant differences between study groups with respect to age, weight, ASA classification or duration of surgery (Table). Duration of effective postoperative analgesia after single-shot caudal infusion was significantly longer in group B compared to group A (Table). Significant motor block was no recorded.

Table

Variable	Group A n = 37	Group B n = 41
Age (years) *	3.6 (1.2)	4.2 (1.4)
Weight (kg) *	17.3 (2.8)	16.7 (3.2)
ASA I/II †	32/5	38/3
Duration of surgery (min) *	75 (18)	70 (25)
Duration of effective postoperative analgesia (hours) ‡	4.9 (1.2)	7.2 (0.8)

numbers are means (standard deviation) or number of patients.
*P > 0.05 when compared with *t*-test, †P > 0.05 when compared with Yates corrected chi square ‡P < 0.001 when compared with *t*-test.

Conclusion(s): The dose of ropivacaine 0.2% 2 ml · kg^{-1}plus 1 μg · kg^{-1} fentanyl in single-shot caudal infusion offers longer effective postoperative analgesia compared to ropivacaine 0.2% 1 ml · kg^{-1} plus 1 μg · kg^{-1} fentanyl without occurrence of significant motor block.

A-847

Incidence of complications and incurred costs associated with postoperative pain management modalities in Belgium

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Background and Goal of Study: Patient safety is integral to postoperative pain management, which often relies upon invasive routes of analgesic administration (e.g., intramuscular [IM], intravenous [IV], and epidural). This study evaluated the association between analgesic modalities, patient risk factors, and rates of complications (and their resultant costs).
Materials and Methods: Data from 7 Belgian hospitals from Semester 2, 2003, were extracted from the minimum basic data set to which Belgian hospitals are required to submit patient data. Data were from patients > 20 years of age who underwent surgeries likely to require significant postoperative pain management, and received oral, IM, IV, or epidural analgesia (± patient-controlled analgesia [PCA] pumps). The incidence rates (per 100 patients) for complications associated with catheters and/or needles, immobility, or anticoagulants were derived from relevant ICD 9-CM codes recorded by the hospitals. Per patient costs were calculated from hospital billing records and compared between patients who experienced or did not experience a complication.
Results and Discussion: The majority of patients (N = 7.425) were female (59.5%) and <65 years of age (60%). The reported rates of complications associated with a catheter/needle, immobility, or anticoagulants were 0.5%, 0.9%, or 0.6%, respectively. Patients treated with epidural PCA or epidural without PCA had the highest incidence rate for complications associated with catheters (1.0%) or anticoagulants (0.9%), respectively. IV PCA-treated patients had the highest incidence of immobility-related (1.5%) and overall (2.4%) complications. Catheter/needle complications were associated with $$3,222.8 ($P < 0.0001$) and $$5,307.4 ($P < 0.0001$) in excess pharmaceutical and total hospitalization costs, respectively, and a 5.7-day excess length of stay (LOS). Complications associated with immobility or anticoagulants resulted in 11.7% ($P < 0.0001$) or 19.3% ($P < 0.0001$) excess mortality ($\%_{\text{complications}} - \%_{\text{no complications}}$), respectively.
Conclusion: Although the incidence of postoperative complications was relatively low, the resultant morbidity significantly impacted LOS, hospital costs, and mortality.

A-848

Relationship between opioid use and adverse effects with parecoxib/valdecoxib vs placebo after major general surgery

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Background and Goal of Study: To estimate the association between reduced postoperative opioid use and risk of experiencing opioid-related adverse effects with parecoxib vs placebo.
Materials and Methods: Following major general surgery, patients in this 10-day, double-blind placebo-controlled trial were randomized to parecoxib/valdecoxib (PAR/VAL) (n = 533; PAR 40 mg IV loading dose within 6 h, PAR 20 mg IV/IM q12h for ⩾ 5 doses, followed by VAL 20 mg q12h until Day 10 or matching placebo [PBO; n = 529]). Both groups received prn morphine during IV/IM dosing, and codeine/APAP or hydrocodone/APAP during oral dosing; all doses were converted to morphine equivalents and daily opioid use was calculated. The validated Opioid-Related Symptom Distress Scale (OR-SDS) was completed by patients beginning on Day 2 and used to determine the incidence and clinical meaningfulness (CM) of CNS opioid-related symptoms and postoperative nausea or vomiting (PONV) on Days 2–4. Descriptive analyses were conducted with Fisher's exact and GLM methods; random effects Poisson regression was used to estimate relative risk (RR) of opioid-related symptoms associated with opioid exposure and treatment group, controlling for study day.
Results and Discussion: On Days 2–4, 47% (1439/3067) of patients in the PAR/VAL group did not receive opioids compared with 25% in the PBO group (802/637; $P < 0.001$). On Days 2 and 3, significantly more PAR/VAL patients did not take any opioids (61% and 33%, respectively) compared with PBO ($P < 0.001$). Day 4 differences were nonsignificant (8%; $P = 0.110$). For patients who did take opioids, Day 2–4 opioid consumption was not associated with CM CNS symptoms or PONV. The RR of CM CNS symptoms was reduced by 50% ($P < 0.001$) for patients not taking opioids compared with those taking opioids, and a 56% reduction was observed for CM PONV. Randomization to PAR / VAL was also associated with a 22% reduction in CM CNS symptoms and a 29% reduction in CM PONV ($P < 0.001$ vs placebo).
Conclusions: Postoperative treatment with PAR / VAL significantly reduced opioid consumption and the risk of CM opioid-related CNS symptoms and PONV.

A-849

Cardiovascular safety of the cyclooxygenase-2 selective inhibitor parecoxib sodium: Review of pooled data from surgical studies

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Background and Goal of Study: To assess the incidence of cardiovascular (CV) thromboembolic events associated with short-term use of parecoxib sodium (parecoxib) following major surgery.
Materials and Methods: An inferential, post hoc analysis of the incidence of CV thromboembolic events as defined by the World Health Organization Adverse Reaction Terminology (WHOART) was performed on the integrated data from 19 double-blind, randomized, controlled studies (10 orthopedic, 5

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gynecologic, 2 coronary artery bypass grafting [CABG], and 2 general surgery) comparing parecoxib 20 to 80 mg total daily dose (TDD) and placebo. All pairwise comparisons between parecoxib and placebo were performed using Fisher's exact test without adjustment for multiple comparisons. Since NSAIDs and coxibs are contraindicated in CABG surgery, pooled data from 17 studies (excluding the 2 CABG studies) were also assessed for the incidence of CV thromboembolic events stratified by preexisting CV risk factors (none, 1, ⩾1, ⩾2 of the following: angina, coronary atherosclerosis, myocardial infarction, hypertension, peripheral vascular disease, diabetes, hyperlipidemia, or peripheral edema).
Results and Discussion: In the 19 studies, 3821 patients received parecoxib 20 to 80 mg TDD and 3158 received placebo. This sample size provided 92% power to detect a 2-fold increase in events from a baseline rate of 1%. No statistically significant differences in the incidence of total or individual CV thromboembolic adverse events were observed with parecoxib (1.0%; 39/3821) compared with placebo (0.9%; 27/3158). In the 17 noncardiac surgery studies, no significant differences were observed between treatment groups when stratified by number of preexisting CV risk factors.
Conclusion: Analysis of integrated safety data from completed clinical studies did not show an increase in CV thromboembolic risk associated with parecoxib 20 to 80 mg TDD.

A-850

Risk reduction of opioid-related symptoms with parecoxib and propacetamol, alone and in combination, after hip arthroplasty

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Background and Goal of Study: To estimate the risk reduction of clinically meaningful (CM) opioid-related symptoms associated with parecoxib (PAR), propacetamol (PRO), and combined PAR/PRO after hip arthroplasty.
Materials and Methods: This was a secondary analysis of patients who received ⩾1 dose of study medication and completed the Day 1 Opioid-Related Symptom Distress Scale (OR-SDS) in a randomized, double-blind study comparing PAR 40 mg IV bid (n = 69); PRO 2 g IV qid (n = 68); PAR 40 mg IV bid plus PRO 2 g IV qid (n = 68); or PBO (n = 36) after hip arthroplasty. Patients received PCA morphine prn. Data to estimate the relative risk (RR) of a CM opioid-related symptom – defined as a symptom with at least frequent occurrence, moderate severity, or moderate bother – were collected at 24 and 48 h with the validated patient-reported OR-SDS. Exploratory factor analysis was used to identify symptom groups. Random effects Poisson regression was used to estimate RRs of a symptom group by morphine exposure and treatment on Days 1 and 2.
Results and Discussions: Day 1 morphine use was 17, 21, 26, and 34 mg in the PAR/PRO, PAR, PRO, and PBO groups, respectively; all active treatments significantly reduced morphine use vs PBO (PAR/PRO and PAR, $P < 0.001$; PRO, $P = 0.018$), and Day 2 comparisons were similar. A 2-factor solution identified CNS symptoms (fatigue, drowsiness, and concentration) and PONV (nausea or vomiting). Compared with PBO and controlling for study site and gender, PAR/PRO and PAR reduced the risk of a CM CNS symptom by 55% ($P < 0.001$) and 33% ($P = 0.044$), respectively, whereas PRO was not associated with significant risk reduction ($P = 0.118$). Morphine consumption was only weakly associated with CM CNS risk ($P = 0.075$), linearly decreasing the risk by approximately 7% for each 10-mg decrement in exposure (95% CI, 0.4% increase to 14.7% decrease). The RR of PONV was not associated with opioid exposure ($P = 0.384$) or treatment ($P = 0.315$).
Conclusion(s): Treatment with PAR/PRO and PAR significantly reduced the risk of CM CNS symptoms. These symptoms were weakly but not significantly associated with opioid exposure. Neither treatment nor opioid exposure was associated with the risk of PONV.

A-851

The analgesic efficacy of dexmedetomidine added to ropivacaine patient controlled interscalene analgesia via the posterior approach

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Background and the Goal of the Study: Analgesic adjuncts such as α_2 adrenoreceptor agonists have been combined with local anaesthetics to prolong the duration of peripheral nerve blocks. Dexmedetomidine is a potent α_2 adrenoreceptor agonist that is 8 times more selective than clonidine. The present study evaluated the analgesic efficacy and side effects of dexmedetomidine when added to patient controlled interscalene analgesia with ropivacaine 0.2%.
Materials and Methods: With local ethics committee approval and informed consent, 40 ASA I–III patients scheduled for upper extremity surgery were recruited. Before standardized general anaesthesia, all patients received an interscalene catheter via the posterior approach. Correct placement of the needle was defined as contraction of the deltoid, biceps or triceps muscle at an intensity of < 0.5 mA. A bolus dose of 30 ml ropivacaine 0.2% (Group I) or ropivacaine 0.2% + dexmedetomidine 1 μg/ml (Group II) was given through the catheter initially. After the surgery, patients were connected to a PCA pump set up to deliver 5 ml PCA bolus of the study drugs at 30 min intervals during the first 48 hr postoperatively. Diclofenac 75 mg was administered at the induction of general anaesthesia and then two times daily. Rescue analgesia was provided with IV tramadol 1 mg/kg if the VAS score was ⩾ 4. Pain and sedation scores, sensory block, supplemental analgesia, hemodynamic parameters, total local anaesthetic consumption and side effects were recorded. Statistical analysis was made using t test, Mann Whitney-U or Chi square as required.
Results: The pain scores at rest and on movement, sedation scores and distribution of the sensory block with the initial dose were similar in both groups. Four patients in Group I required for additional analgesics. The heart rates were lower in Group II in 0, 2, 24, 48 postoperative hr and systolic blood pressures in 0, 2, 4 hr ($p < 0.05$).Total local anaesthetic consumption was 158 ± 66 ml in Group I and 112 ± 58 ml in Group II ($P < 0.05$). No major side effect was observed.
Conclusion: The addition of dexmedetomidine 1μg/ml to a ropivacaine patient controlled interscalene analgesia provides similar pain scores while reducing local anaesthetic consumption and without causing any major side effect.

A-852

The quality of postoperative pain management following thoracotomy and major urological surgery

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Background and Goal of Study: There is a constant need to improve the quality of postoperative pain management [1]. The solution seems to involve a better use of already existing techniques and resources [2]. The aim of the study was to asses the efficacy of nurse-based model of Acute Pain Service (APS) during the 4 years period.
Material and Methods: We have studied 705 patients after thoracotomy (group T) and 77 patients undergoing urological surgery (group U). Postoperative pain control was provided by thoracic/lumbar continuous epidural analgesia with a combination of the local anaesthetic and opioid. Level of postoperative pain (Prince Henry Hospital Pain Score–PHHPS and VAS score), systolic and diastolic blood pressure (SBP, DBP), sedation (Ramsay Score-RS), interventions and side-effects were recorded.
Results: Satisfactory analgesia in group T (PHHPS ⩽ 1) was found in 5023 (81%) measurements and in group U (VAS ⩽ 2) in 457 (97%) measurements ($P < 0.05$). Mean SBP amplitude was similar in both groups (39 ± 19 mmHg in group T and 34 ± 21 mmHg in group U, NS). Optimal level of sedation (level II in RS) was registered in 5933 measurements (96.3%) in group T and in 450 measurements (97.8%) in Group U. Overall, 17 ± 7.6 interventions of the APS team per patient were recorded in group T and 13 ± 6.7 in group U ($P < 0.001$). 84.3% interventions were performed by the nurses and 15.7% by the anaesthesiologists – this percentage was similar for both study groups. The interventions involved: change of flow rate of epidural infusion or concentration of LA, administration of bolus dose or additional parentaeral analgesic, treatment of side-effects. No major complications occurred.
Conclusions: A nurse-based anaesthesiologist-supervised pain service provides efficient postoperative pain management, however patients in T group more often required rescue analgesia.
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A-853

Multimodal analgesia for postoperative pain after abdominal hysterectomy

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Background and Goal of Study: Gabapentin and local anesthetics decrease analgesic requirements and pain after breast surgery for cancer[1],

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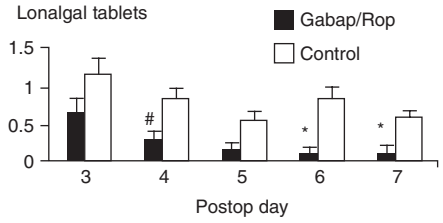
but not gabapentin alone after abdominal hysterectomy[2]. We hypothesized that oral gabapentin and local anesthetic in the wound area will decrease analgesic requirements and acute pain following abdominal hysterectomy.
Materials and Methods: Women scheduled for abdominal hysterectomy, via Pfannenstiel incision, under standardized general anesthesia were blindly randomized to receive gabapentin (1600 mg/d given 1 day before and for six days postoperatively) and 0.75% ropivacaine (continuous infusion 2 ml/h locally in the wound for 30 hours), or placebo and saline (control). Pain (VAS at rest and with cough) and analgesics were assessed blindly 2, 4, 8 h, and every 24 h for 7 days after surgery. Postoperative analgesia included morphine via PCA during the first 48 hours, and Lonalgal® tablets from the 3rd to the 7th postoperative day.
Results: Demographics, duration of surgery, and pain intensity at rest and with cough did not differ between the two groups. Cumulative morphine consumption until 48 h postoperatively was less in the treatment ($n = 27$) compared to control group ($n = 24$), overall (32 ± 13 vs 50 ± 20 mg respectively, $p < 0.001$), as well as at any time point ($p = 0.03$). Use of Lonalgal® tablets was also less in the treatment group compared to control, overall (1.3 ± 1.6 vs 3.8 ± 3.7 respectively, $p = 0.004$), as well as at the 4th (#: $p = 0.03$ vs control), 6th and 7th days (*: $p \leqslant 0.003$ vs control). Means ± SE are shown.



Conclusion: Combination of oral gabapentin and local infusion of ropivacaine significantly decreases analgesic requirements after abdominal hysterectomy.
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A-854

Differential effects of small-dose ketamine on postoperative hyperalgesia following abdominal or vaginal hysterectomy

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Background and Goal of Study: NMDA-receptor activation and prostaglandin receptor mediated events may interact in central sensitization to nociception. We studied the role of inflammatory reactions on ketamine effects on postoperative pain intensity in different types of surgery.
Materials and Methods: The study was double blinded, randomized and placebo-controlled. After protocol approval by the Ethical Committee of the University and written informed consent, forty patients undergoing elective abdominal or vaginal hysterectomy under remifentanil-propofol based anesthesia were enrolled. The ketamine groups (Ket) received a bolus of 0.5 mg/kg ketamine followed by a continuous infusion of 0.1 μg/kg/min ketamine until 6 h after emergence from anesthesia. The placebo groups (Plac) received saline solution in the same sequence. Half of the patients in the placebo and ketamine groups received parecoxib 40 mg iv bid (Prx) during 48 h, while the other half of patients received saline, with the first dose given just before incision. All patients received 15 μg sufentanil 20 min before anticipated end of surgery and PCA-piritramide (2 mg/dose, 10 min lockout) was provided. Opioid consumption was recorded for 48 h.
Results and Discussions: In abdominal hysterectomy, the mean piritramide consumption at 48 h was 117 ± 44 mg in the Plac/Plac group compared to 54 ± 23 mg in the Prx/Plac group, 54 ± 21 mg in the Prx/Ket group and 26 ± 13 mg in the Plac/Ket group. The dose of piritramide at 48 h was reduced by 54% in the Prx/Plac, 55% in the Prx/Ket and 77% in the Plac/Ket groups, respectively. In vaginal hysterectomy the mean piritramide consumption at 48 h was 41 ± 23 mg in the Plac/Plac group compared to 41 ± 23 mg in the Prx/Plac group, 27 ± 2 mg in the Prx/Ket group and 29 ± 13 mg in the Plac/Ket group. The dose of piritramide at 48 h decreased by 0% in the Prx/Plac group, 35% in the Prx/Ket group and 30% in the Plac/Ket group compared to placebo. In the abdominal model, ketamine needs an enhanced peripheral input from surgical inflammation to inhibit hyperalgesia. After vaginal surgery, blocking inflammation did not alter the effect of ketamine.
Conclusions: Ketamine may be only effective in reducing hyperalgesia in the presence of enhanced peripheral input after abdominal surgery, while this is not the case after vaginal surgery.

A-855

Results from an interactive audience survey of the current state-of-the-art practices for delivery of postoperative analgesia

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Background and Goal of Study: A survey was conducted at the 2004 Euroanaesthesia Annual Meeting to determine the current practices in postoperative pain management.
Materials and Methods: A live, interactive audience ($N \approx 263$) was asked to participate in a survey that consisted of 18 questions. Eight questions dealt with current practice issues, 4 questions dealt with the demographic population of the audience, 4 questions dealt with the attitudes toward the use of intravenous patient-controlled analgesia (IV PCA), and 2 questions dealt with unmet needs and new drug therapies in postoperative analgesia.
Results and Discussions: Most participants were from Europe (42%) or Asia (31%), and most were anaesthesiologists (34%) or pain specialists (21%). Forty-four percent of participants were satisfied with the postoperative pain management they provided to their patients. Forty-nine percent of participants used IV PCA for postoperative pain management in the first 24–48 hours following major orthopaedic surgery, while 26% used IV PCA in >75% of patients following major surgery. Patient satisfaction (46%), effectiveness (21%), and avoidance of analgesic peaks and troughs (21%) were considered to be the main benefits of IV PCA, whereas side effects (27%), resolving device-related problems (22%), and incorrect patient use (21%) were the main disadvantages. The primary reason for not using IV PCA was the expense (42%). Organised acute pain services (APS) in all institutions (33%), better assessment and documentation of pain (25%), and improved methods for pain control (23%) were considered to be the main unmet needs for management of acute, postoperative pain.
Conclusion(s): Over half of participants were unsatisfied with current pain management. Results suggest the adoption of organized APS, better procedures for assessing and documenting pain, and improved methods for pain control are needed to improve the delivery of postoperative analgesia.

A-856

Genetics and postoperative pssain

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Background and Goal of Study: The goal of the study was to analyze the association among the acute pain perception and some gene polymorphisms (A/G polymorphism of monoamine oxidase B (MAO B) gene, I/D polymorphism of angiotensin-converting enzyme (ACE) gene, M235T polymorphism of angiotensinogen (AGT) gene, -330 polymorphism of interleukin-2 (IL-2) gene).
Materials and Methods: The tonsillectomy and tourniquet test were taken as acute pain perception models. The study set of patients was divided into groups according to pain intensity based on visual analogue scale (VAS) and according to pain tolerance (time interval within pain intensity does not reach VAS = 4). Both, intensity and tolerance were measured immediately after the tonsillectomy and tourniquet test, and compared with gene polymorphisms. The Mann-Whitney U test and the Kruskal-Wallis test were used for statistical analysis.
Results and Discussions: We examined 300 Czech subjects (Caucasians; 189 women and 111 men). The association of the A/G MAO-B gene polymorphism with pain intensity in male subjects was found ($p = 0.02$). We found statistically significantly higher average intensity of postoperative pain in males with G allele in comparison with males with A allele.

Similarly, it was found that the M235T polymorphism for AGT tended to affect the hour of administration of analgetics ($p = 0.04$). The effect of the -330 IL-2 gene polymorphism on the postoperative pain tolerance ($p = 0.03$) was confirmed.
Conclusion(s): It follows from our results that the A/G MAO-B gene polymorphism, M235T AGT gene polymorphism, the IL-2 gene polymorphism affect variations in perception of acute pain individually in Czech population.

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A-857

Does the anesthesia technique determine postoperative pain?

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Background and Goal of Study: We investigated whether the use of a locorregional anesthesia technique, determine the quality and treatment of postoperatory pain.
Materials and Methods: After institutional approval, fifty three consecutive patients (age 15–80 years), randomly allocated to receive an inhalation anesthesia with an opiod (remifentanil or fentanyl), inhalation-opiod group (INOPG, N = 21) or a locorregional anesthesia, regional anesthesia group (RAG, N = 32), scheduled for similar procedures of trauma and similar surgical times, were retrospectively studied. The former group received a bolus of 0.1 mg/Kg of morphine (M) 30 min before the end of surgery, and a first dose of a NSAID, that was maintained during the next 48 h. Postoperative analgesia was accomplished with a PCA of M, if VAS score > 4. The latter group received a NSAID at the same time and dose of INOPG, and tramadol 100 mg (T) iv as first drug, and M as second choice, if VAS > 4. The pain scores, medication received during 15, 30, 60, 120 min and 6, 12, 24 and 48 postoperative hours, were analyze and registered using a PADOP program, to further analysis. Analysis of covariance, *t*-test, Chi-squared and Fisher test was used when appropriate.
Results and Discussions: Upon recovery room arrival 30 (94%) patients of the RAG, related a VAS score of 0–4, while only 11 (52%) of the OPG had the same (Chi-squared; p = 0.004). Both groups did not reach the same VAS score until 2h (VASOPG = 2.8 +/− 2 vs VASRAG = 1.9 +/− 2). However, 13 RAG patients need M (mean = 5.5 +/− 3.7 mg), while only one of the RG need M (4 mg) do so (p = 0.004). At 24 h VAS was also similar below 4 in both groups, but again with more patients receiving M on PCA in the OPG (8 vs 1; p > 0.001), while 12 RAG patients need a dose of T. No difference was observed at 48 h.
Conclusion(s): Our study suggests that RG improves the quality of immediate postoperative pain, and reduces the needs of M consumption on PCA, when compared to an inhalatory-opiod anesthesia.

A-859

The efficacy of intraoperative intravenous morphine 0.25 mg/kg alone, versus 0.25 mg/kg combined with lornoxicam, for immediate postoperative analgesia after remifentanil based anesthesia for major surgery

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Background and Goal of Study: To evaluate the immediate postoperative analgesia effect, of intraoperative morphine administration combined with lornoxicam versus 0.25 mg·kg^{-1} alone, in anaesthesia based on remifentanil.
Materials and Methods: We studied 50 patients ASA I, II who were programmed for major operations under general anesthesia used remifentanil as the perioperative opioid (1 μg·kg^{-1} as a bolus then 0.5 μg·kg^{-1}/min as a continuous infusion). The patients were divided randomly into two groups, A (n = 25 pts) and B (n = 25 pts) with comparative demographic characteristics. A morphine bolus of 0.25 mg·kg^{-1} with lornoxicam (A Group) or 0.25 mg·kg^{-1} (B Group) was administered 30 min before the end of surgery. In the postanesthesia care unit, pain scores for patients were evaluated by using visual analog scale scores of 0–10. Postoperative analgesia was obtained by a morphine titration (2 mg every 5 min). We recorded: a) the postoperative pain level, b) the need for complementary morphine, c) the modified Aldrete scale, d) the opioid spare effect, e) the adverse reactions. Adequate analgesia was accepted with a pain score of 0–3. The statistical evaluation was done using the student t-test. Values of p < 0.05 were accepted as statistically significant.
Results and Discussions: There was no demographic difference between the two groups. Post operative analgesia was not effective in both groups which were studied. By comparing the mean pain value we determined a statistically significant difference between two groups with the higher levels of pain being noted in patients of group B (p < 0.05).
Statistical significance in the mean pain value between the two groups were observed at 30 min (p < 0.04), 45 min (p < 0.02) and 60 min (p < 0.02). The complementary use of morphine was 8.2 ± 2.9 in group A and 9.3 ± 1.9 in group B, a difference which was not statistically significant. Comparing the modified Aldrete scale, found no statistical significant difference between the two groups. No statistical differences were found in the side effects.
Conclusions: a) The postoperative analgesia of the two groups was unsatisfactory, although there was statistically significant difference in the level of pain, b) the complementary administration of morphine did not yield significant statistical difference, c) no statistical difference was noted in the modified Aldrete scale, d) the opioid spare effect in group A was 12% and e) no differences noted in the adverse reactions between the two studied groups.

A-860

Efficacy of the fentanyl HCl patient-activated transdermal system (PATS) versus morphine intravenous patient-controlled analgesia (IV PCA) for acute postoperative pain management in patient subgroups

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Background and Goal of Study: Intravenous patient-controlled analgesia (IV PCA) is often used to manage acute pain. This pooled analysis compared the efficacy of the fentanyl HCl patient-activated transdermal system (PATS) with morphine IV PCA for postoperative pain management.
Materials and Methods: Data were from 3 multicenter, open-label, randomized, active-controlled North American trials. Patients received the fentanyl HCl PATS (40 μg fentanyl per dose) or morphine IV PCA (1-mg morphine per dose) following hip replacement, orthopedic, pelvic, or abdominal surgery. The primary efficacy measure was success ("good" or "excellent" ratings) on the patient global assessment (PGA) of the method of pain control in the first 24 h (ratings: "excellent," "good," "fair," "poor"). Equivalence was achieved if the 95% CI for the between-group difference in success was within ±10%. Pain intensity (scale, 0 to 10) and discontinuation rates were assessed. Efficacy was evaluated across age and body mass index (BMI) subgroups.
Results and Discussion: Patients (N = 1,941) were mostly female (67.3%) with a mean age of 55.6 years. Percentages of success ratings on the 24-h PGA were comparable overall (80.5% vs 81.0%; 95% CI, −4.0% to 3.0%) and in subgroups of age (≤65 y, 79.1% vs 81.3%; 66–75 y, 82.4% vs 79.4%; >75 y, 86.0% vs 81.4%) and BMI (<25 kg/m^2, 78.7% vs 77.1%; 25–29 kg/m^2, 82.9% vs 80.8%; ≥30 kg/m^2, 79.6% vs 83.7%) for the fentanyl HCl PATS and morphine IV PCA, respectively. Mean last pain intensity scores in the first 24 h were comparable for patients overall (3.1 vs 3.0) and in subgroups of age (≤65 y, 3.2 vs 3.1; 66–75 y, 3.0 vs 2.9; >75 y, 2.3 vs 2.8) and BMI (<25 kg/m^2, 3.0 vs 3.1; 25–29 kg/m^2, 3.0 vs 3.1; ≥30 kg/m^2, 3.2 vs 2.9) for the fentanyl HCl PATS and morphine IV PCA, respectively. Discontinuation rates were 19.3% vs 17.1% (P = 0.217) overall, 4.5% vs 6.5% (P = 0.047) due to an adverse event, and 11.9% vs 6.3% (P < 0.001) due to inadequate analgesia for the fentanyl HCl PATS vs morphine IV PCA, respectively.
Conclusions: Results indicate that the fentanyl HCl PATS and morphine IV PCA are of comparable utility for postoperative pain management, regardless of age or BMI.

A-861

Comparison of intrathecal morphine plus PCA and PCA alone for postoperative analgesia after nephrolithotomy

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Background and Goal of Study: Nephrolithotomy produces marked postoperative pain. Patient controlled analgesia (PCA) can reduce pain but in some patients it still causes severe pain. We want to study the intrathecal morphine with aims to reduce pain score and morphine consumption including side effect and to improve patient satisfaction.
Materials and Methods: After receiving an approval from our institution's Research Ethics Board, written informed consent was sought from patients scheduled for elective kidney surgery. We included patients who received flank incision: age ranged between 18 and 65-years-old, with an ASA class of I–II. Patients who had contraindication for spinal block and morphine, morbid obesity, inability to operate PCA pump were excluded. Patient was divided into two groups by block randomization – spinal and controlled. For spinal group, patients were given 0.3 mg of intrathecal morphine after general anesthesia. In the post anesthesia care unit, numeric rating score (NRS, range 0–10) was evaluated. Two mg of Bolus morphine was given to reduce pain every 5 minute until NRS < 5. Morphine PCA pump (morphine 1 mg/ml, PCA dose 1 mg, lock out interval 5 min and 1 hr limit 8 mg) started in PACU promptly.

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Data was recorded by a nurse anesthetist who did not apprise the identity of the persons in the patient group. NRS at rest and while coughing, morphine consumption were recorded at T0, 2 (T2), 6 (T6), 12 (T12), 24 (T24) and 48 hrs (T48). Sedation score, nausea vomiting score, itching score were recorded at the same time. Patient satisfaction was recorded at the end of the study.
Results and Discussions: Demographic data was comparable. Spinal group had less of both NRS at rest and at cough than controlled group at T0, T2, T6, T12, and T24 (p value < 0.05). Spinal group had less morphine consumption than controlled group at T2, T6, T12, T24, and T48 (p value < 0.05). Sedation score, nausea vomiting score, like patient satisfaction were indifferent (p value > 0.05 for all). Higher itching score was found in spinal group at T6, T12, T24, and T48 (p value < 0.05).
Conclusion(s): Spinal morphine plus PCA can improve analgesic effect better than the use of PCA alone. Itching was more common in spinal group, but does not impact patient satisfaction.

A-862

Opioids sparing effect of gabapentin in neurogenic thoracic outlet syndrome surgery

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Background and Goal of Study: Gabapentin is commonly effective in treating neuropathic pain. Various studies have shown conflicting results following its use in treatment of acute postoperative pain (1). We realized a prospective doubled-blind randomized study to evaluate peri-operative effect of gabapentin premedication in the neurogenic thoracic outlet syndrome (NTOS) surgery. We chose this model because of the high drug tolerance frequently encountered in this kind of patients.
Materials and Methods: After institutional approval and informed consent, 30 ASA 1–2 patients, scheduled for elective NTOS surgery were randomly allocated in two groups: GP group receiving 1200 mgr per os of gabapentin one hour before surgery whereas PL group receiving placebo. General anesthesia was induced and maintained with propofol (TCI = 3 μg/ml), remifentanil (started at 0.25 μg/kg/min and titrated by step of ±0.05 μg/kg/min to obtain stable haemodynamics) and rocuronium. All patients received 125 mg of IV methylprednisolone and a local wound infiltration of lidocaïne 1% with epinephrine (1/80000). Postoperative analgesia was achieved with IV paracetamol 1 g q6h (1st dose given before arousal) and piritramide Patient Controlled Analgesia. We recorded peroperative remifentanil consumption, postoperative pain evaluated with VAS (0–10 cm) at 0, 1, 2, 4, 8, 24, 48, 72 post-operative hours in parallel with the piritramide consumption. Statistical analysis used ANOVA, Student t-test and Mann-Whitney test with significance above 0.05. Results are mean ± SD.
Results: Demographic data were similar among the two groups. Total remifentanil consumption was reduced from 0.23 (±0.08) μg/kg/min in group PL to 0.17 (±0.07) μg/kg/min in group GP ($p = 0.03$). At each postoperative time, the VAS score for pain as well as piritramide consumption were not significantly different between the two groups.
Conclusions: In NTOS surgery, gabapentin premedication (1200 mg) reduced peroperative remifentanil consumption. Nonetheless, it fails to demonstrate an opioid sparing effect in the postoperative period.
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A-863

Patient controlled epidural analgesia using bupivacaine-fentanyl-adrenaline mixture combined with single dose of ketamine

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Background and Goal of Study: Epidural analgesia using continuous infusion of triple mixture of bupivacaine, fentanyl, and adrenaline provides effective postoperative analgesia after surgery [1]. Ketamine as a NMDA-receptor antagonist given alone or combined with opioids has been shown to reduce the postoperative pain [2]. Thus, the main goal of our study was to assess the efficacy and safety of adding ketamine to a triple mixture in the patient controlled epidural analgesia (PCEA) after thoracotomy.
Materials and Methods: We enrolled 50 adult patients after major thoracic surgery in a prospective, randomized study. All patients have received PCEA using 0.125% bupivacaine, 2 mcg/ml fentanyl, and 2 mcg/ml adrenaline either without (TRIPLE group, n = 25; 44 ± 2 yrs; 22 males/3 females) or with ketamine (single bolus 0.5 mg/kg epidural) (KEPI group, n = 25; 46 ± 2 yrs; 20 males/5 females). Pain scores were assessed in rest and coughing by 100-mm visual analog scale (VAS) at 1, 3, 6, 12, 18, and 24 h after ICU admission. In addition, the consumption of drugs and the incidence of adverse effects (sedation, pruritis, urine retention, and nausea/vomiting) were recorded. Data were compared using Student's *t*-test and χ^2 test. $p < 0.05$ was regarded as statistically significant.
Results and Discussions: In coughing, VAS was significantly lower in the KEPI group comparing with the TRIPLE group at 3 and 6 h after ICU admission. The consumption of drugs required for the adequate analgesia (VAS < 30) decreased significantly in the KEPI group as compared to the TRIPLE group and was 133 ± 13 vs. 213 ± 21 mg/24 hours and 212 ± 17 and 319 ± 22 mcg/24 hours for bupivacaine and fentanyl, respectively ($p < .05$). We did not register pruritis, urine retention, nausea, and vomiting in both groups. The sedation scores also were similar between the two groups.
Conclusion: During PCEA, the addition of the single bolus dose of ketamine to the triple mixture provides better postoperative pain relief. This approach decreases consumption of bupivacaine-fentanyl-adrenaline mixture and does not increase the incidence of the adverse effects, thus, improving quality of analgesia.
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A-864

Intraoperative use of an intravenous lidocaïne infusion has a morphine sparing effect after remifentanil-based anesthesia

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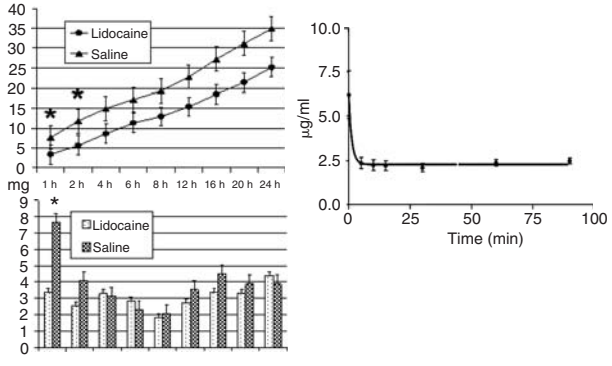
Background and Goal: 1° to evaluate the postoperative (PO) morphine (M) sparing effect of continuous iv lidocaïne (L) during remifentanil (R) based TIVA and 2° to measure the pharmacokinetic (PK) profile of L.
Materials and Methods: In a prospective double-blind placebo (P) controlled study, after ethics committee approval and informed consent, 41 patients (pts) undergoing lower open or coelioscopic abdominal surgery received after induction with propofol TCI 4 mcg/mL and R 0.15 mcg/kg/h, L 1.5 mg/kg bolus, followed by L 2/mg/k/h or P (saline) till end of surgery. Blood L concentrations were measured before bolus and during 90 min, then again from end of infusion for 90 min. M was given by PCA. M consumption, VAS and SVS pain scores, sedation, PONV and shivering were measured and assessed at 1, 2, 4, 6, 8, 12, 16, 20 and 24 hours.
Results: There was no group difference in pts' demographic or operative data. In L group, PO M consumption was lower during the 1st PO h and cumulative M doses show less M consumption during the first 2 PO h. Pain scores were not different between groups. Figures (mean ± SE) show at
–*left*: M consumption (upper) cumulative and (lower) at time intervals. *p ⩽ 0.05 L compared to P and
–*right*: intraoperative L concentrations.



Conclusions: In lower abdominal surgery and R based TIVA, intraoperative iv lidocaïne
1° had a sparing M effect during the early PO period after R anesthesia and could prevent hyperalgesia from R and
2° has a predictable PK plateau profile during continuous infusion.

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A-865

ON-Q pain relief system in combination with patient controlled analgesia (PCA) versus PCA, in upper abdominal surgery

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Background and Goal of Study: Wound pain is considered as a significant contributor of postoperative pain after abdominal operations. We evaluated the efficacy of a wound placed catheter with continuous application of a local anesthetic solution regarding postoperative need for opioid medication.

Materials and Methods: 148 ASA I–III patients who underwent elective upper abdominal surgery were randomized in two groups for postoperative pain treatment. The catheter group (n = 75) had a subfascial infusion with 0.5% ropivacaine delivered by an elastomeric pump with a rate of 2 ml/hr through a catheter (ON-Q by I-Flow-Corp., CA, USA) placed below the rectus fascia and above a closed peritoneum, in combination with patient controlled analgesia (PCA). The non catheter group (n = 73) was treated postoperatively only with PCA. In both groups the PCA was administered with morphine 2 mg/ml, bolus 1.5–2 mg, lockout 20 min, and maximum dose 22 mg/4 h. There were no statistically significant differences regarding patient demographics in both groups. We evaluated postoperative pain scores at rest and on coughing after the awakening, and at 2, 6, 12, 24, and 48 hours postoperatively. The pumps are removed at 48 hours. We also evaluated the total opioid consumption during this evaluation period, the local anesthetic toxicity and the quality of wound closure. All groups received the same anesthesia regimen. Ondasetron 4 mg IV bolus was administered during anesthesia induction. Pain was rated according to a numerical scale from 0 to 4. The presence of nausea or vomiting (N/V) was evaluated according to numerical scale from 1 to 3 (1 no nausea, 2 nausea only, 3 vomiting).

Results and Discussions: Postoperative pain scores at rest and on coughing at the same evaluation phases in both groups had no statistically significant differences. The catheter group had less opioid (morphine) consumption: 0.24 ± 0.14 mg/kg/48 h, vs the non catheter group 0.78 ± 0.48 mg/kg/48 h, ($p < 0.01$). Only one patient from the catheter group had a wound infection. Comparison between the two regimens of postoperative analgesia is shown in the table below:

	Catheter group	Non catheter group	P
Pain score	1.49 ± 0.3	1.59 ± 0.2	NS
N/V	1.12 ± 0.08	1.15 ± 0.07	NS

Conclusion(s): The ON-Q Pain Relief System in combination with PCA is a safe part of the multimodal approach to postoperative analgesia. The results suggest that under the conditions of the study protocol the postoperative needs of opioids, as they delivered with PCA technique, were less in patients who had a subfascial continuous infusion of local anesthetic through a ON-Q catheter.

A-866

Patient controlled intravenous morphine, epidural morphine, epidural morphine-bupivacaine and epidural morphine-ropivacaine combinations for the management of post thoracotomy pain

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Background and Goal of Study: Acute postthoracotomy pain is one of the most painful procedure and a variety of analgesic techniques are used for to control it (1, 2). The aim of this randomised, double-blind, prospective study was to determine the effectiveness of intravenous or epidural use of morphine, bupivacaine or ropivacaine on postthoracotomy pain.

Material and Methods: 60 patients undergoing thoracotomy were randomly allocated into 4 groups by sealed envelop technique. Group IVM (n = 15), EM (n = 15), Group EMB and Group EMR (n = 15) received patient controlled intravenous morphine, epidural morphine, epidural morphine-bupivacaine and epidural morphine-ropivacaine respectively. Preoperative haemodynamic variables were noted and pain while at rest and coughing were assessed with VAS (0–10 cm) at 30 and 60 minutes and 2, 4, 6, 12, 24, 36, 48, and 72 hours after surgery. diclophenac potassium 75 mg im was administered when VAS > 4 cm. ANOVA, Kruskall Wallis One-Way ANOVA and Chi-Square tests were used and $p < 0.05$ was considered as significant. Values are expressed as median and interquartile range.

Results: Patients characteristics and demographic data were similar among groups. Diclophenac potassium requirement during the study was lower in Group EM 75 mg (0–150) compared with Group IVM 225 mg (75–225) ($p = 0.039$), Group EM 225 mg (75–300) ($p = 0.006$) and Group EMR 225 mg (150–375) ($p = 0.02$). Area under VAS-time curve was lower in Group EM 335 cm^2 (305–375) compared to Group IVM 445 cm^2 (355–462) ($p = 0.028$) but similar with Group EMB 447 cm^2 (290–520) and Group EMR 395 cm^2 (270–512). Pain scores at rest were higher at the 12, 24, 36, and 48 hours in Group IVM compared to Group EM ($p < 0.05$).

Conclusion: Epidural morphine with or with bupivacaine or ropivacaine provides similar postoperative analgesia profile in postthrocatomy pain. However, Group EM provides least additional analgesic requirement among groups. The preference for management of postthrocatomy pain depends on the experience care provider and the choice of the patient.

References:

1 Bloch MB, et al. Anesth Analg 2002; 94: 523–8.
2 Kavanagh BP, et al. Anesthesiology 1994; 81: 737–59.

A-867

Readdressing the challenge of morphine in high thoracic patient-controlled epidural analgesia

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Background and Goal of Study: Epidural analgesia (EA) using continuous infusion of local anesthetics combined with fentanyl provides effective postoperative analgesia after thoracotomy (1). However, the safety of morphine application in thoracic epidural analgesia still remains disputable. Thus, the main goal of our study was to assess an efficacy and safety of high thoracic patient-controlled epidural analgesia (PCEA) with morphine-bupivacaine mixture.

Materials and Methods: We enrolled 64 adult patients undergoing major thoracic surgery in a prospective study. After placing epidural catheter at Th4–Th5 level, all patients were randomized in three groups. Twenty patients have received PCEA with morphine 100 mcg/ml in 0.125% bupivacaine solution (PCEA group; n = 20). In other groups, these analgesics were given either via bolus injections (BEA group; n = 22) or as a continuous epidural infusion of morphine 100 mcg/ml in 0.125% bupivacaine solution (CIEA group n = 22). Pain scores and the incidence of the adverse effects were assessed during first 24 hours after surgery. Data were compared using Student's *t*-test and χ^2 test with Bonferroni correction. $p < 0.017$ was regarded as statistically significant.

Results and Discussions: The VAS scores in rest and coughing were similar between the three groups. The consumption of the analgesics necessary for the adequate analgesia during first 24 h after surgery was significantly lower in the PCEA group compared with the BEA and CIEA groups. We did not observe any episodes of an excessive sedation in all the groups. In the BEA and CIEA groups, the incidence of nausea was 27% and 9%, respectively. These adverse effects were not found during PCEA ($p < 0.017$). An opioid-induced pruritis was mostly observed in the BEA group (32%).

Conclusion: Thoracic PCEA with morphine-bupivacaine solution provides adequate postoperative analgesia after thoracotomy and reduces the analgesic consumption, In addition, PCEA reduces the incidence adverse effects of morphine.

Reference:

1 Macias A, et al. *Anesth Analg* 2002; 95: 1344–1350.

A-868

The efficacy of levobupivacaine plus epinephrine scalp infiltration in reducing pain severity and analgesic requirements after supratentorial craniotomy

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Background and Goal of Study: Scalp infiltration with local anesthetics is commonly used in patients undergoing elective craniotomy procedures. The objective of this study was to assess the efficacy of pre- and postincisional local anesthetic scalp block on decreasing the severity of postoperative pain and the need for analgesic requirements.

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Materials and Methods: Forty (40) patients ASA I–III, aged 24–67 scheduled for supratentorial craniotomy were enrolled in this controlled study. They were randomly divided into two groups: group A (30 ml 0.25% levobupivacaine + 5 mcg/ml adrenaline) and group B (30 ml N.Saline 0.9%). Scalp block was performed before skin incision and before closing the subcutaneous tissue. Postoperatively, pain level was assessed at 4, 8, 12 and 24 h using visual analog scale score (VAS). The total amount of paracetamol (for VAS 0–5) as well as the total dose of dextropropoxyphene (for VAS ⩾6) given to patients were recorded during the first 24 h after surgery.
Results and Discussion: All data are reported as mean ± standard deviation (SD). Comparisons between the two groups were carried out using Student's t-test for normal data (minimum time to initial analgesic intake), and Wilcoxon's Rank-Sum test, when the data were not normally distributed (VAS score, total paracetamol dose and total opioid dose). Demographic data were comparable in both groups. P value < 0.05 was regarded as statistically significant. Postoperatively, the minimum time (in minutes) to initial analgesic intake was 563.00 ± 151.52 for group A and 138.50 ± 85.24 for group B ($p < 0.0001$). Mean VAS score was 3.75 ± 1.29 for group A and 5.00 ± 1.08 for group B ($p < 0.0001$). The total dose of paracetamol given (mg) was 690.00 ± 487.64 for group A and 1320 ± 313.89 for group B ($p < 0.0001$). However, there was borderline statistically significant difference in the amount of opioid administration (mg) between the two groups (7.50 ± 23.08 for group A and 45.00 ± 66.19 for group B respectively, $p = 0.0501$).
Conclusion(s): Scalp infiltration was successful in decreasing pain in the immediate postoperative period after supratentorial craniotomy. Further studies are needed to elucidate its precise pain modulating beneficial action.
Reference:
1 A. Nguyen et al. Anesth Analg 2001;93(5):1272–6.

A-869

A prospective, randomized study of pain control management using continuous infusion of local anesthetic following thoracotomy

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Background and Goal of Study: Inadequate pain control after thoracotomy can result in increase morbidity and hospital length of stay (LOS). Although thoracic epidural pain management is the current standard of care, is labor intensive with major complications. We sought to determine the clinical effectiveness of intercostal-incisional infusion of local anesthetic (Ropivocaine) via a continuous infusion elastomeric pump for management of postoperative pain following thoracotomy.
Materials and Methods: In this prospective randomized placebo-controlled double-blind clinical trial, 28 patients underwent thoracotomies. The patients were randomly assigned to receive normal saline (control: 14 patients) or Ropivocaine (14 patients) via an elastomeric infusion pump at a 4 ml/hour infusion rate. Both groups received patient control iv morphine (PCA). Patients evaluated by 10 points pain scale and doses attempted and given by PCA. Data sources were reviewed for lung volumes, hospital stay and complications.
Results and Discussions: The total amount of narcotic analgesia required by Ropivocaine group was significantly less than the control group (45.1 mg vs. 85.3 mg, $p = 0.038$). The mean overall pain scores for Ropivocaine group were significantly less than the mean overall scores for the normal saline group (3.5 vs. 4.5 respectively, $p = 0.005$). There were difference in assessment of pulmonary function and LOS was 5.5 days versus 8.5 days in control group ($p = 0.001$).
Conclusions: Continuous intercostal-incisional infusion of Ropivocaine via elastomeric infusion pump is safe and effective adjunct in postoperative pain management for thoracotomy. There is an increase in pulmonary function and reduce in narcotic usage and hospital stay.

A-870

Comparison of two different concentrations of levobupivacaine administered via epidural catheter for analgesia in postthoracotomy patients

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Background and Goals: Two different concentration of levobupivacaine associated with sufentanil were administered in continuous epidural post-thoracotomy infusion to investigate quality of analgesia, motor block and side-effects.
Methods: After obtaining patient informed consent, we enrolled 72 patients aged 20–75 yr, ASA physical status I to III, undergoing elective postero-lateral thoracotomy for lobectomy or pneumonectomy. Before the induction of general anaesthesia, a catheter was placed into the epidural space at thoracic level (T4–T7) with paramedian approach under local anaesthesia and an initial dose of levobupivacaine 0.25% (15 ml) plus 30 mcg of sufentanil was administered. Anaesthesia was standardized using propofol for the induction and sevoflurane for the maintenance. Patients were randomly assigned to receive two different levobupivacaine concentrations via epidural catheter (group A: 0.125% and group B: 0.0625%) in addition to sufentanil at the fixed concentration of 1 mcg/ml through an elastomeric pump at a rate of 5 ml/h to control postoperative pain for a 48 hours period. Intravenous morphine patient-controlled analgesia was given as rescue analgesia. Sensory and motor blockade, sedation level, visual analogue scale pain score (VAS), and cardiovascular parameters were also recorded at regular intervals postoperatively. Student's t-test and analysis of variance were used for the statistical analysis.
Results: Patients of each group reported similar VAS at rest although VAS after cough resulted in group A for the first 3 postoperative hours. Morphine total rescue dose was significantly greater in group B. Patients of group A presented low incidence of nausea, vomiting and pruritus probably because of the smaller amount of rescue morphine administered. No significant variations in cardiovascular parameters were observed in the two groups; sedation, sensory and motor block did not occur in any patient.
Conclusions: Epidural levobupivacaine at the concentration of 0.125% in combination with sufentanil allowed us to obtain a good pain control in patients undergoing thoracotomy for lung resection with no adverse effects and motor block at all.
Reference:
1 Foster RH, Markham A. *Drugs* 2000;59:551–579.

A-872

Pain after laparoscopic gynecological surgery and transabdominal or transvaginal hysterectomy

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Background and Goal of Study: Laparoscopic procedures are considered to be less painful than transabdominal or transvaginal hysterectomies[1]. Thus, we conducted a questionnaire survey and evaluated pain perception after laparoscopic (L) vs. "open" gynaecological surgery (O).
Materials and Methods: 81 women who underwent one of these procedures were asked to answer a pain questionnaire the evening before hospital discharge. 43 questionnaires were returned and analysed statistically by Chi-square Test and one-way ANOVA. $p \leqslant 0.05$ was considered to be significant.
Results and Discussions: Results are presented in the Table. No differences in demographic data were detected between the groups. While the mean pain scores and pain localization did not differ, patients in Group L reported more pain during mobilization and coughing, but were discharged earlier from hospital.

Group		L	O
Patients (N)		43	38°
Questionnaires returned		25 (58.1%)	18 (47.4%)°
Pain intensity			
NRS 1–10 (Mean ± SD)		5.04 ± 1.84	4.17 ± 2.43°
Region	Skin	15 (62.5%)	10 (62.5%)°
	Abdomen	13 (54.2%)	5 (31.3%)°
	Shoulder, back	9 (37.5%)	5 (31.5%)°
Time of worst pain	Immediately after surgery	5 (21.7%)	3 (18.8%)°
	First 24 hours after surgery	11 (47.8%)	8 (50%)°
	Days 2 and 3 after surgery	4 (17.4%)	6 (37.5%)°
	Mobilization and coughing	13 (56.6%)	2 (12.5%)*
Days in hospital (SD)		4.9 (1.7)	7.3 (2.7)**

°no significant difference *$p \leqslant 0.005$ **$p \leqslant 0.001$.

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Conclusion(s): We conclude, that, while patients following L had a shorter stay in hospital, pain scores did not differ between the groups and were higher in Group L during mobilization and coughing.

Reference:

1 Teng SW. J Am Assoc Gynecol Laparosc 2003; 10(4): 474–7.

A-873

Postoperative analgesia in thoracic surgery: an Italian survey of 56 centers

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Background and Goal of Study: Effective analgesia may improve outcome and speed up recovery following thoracic surgery. There have been a number of analgesic techniques used to achieve this end point. The aim of the study is to analyze current practice of pain treatment after lung resection surgery in 56 dedicated italian centers.

Materials and Methods: A four-pages questionnaire was submitted to thoracic anesthesiologists by telephone or e-mail interview. The questions referred to local standards about postoperative pain treatment techniques, pain measurement regimen and incidence of side effects.

Results and Discussions: The most common technique is epidural analgesia (52%), with midthoracic level catheter placement (84%), using opioids and local anesthetics (76%) and for up to 3 days (42%). Overall use of Epidural PCA is 12%. Although i.v. continuous opioids infusion is frequently used (48%), on demand i.v. boluses are the sole technique in 12% of cases. Pain measurement is performed by 70% of anesthesiologist or nurses at least one time during the day and 55% of responders only use VAS o NRS scale for pain assessment.

Conclusion(s): Despite significative differences among the centers, Italian anesthesiologists are moving to more effective analgesic techniques for thoracic surgery, especially epidural infusion of local anesthetics and opioids. Further efforts are needed in carefully evaluating the impact of pain therapies.

A-874

Post-operative analgesia in patients undergoing cardio-thoracic surgery

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Background and Goal of Study: Inadequate control of post-operative pain in cardio-thoracic surgery can provoke serious complications (1).

The objective of this study was to determine the type of analgesia received by patients undergoing cardiac or thoracic surgery, as well as what percentage of them were controlled by the acute pain service (APS).

Materials and Methods: We conducted a retrospective analysis of the analgesia received by patients undergoing cardio-thoracic surgery who were visited by the APS during the year 2004.

Results and Discussions: Of the 1,036 cardio-thoracic surgery patients, the APS controlled 202. In Cardiac Surgery (CS), 17.3% were controlled by the APS (111/641), all of them receiving patient-controlled analgesia (PCA) of intravenous morphine. The mean number of visits was 1.9.

Thoracic surgery (TS) patients controlled by APS represented 23% of the TS operations throughout the year (91/395). 60% of these received epidural PCA with ropivacaine and fentanyl; 27% received epidural methadone; and 13% PCA with intravenous morphine. The mean number of visits was 2.3.

The degree of pain (visual analogic scale VAS) is shown in table I as percentage of patients.

Table I. Pain in cardiac and thoracic surgery

	Cardiac surgery			Thoracic surgery		
	VAS < 3	VAS 3–6	VAS > 6	VAS < 3	VAS 3–6	VAS > 6
6 h	68%	22%	10%	51%	45%	4%
12 h	61%	35%	4%	71%	24%	5%
24 h	75%	24%	1%	78%	17%	5%
48 h	87%	13%	0%	89%	11%	0%

Incidence of nausea and vomiting was 11% for CS and 5.5% for TS. There were no cases of respiratory depression.

Conclusion(s): The control of postoperatory pain in CS and TS with PCA is satisfactory in cases of severe pain, VAS greater than 6, less than 10%. However, the percentage of cardio-thoracic patients controlled by APS remains low.

Reference:

1 Kehlet H, Holte K. Effect of postoperative analgesia on surgical outcome. Br J Anaesth 2001 Jul;87(1):62–72.

A-875

Acute Pain Units: What outcomes should be measured?

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Background and Goal of Study: There is great heterogeneity data concerning results following different procedures undertaken in Acute Pain Units. We propose to define a series of indicators of effectiveness and safety in the postoperative analgesic treatment, which help to gain homogeneity.

Materials and Methods: A computerized registration was developed (Form APU-HP-Doctor) to record daily follow-up data in APU patients at our institution. From these data, 20 previously defined outcome indicators were obtained in accordance with previous studies (1), trying to allow comparison among different APUs.

Results: Case-mix, Effectiveness, Safety and Satisfaction, were considered major outcome indicators. 1519 patients were followed in our APU during an 18 months period. Summary of results: Effectiveness 90% (Epidural PCA 90% – IV PCA 92% – Regional PCA 92%). Pain NRS (numeric rate score) 3–7 at rest 11%, at movement 7%. Pain NRS > 7 at rest 5%. 53% adverse events were found and 81% of them were fully solved. The most frequent adverse events according to analgesic procedure were: Insufficient analgesia (14%), Numbness (13%) and Nausea/vomiting (9%) for Epidural PCA; Nausea/vomiting (18%), Sedation (10%) and Insufficient analgesia (9%) for IV PCA; Insufficient analgesia (9%), Motor block (6%) and Numbness (5%) for Regional PCA. We found two serious adverse events, one poliradiculopaty (0.1%) after epidural analgesia, and one respiratory depression (hypoxemia) (0.1%) with intravenous analgesia. Patients Satisfaction rate was 90%.

Conclusion: Systematized registration of APU data allows us to analyze the effectiveness and the safety of treatments. We believe that it is important to promote a clear definition of outcome indicators, allowing an internal as well as an external comparison of results among different APUs. Future developments of our Form-APU (HP-Doctor) would ideally include other variables as cost-measures, workload and patient's comfort.

Reference:

1 Dolin SJ, Cashman JN, Bland JM. Effectiveness of acute postoperative pain management: Evidence from published data. Br J Anaesth 89 (2002) 409–423.

A-876

Prevalence of pain in the Czech Republic

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Background and Goal of Study: Pain has been recognised as an important social problem. As there has not been any data concerning the prevalence of chronic pain in the Czech Republic available we decided to arrange a nation-wide cross-sectional epidemiological study.

Materials and Methods: A four page anonymous questionnaire was created which had been validised in a pilot study. Self-administered four-pages questionnaire was divided into several parts: basic demography, self-assessment of health status and well-being, prevalence of pain and its characteristics, influence of pain on various activities, accessibility of pain therapy and its quality. The population was stratified to represent the Czech population and the questionnaire was personally distributed to a random sample.

Results and Discussions: 3698 questionnaires (1739 men, 1959 women) were processed by epidemiological statistical programme EPI-INFO. The results showed that 13.5% (11% men, 15% women, $p < 0.05$) had pain lasting longer than 3 months. This prevalence increases with age. The main sources of problems are back pain, headaches, osteoarthritis and menstrual pain in women. Medical care for pain therapy was used by 83% of men and 86% of women. Regular analgesic medication was used more frequently by women (32%) than by men (21%, $p < 0.01$). Although the majority of respondents (75%) were satisfied with accessibility and quality of medical care, the effect of therapy was evaluated as average and the majority of pain sufferers did not believe in improvement. Chronic pain affected many activities of daily life.

Conclusion(s): The prevalence of chronic pain in the Czech Republic is less than in other countries, but the location and risk factors are the same.

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A-877

Do obese patients require less postoperative analgesia?

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Background and Goal of Study: There are relatively few studies on postoperative requirements for the obese patients. Opinions in the literature are more in favor of "less analgesia" because of the "depot" role of the adipose tissue and endogenous endorphins (1, 2).

Materials and Methods: 39 patients ASA I/II scheduled for laparoscopic cholecistechtomy where devided into 2 groups, based on BMI. Group 1 ($n = 19$) included normoponderal patients and group 2 ($n = 20$) included obese patients (BMI $\geqslant 30$). General anaesthesia was induced with fentanyl, propofol and rocuronium and maintained with isoflurane. Prior induction, all patients received dexamethasone 4 mg. Postoperative analgesia (on VAS) and petidine requirements (administrated as 20 mg IV boluses on request and when VAS $\geqslant 3$) as well as other side effects where recorded every 6 h for the first 24 h postoperatively.

Results and Discussions: Table 1 shows the main results:

	Normal weight patients	Obese patients
Age (years)	53.47	51,45
Gender (M/F)	1/18	2/18
Weight (kg)	69.59	90.9
BMI (kg/m^2)	25.89	34.54
ASA (I/II)	5/14	2/18
Intraop fentanyl (mg/Kg)	0.5421	0.54
VAS (1–5)	3.68	3.64
Postop pethidine (mg/kg)*	60.52	33.5

* $p < 0.05$.

Conclusion(s): Postoperative analgesic requirements were significantly reduced on obese patients.

References:

1 Buckley FP, In Barash PG, et al. (3rd ed) Clinical anesthesia, Lippincott-Raven, Philadelphia, 1996: 975–991.

2 Rand CSW. J Psychosom Res 1985; 29: 43–46.

A-878

Acute postoperative pain services in the Republic of Ireland

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Background and Goal: The objective of this survey was to assess acute postoperative pain services in teaching hospitals in the Republic of Ireland. This is information that has not previously been available.

Materials and Methods: Postal questionnaires were sent to teaching hospitals in the Republic of Ireland ($n = 40$). The detailed questionnaire dealt with current and future acute pain services and related topics.

Results and Discussion: Thirty one out of the 40 teaching hospitals returned a completed questionnaire representing a response rate of 78%. Seventy one percent (22/31) of teaching hospitals had acute postoperative pain services and an additional 23% (7/31) had plans to establish such services. Eighty five percent (19/22) of acute pain services were established in the last 15 years with 45% (10/22) in the last five years. Ninety one percent (20/22) of hospitals who provided an acute pain service selected the control of post operative pain as their primary goal and all of these hospitals offered Patient Controlled Analgesia (PCA). Anaesthestists were responsible for acute pain services in 91% (20/22) of hospitals. Fifty two percent (16/31) of hospitals included pain as a factor in their quality assurance structures while 87% (27/31) of clinicians surveyed believed that the trend in pain consultations is increasing.

Conclusions: Despite a growing trend in formalised acute postoperative pain services and the publication of guidelines, 29% (9/31) of the teaching hospitals in the Republic of Ireland do not have such services. Further resources and greater urgency need to be implemented to address this deficiency at improving the management of acute postoperative pain.

A-879

The prevalence of chronic postmastectomy pain in the Czech Republic

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Background and Goal of Study: There is growing evidence that after successful surgical treatment many patients suffer chronic pain. The most common estimates of chronic postmastectomy pain are between 40–50%. The aims of our study were to discern the prevalence of postmastectomy pain in the Czech Republic, to identify risk factors and to obtain basic information about the quality and efficacy of pain therapy.

Materials and Methods: An anonymous questionnaire was developed, which consisted of demography, type of the surgery, oncology therapy, the presence of pain and its characteristics and the type and efficacy of analgesic therapy and was distributed to patients 6–12 months after breast surgery.

Results and Discussions: Six hundred and thirty four of the 650 questionnaires distributed were completed and returned (97.5% response rate). This represents over 10 percent of breast cancer incidence in the Czech Republic. Chronic pain was described by 180 of the respondents (28.4%). Being younger than 55 years of age ($p = 0.001$) or having had lumpectomy (versus total mastectomy, $p = 0.035$) were independent predictors of developing postmastectomy pain. A history of strong postoperative pain ($p < 0.001$) was also a predictor. There was also greater probability in developing chronic post mastectomy pain after radiotherapy ($p = 0.007$), and the same, though insignificant, trend was seen for chemotherapy ($p = 0.055$). Chronic pain was related to increased physical activity of respondents ($p = 0.014$), decreased muscle strength ($p < 0.001$), lymphoedema ($p < 0.001$) and decreased skin sensitivity ($p < 0.001$). There was no apparent relation between pain and depression (self-assessment of the patients, $p = 0.326$).

Conclusion(s): We can summarise, that the prevalence of chronic postmastectomy pain was usually lower than in other countries, but the predictors were the same.

A-880

Perioperative opioid consumption is enhanced in patients with Crohn's disease

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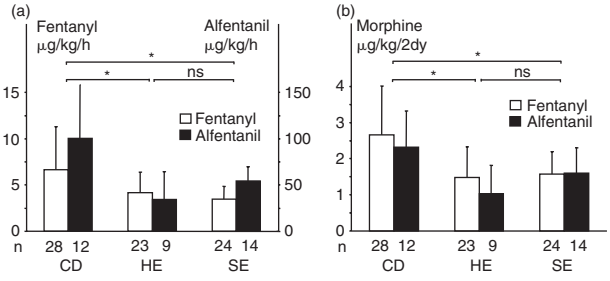
Background and Goal of Study: The aim of this retrospective study was to compare intra- and postoperative consumption of analgesics between patients undergoing hemicolectomy (HE), sigmoidectomy (SE), and abdominal surgery due to Crohn's disease (CD).

Materials and Methods: In a retrospective review of medical charts we analyzed all patients with the above designed procedure in the years 2001–2004. Intraoperative opioid consumption (fentanyl or alfentanil) and postoperative demand of analgesics (morphine, non-opioid analgesics) were compared among patients with CD, HE and SE. Doses of analgesics were normalized by weight. Postoperative demand for morphine was assessed using patient controlled analgesia.

Results and Discussions: Patients with CD where significantly younger (35 ± 12 vs. 67 ± 13 and 57 ± 13, mean $\pm$ SD) than patients with HE and SE. There was no difference in gender and postoperative consumption of non-opioid analgesics among the groups. Intraoperative opioid consumption and postoperative demand for morphine (Figures A and B, respectively, *$p < 0.05$ Bonferroni corrected t-tests) were significantly different in patients with CD vs. patients with HE or SE.



Conclusions: Patients with CD showed a higher demand for opioids during surgery and for morphine in the postoperative period than patients with SE or HE. Since patients with CD were significantly younger, age-related effects must be considered. However, further research is warranted to determine the underlying mechanism of this observation. Since CD is known to have several underlying genetic mutations (e.g. NOD2, CARD15) with an overexpression of inflammatory proteins, the enhanced pain sensitivity might be related to this fact.

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A-881

Interaction between epibatidine and clonidine in spinally mediated analgesia in rats

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Background and Goal of Study: Nicotinic acetylcholine receptor and α_2 adrenoceptor had a great role in pain mechanism in the spinal cord. We investigated the analgesic interaction between spinally administered nicotinic acetylcholine receptor agonist, epibatidine and α_2 agonist, clonidine using rats.

Materials and Methods: Sprague-Dawley rats with lumbar intrathecal catheters were tested for their thermal tail withdrawal response using the tail flick test and for their paw flinches by formalin injection after intrathecal administration of epibatidine or clonidine. The effects of the combination of epibatidine and clonidine were tested by an isobolographic analysis using ED_{50} (50% effective dose) values. Eight rats were used in each dose group. Behavioral side effects were also investigated.

Results and Discussions: ED_{50} values are shown.

	Tail flick	Formalin phase 1	Formalin phase 2
Epibatidine (ng)	32.0 (22.5–45.6)	37.4 (21.5–65.1)	26.8 (6.2–45.8)
Clonidine (μg)	0.26 (0.16–0.42)	0.12 (0.07–0.20)	0.13 (0.07–0.25)
Epibatidine in combination (ng)	12.4 (3.4–35.9)	13.9 (2.0–39.0)	24.6 (9.5–46.0)
Clonidine in combination (μg)	0.10 (0.03–0.37)	0.07 (0.01–0.28)	0.12 (0.03–0.77)

(): 95% confidence interval.

Behavioral side effects decreased by combinations compared with each single agent.

Conclusions: Intrathecal epibatidine and clonidine had additive effects on thermal and inflammatory induced acute pain, but had antagonistic effects on inflammatory induced facilitated pain.

A-882

Intraarticular injection of the cyclooxygenase-2 inhibitor parecoxib attenuates osteoarthritis after anterior cruciate ligament transection: role of excitatory amino acids

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Background and Goal of Study: We previously reported an increase in levels of the excitatory amino acids (EAAs), glutamate and aspartate, in joint dialysates of the anterior cruciate ligament-transected (ACLT) knee in rats which developed osteoarthritis (OA). Our present objective was to examine the effect of intra-articular injection of the cyclooxygenase-2 (COX-2) inhibitor, parecoxib, on OA development and concomitant changes in EAA levels in the ACLT knee joint dialysate.

Materials and Methods: OA was induced in Wistar rats by transection of the ACL in the knee of one hindlimb, the other knee being left untreated. The ACLT animals were divided into two groups, one (n = 9) receiving intra-articular injections of parecoxib (100 μg/0.1 ml) in the ACLT knee once a week for 5 consecutive weeks starting 8 weeks after surgery and the other (n = 8) identical injections of normal saline. A sham-operated group (n = 9) underwent arthrotomy, but not ACLT, of one knee and received no treatment. Twenty weeks after surgery, knee joint synovial fluid were collected by microdialysis for EAA assay by high performance liquid chromatography, and the medial femoral condyles and synovia underwent gross morphological examination and histopathological evaluation.

Results and Discussions: Rats receiving parecoxib showed a significant lower degree of cartilage degeneration on the medial femoral condyle at both the macroscopic level and on the Mankin grading scale than rats receiving saline. Intra-articular parecoxib injection also suppressed the inflammatory reaction of the synovia. Moreover, glutamate and aspartate levels in the ACLT knee joint dialysates were significantly reduced by parecoxib treatment compared to the saline group.

Conclusions: This study demonstrates that one of the underlying mechanisms of the anti-inflammatory effect of the COX-2 inhibitor, parecoxib, is inhibition of glutamate and aspartate release in ACLT knee joints, thus attenuating the development of OA.

A-883

Comparison of non-pharmacologic pain treatment techniques during eye examinations for retinopathy of prematurity

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Background and Goals: Premature infants undergoing eye examination to screen retinopathy of prematurity (ROP) are facing pain and stress. The aim of the study was to compare the efficacy of applying local anesthetic (LA) and LA with oral sucrose and LA with music on ameliorating the pain and stress.

Material and Methods: 172 preterm infants (postconceptual age < 48 weeks and weight < 3500 g) included in the study. Age, weight, history at birth recorded and patients were randomized according to date. All infants received 0.5% proparacaine eye drops, Group Sucrose (S) were given 2 mL of 24% S solution immediately. Group Music (M) regional lullabies played from a tape in the room. The neonatal-infant pain scores (NIPS) were recorded immediately after LA application (arrival) and 1 min after, at placement of speculum (PS1) to first eye, during retinal depression (RD1), and repeating the same steps for the other eye (PS2, RD2), 1 and 2 min (departure) after the procedure is ended. The findings of Group LA (n = 50), Group S (LA + S, n = 60), Group M (LA + M, n = 62) were compared by using ANOVA tests.

Results: The groups were similar in gestational, postconceptual age, birth weight and weight at the time and incidence of ICU stay.

NIPS	Group LA, n = 50	Group S, n = 60	Group M, n = 62
Arrival	0.18 ± 0.95	0.14 ± 0.78	0.39 ± 1.52
PS1	5.25 ± 2.3	4.67 ± 2.72	6.02 ± 2.17*
RD1	6.53 ± 1.12	6.44 ± 1.17	5.65 ± 2.22*&
PS2	6.24 ± 1.83	5.74 ± 1.17	5.95 ± 1.99
RD2	6.59 ± 1.17	5.42 ± 1.31″	5.87 ± 2.13
Departure	0.12 ± 0.85	0.22 ± 1.02	0.43 ± 1.54

*Significant difference between Group S and M, &between LA and M, ″between LA and S; $p < 0.05$.

Discussion: Although the benefit of oral sucrose reported[1] during ROP screening infants the results in this study is very vague. The gain from listening lullabies is also controversial.

Conclusion: All precautions should be taken to minimize pain during ROP without increasing the risk of apnea and a more effective method should be searched.

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A-884

Validation of the electrical hyperalgesia model in human volunteers: effects of oral pregabalin and the NK1 antagonist aprepitant

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Background and Goal of Study: Central sensitization is a key mechanism of neuropathic pain. The electrical hyperalgesia model invokes central sensitization experimentally and could be used to detect efficacy of novel treatments in humans. To assess its predictive value, we have investigated pregabalin, a standard neuropathic pain treatment, and aprepitant, an NK1 antagonist, as an example of a drug class active in animal models but not in pain patients. Furthermore, we explored if combinations of either of these drugs with the COX-2 inhibitor parecoxib could improve its efficacy.

Materials and Methods: This was a double-blind, two-period, placebo-controlled, incomplete block design study in 32 healthy volunteers. In a baseline session, the intensity of intradermal electrical stimulation required to cause ongoing pain of 6 on the 11 point numeric rating scale was established; this evoked stable areas of pinprick hyperalgesia and dynamic touch allodynia. The same stimulation was used in the two subsequent sessions. Subjects received oral pregabalin or aprepitant (titrated to 300 mg and 320 mg, respectively) and placebo for 6 days prior to testing. On the day of testing, ongoing pain and sensitization were assessed over 3 hours; at 2 hours subjects received either parecoxib (40 mg) or saline i.v.

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Results and Discussions: Pregabalin significantly reduced the areas of hyperalgesia and allodynia vs. placebo ($P < 0.0001$); no significant effect on the area of hyperalgesia or allodynia vs. placebo was observed with aprepitant. In the group that received pregabalin + parecoxib, the area of allodynia was significantly reduced ($P < 0.0001$) and the area of hyperalgesia insignificantly attenuated ($P = 0.09$) vs. placebo + parecoxib; no efficacy improvement was observed with aprepitant + parecoxib. There was no significant effect on ongoing pain with any of the treatments. The side-effects of the treatments were mild and consistent with those observed in the clinic.
Conclusion(s): The model can serve to predict efficacy of analgesic treatments in early clinical development and provide hints on the mechanism of action in humans. It can also be useful for exploring efficacy of analgesic combinations to provide a rationale for patient studies.

A-885

Behavioral and pharmacological validation of the double plate technique: a new method to assess cold allodynia in neuropathic mice

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Background and Goal of the Study: Assessment of cold allodynia in mice can lead to problems of interpretation with classical methods such as a simple cold plate at 5°C or the acetone drop technique. Therefore, we developed a technique based on the preference of place between a thermoneutral plate (31 ± 1°C) and one regulated at 18 ± 1°C (over the cold noxious threshold considered to be 15°C). Preliminary experiments showed that the chronic constriction injury (CCI) was the most sensitive model of neuropathic pain among two others using this technique.
Materials and Methods: Using the double plate technique, we added further behavioral experiments to evaluate if any variation of duration of testing (5, 10 or 15 min) or variation of temperature (18, 22, 26, 31 ± 1°C) would change the behavior of CCI or naive C57BL/6 mice. An eventual habituation was also assessed with these animals. Finally, we used the double plate technique to evaluate the antiallodynic effects of gabapentin (50 mg/kg i.p.) and amitriptyline (10 mg/kg i.p.) in CCI mice.
Results and Discussion: CCI mice were significantly more sensitive to cold compared to naive mice. The level of significance was not modified by the various duration of observation ($P < 0.001$ for the three durations). The time spent on the cold plate was correlated to its temperature ($r = 0.98$ and 0.95 for naive and CCI mice, respectively). We did not observe any significant habituation of animals to one plate compared to the other. Cold allodynia induced by CCI surgery was reversed by gabapentin. Amitriptyline could not be tested with the double plate technique because of its sedative effect which reduced the explorative behavior of the mice.
Conclusions: The double plate technique allowed the assessment of cold allodynia in neuropathic animals. The advantages of this technique are that mice are confronted to a non-noxious cold stimulus and are also able to avoid the fierce stimulation due to the cold plate. The double plate technique is adequate for the assessment of analgesic drugs since sedative effects or motor impairments are readily detected with this technique.

A-886

Supra-additive effects of tramadol and paracetamol in a human pain model

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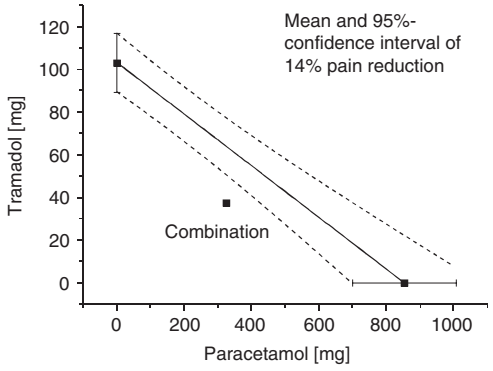
Background and Goal of Study: Combination of analgesic drugs with different pharmacological properties show better efficacy with less side effects. Aim of this study was to examine the analgesic and antihyperalgesic properties of the weak opioid tramadol and the non-opioid acetaminophen (paracetamol) alone and in combination in an experimental pain model in humans.
Materials and Methods: After approval of the local ethics committee, 20 healthy volunteers were enrolled in this double-blind and placebo-controlled study in a cross-over design. Transcutaneous electrical stimulation at high current densities (29.6 ± 16.2 mA) induced spontaneous acute pain (NRS = 6 of 10) and stable areas of hyperalgesia for painful mechanical stimuli (pinprick-hyperalgesia). Pain intensities as well as the extent of the areas of hyperalgesia were assessed before, during and 150 min after a 15 minutes lasting intravenous infusion of acetaminophen (650 mg), tramadol (75 mg), a combination of both (325 mg acetaminophen and 37.5 mg tramadol), or saline 0.9%.
Results and Discussions: Tramadol led to a maximum pain reduction of 12% with no antihyperalgesic properties. In contrast, acetaminophen led to a weaker pain reduction (8%), but sustained antihyperalgesic effects. The combination of both analgesics at half doses led to a supra-additive pain reduction of 14% (Fig., Isobole for 14% pain reduction) and enhanced antihyperalgesic effects as compared to single administration of acetaminophen (not shown).



Conclusions: Our study provides first results on interactions of tramadol and acetaminophen on experimental pain and hyperalgesia in humans. The results might act as a rationale for combining both analgesics.

A-887

Randomized comparison between two different insufflation pressure for laparoscopic cholecystectomy

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Background and Goal of Study: Laparoscopy has become the standard technique for cholecystectomy. The use of low pressure pneumoperitoneum has been shown to reduce adverse hemodynamic effect. The aim of this study was to compare cardiorespiratory changes and postoperative pain in patients undergoing laparoscopic cholecystectomy at an insufflation pressure of 8 or 13 mmHg.
Method(s): Forty, ASA physical status I or II patients, scheduled for elective laparoscopic cholecystectomy, were randomized to either high (13 mmHg) or low (8 mmHg) pressure capnoperitoneum.

Anaesthesia was standardized, and the end tidal CO_2 was maintained at 35–40 mmHg.

Cardiovascular data (heart rate, arterial pressure) and respiratory parameters were measured.

Patients were then asked to complete a 10-cm visual analogue scale (VAS) for abdominal pain.

The surgeon satisfaction was recorded with a three points score:

1 bad surgical conditions,
2 acceptable surgical conditions,
3 good conditions.

Statistical analysis was performed using the logiciel SPSS 11.0 for windows. A p value ⩽ 5% was considered as significant.
Result(s): The characteristics of patients were similar in two groups.

There were no significant difference in the heart rate, mean arterial pressure, arterial oxygen pressure (paO_2) and arterial carbon dioxide pressure ($paCO_2$).

The procedure was completed in all patients in the high pressure group; but one patient in low pressure group was converted to laparotomy.

Surgeon satisfaction was similar: good conditions: 80% (8 mmHg) vs 80% (13 mmHg) ($p < 0.05$).

Patients with high pressure insufflation developed more pain at H6 ($p = 0.03$) and H12 ($p = 0.02$).
Conclusion: Low pressure pneumoperitoneum is feasible in the laparoscopic cholecystectomy as it offers acceptable surgical conditions and a better postoperative analgesia.
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A-888

Preventive effects of nefopam on pain sensitization process induced by inflammatory pain infentanyl-treated rats

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Background and Goal of Study: Though the use of opioid analgesia is essential for pain management, it also induces an NMDA-dependent enhancement of hyperalgesia after inflammatory pain [1]. Previous studies have reported nefopam, an analgesic agent commonly used in post-operative pain management, decreased allodynia and hyperalgesia in rats [2] and reduced morphine consumption meanwhile potentiating its analgesic effect in humans [3]. The purpose of this study was to evaluate the interest of nefopam in painful rats (inflammation) to prevent enhancement of hyperalgesia and pain sensitization processes induced by high-doses of fentanyl.

Materials and Methods: First, the analgesic effects of a single injection of nefopam (10 or 30 mg/kg, s.c.) were evaluated on the Nociceptive threshold (Nt) in pain free rats. Second, we evaluated the preventive effect of nefopam (10 mg/kg on D_0) on hyperalgesia induced by twice injection of the pro-inflammatory drug carrageenan (D_0 and D_{13}) in fentanyl-treated rats ($4 \times 100\ \mu g/kg$ separated by 15 min on D_0).

Results and Discussions: In pain free rats, nefopam induced a dose-dependent analgesic effect. In rats with inflammatory pain, nefopam opposed the fentanyl enhancement of hyperalgesia induced by the first carrageenan injection. Moreover, in rats treated by fentanyl on D_0, the nefopam pre-treatment (D_0) opposed the exaggerated hyperalgesia induced by the second carrageenan injection performed 13 days later.

Conclusion(s): Our results show, for the first time, that nefopam has not only analgesic effects but also potent antihyperalgesic properties. Pre-treatment with nefopam may have a clinical impact on pain management by reducing both post-operative pain and pain sensitization leading to exaggerated and sustained hyperalgesia.

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A-889

Fentanyl induces both long-lasting hyperalgesia and anxiety. Prevention by nitrous oxide

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Background and Goal of Study: Although opioids are unsurpassed analgesics for surgery, they also induce an *N*-methyl-D-aspartate (NMDA)-dependent enhancement of postoperative hyperalgesia [1]. An hypothesis is that per-operatively treatment with nitrous oxide (N_2O), an NMDA receptor antagonist [2], could prevent long-lasting hyperalgesia [3] and related anxiety disorders.

Materials and Methods: On day 0 (D_0), different groups of rats received the pro-inflammatory drug carrageenan injection, fentanyl and/or 50/50% N_2O–O_2 mixture. Hyperalgesia was evaluated with the paw pressure vocalization test for several days. Moreover rats were exposed to repeated non-nociceptive environmental stress (D_{12}; D_{14}; D_{18}) or re-exposed to carrageenan (D_{20}) or challenged in the elevated plus-maze test for evaluating anxiety-like behavior (D_{15}).

Results and Discussions: Treatment with fentanyl induced long-lasting hyperalgesia in rats exposed to carrageenan or stress. Moreover, fentanyl increased anxiety-like behavior in carrageenan-treated rats. Both opioid-induced hyperalgesia and anxiety-like behaviors were totally abolished by a single N_2O exposure (4 h on D_0).

Conclusion(s): These results indicate that nitrous oxide, probably *via* an NMDA receptor mechanism, could improve postoperative pain management and facilitate rehabilitation [4] by preventing opioid-induced hyperalgesia and anxiety disorders.

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A-890

Central not peripheral origin of mechanical hyperalgesia surrounding the sunburn skin pain model

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Background and Goal of Study: The induction of experimental sunburn leads to mechanical hyperalgesia in non-inflamed skin surrounding the sunburn (1). Although in other pain models the central origin of secondary hyperalgesia has been demonstrated (2), peripheral mechanisms of sensitization have not been excluded for the UV-B induced hyperalgesia. It was the goal to investigate the development of mechanical hyperalgesia surrounding experimental sunburn during peripheral lidocaine block of skin afferents.

Materials and Methods: 12 healthy volunteers (f:m = 1:1, age 19–40 ys) consented in this study (approved by local ethics committee). Two microdialysis catheters were applied superficially into the skin of an upper thigh over 10 cm at the border of the planned circular sunburn and perfused by lidocaine (2%, 0.3 ml/h each). A circular spot of UV-B (Φ 4.2 cm) was applied on both thighs by our standard procedure (1) with 3 times the individual erythema dose. Immediately after irradiation and 4 and 8 hours later the areas of secondary hyperalgesia were assessed by pin prick using a rigid von Frey filament (256 mN) on 8 radial lignes. Thus the area of secondary hyperalgesia was assess as an octagon. This was done on both thighs.

Results and Discussions: All volunteers developed areas of secondary hyperalgesia over 8 hours, both on the lidocaine and on the control side ($5874\ mm^2 \pm SD\ 3969\ mm^2$ and $4525\ mm^2 \pm SD\ 2012\ mm^2$ respectively). There was no difference between lidocaine block and control ($p > 0.18$).

Consequently the afferent block did not alter mechanical hyperalgesia.

Conclusion: Mechanical hyperalgesia develops in UV-B inflamed skin independently from the afferent input of the non-inflamed skin. A central origin of mechanical hyperalgesia in this pain model can be concluded.

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A-891

Postoperative analgesia and outcome following radical retropubic prostatectomy. A double-blind comparison between low thoracic epidural and patient-controlled intravenous analgesia

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Background and Goals: Postoperative pain following radical retropubic prostatectomy can be severe unless adequately treated. Low thoracic epidural analgesia (TEA) and patient controlled intravenous analgesia (PCA) were compared in this double blind, randomized study.

Methods: Sixty patients were randomized to receive either low TEA (Group E) or PCA (Group P) for postoperative pain relief. All patients had a low thoracic epidural catheter inserted prior to the operation. Postoperatively, patients in Group E received an infusion of ropivacaine, fentanyl and adrenaline, 10 ml/h during 48 h epidurally and placebo PCA pump iv. Patients in Group P received a PCA pump with morphine iv and placebo 10 ml/h epidurally. Pain, the primary outcome variable, was measured during 48 h after the operation at rest and on coughing. Secondary outcome variables included gastrointestinal function, respiratory function (maximum expiratory pressure – MEP), mobilization, and full recovery. Health-related quality of life was measured using the SF-36 before and 1 month and 3 months after the operation.

Results: Incisional pain and pain on coughing were lower in Group E compared to Group P at 2–24 h, and deep pain between 3–24 h postoperatively ($p < 0.05$). MEP was greater in Group E at 4 and 24 h ($p < 0.05$) compared to Group P. A greater number of patients in Group E were ready to be discharged home on Day 2 compared to Group P ($p = 0.058$). At one month, the scores on the emotional role, physical functioning and general health of the SF-36 were higher in Group E compared to Group P.

Conclusion: We found evidence for better pain relief, improved expiratory muscle function, earlier home readiness on day 2 and improved functioning at 1 month in patients receiving low thoracic epidural analgesia for radical retropubic prostatectomy.

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A-892

Preoperative multiple-injection paravertebral block reduces postoperative pain and analgesic requirements after video-assisted thoracic surgery

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Background and Goal of Study: Thoracoscopic surgery can be associated with considerable postoperative pain. We tested the hypothesis that preoperative multiple-injection paravertebral block (PVB) reduces opioid requirements and promotes early ambulation after video-assisted thoracic surgery (VATS) procedures.

Materials and Methods: 50 ASA I–III consenting patients undergoing elective VATS were included in this prospective, randomized, double-blind, placebo-controlled study. 45 patients completed the study. They were randomly allocated to two groups: the PVB group (n = 23) received i.v. patient-controlled analgesia (PCA) with morphine plus multiple-injection thoracic paravertebral block (T4–T8 levels) with bupivacaine 0.5% containing epinephrine 1:200,000 (4 mL for each level). The placebo group (n = 22) received preoperative multiple subcutaneous saline injections at the same levels plus PCA morphine. The main recorded data were pain scores using the visual analogue scale (VAS, 0–10) and cumulative PCA morphine consumption during 48 h after surgery, and times to first mobilization and hospital discharge.

Results: Intraoperative fentanyl consumption was lower in the PVB group ($p < 0.01$). The time to first analgesic requirement and pain scores at this time were less in the PVB group ($p < 0.05$ and $p < 0.01$, respectively). Postoperative pain scores both at rest and with coughing were lower during the first 4 hours in the PVB group than those in the placebo group ($p < 0.01$ for 0 h, $p < 0.05$ for 1, 2, and 4 h). Cumulative morphine consumption was significantly less in the PVB group at all time points ($p < 0.01$ for 12 h and $p < 0.001$ for all other time points), but there were no significant differences in sedation scores between the two groups. There were no complications with the blocks. In the PVB group, patient satisfaction with the analgesia was significantly greater ($p < 0.01$) and first mobilization and hospital discharge were quicker ($p < 0.01$ and $p < 0.05$, respectively).

Conclusion(s): Preoperative multiple-injection PVB with bupivacaine containing epinephrine provided effective pain relief and a significant reduction in opioid requirements. This regime may also contribute to earlier postoperative ambulation after VATS.

A-894

Analgesic effects of a perioperative intravenous infusion of lidocaine and ketamine compared to thoracic epidural analgesia after abdominal aortic surgery

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Background and Goal of Study: Thoracic epidural analgesia (TEA) provides effective dynamic analgesia, and improves postoperative outcome after abdominal surgery (1). However, some authors are opposed to TEA for vascular surgery because of an increased risk of epidural haematoma (2). Intravenous (IV) lidocaine (3) and ketamine (4) improve systemic opioid analgesia. We therefore compared the effects of TEA and balanced IV analgesia combining lidocaine, ketamine and opioid on early postop analgesia and outcome after open abdominal aortic surgery.

Materials and Methods: After approval of our ethic committee and informed consent, 34 patients were included in this randomized study. General anaesthesia was standardized. In 16 patients (Group E), TEA at T9–T10 level was started before surgical incision and maintained for the first 48 h postop (ropivacaine 0.2% with a 0.5 μg/ml sufentanil solution). The 18 remaining patients were given an IV bolus injection of ketamine and lidocaine after the induction of general anaesthesia, followed by a continuous infusion during the first 24 h postop (Group KL). All patients were provided with a piritramide PCA for 96 h. Pain scores at rest and during activity (100 mm VAS), piritramide consumption, respiratory function, postop. outcome (PONV, satisfaction, fatigue, time to first flatus, first ambulation, hospitalization stay and morbidity) were recorded. ANOVA for repeated measures, t test, Mann-Whitney test and Fischer exact test were used as appropriate with $p < 0.05$ as significant.

Results and Discussions: Demographic data were similar for both groups. Pain scores at rest ($p < 0.05$), when coughing ($p < 0.01$) and during mobilization ($p < 0.05$) were significantly less in the group E than in group KL. Total opioid consumption is increased in KL group (37.4 mg ± 21 vs 76 mg ± 44) with $p < 0.003$. There was no difference with regards to morbidity or postoperative outcome parameters, between the groups.

Conclusion: TEA provides better pain relief than IV balanced analgesia combining lidocaine, ketamine and PCA administered opioid.

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A-895

Extended-release liposomal formulation of bupivacaine for post-operative pain management after hernia repair surgery

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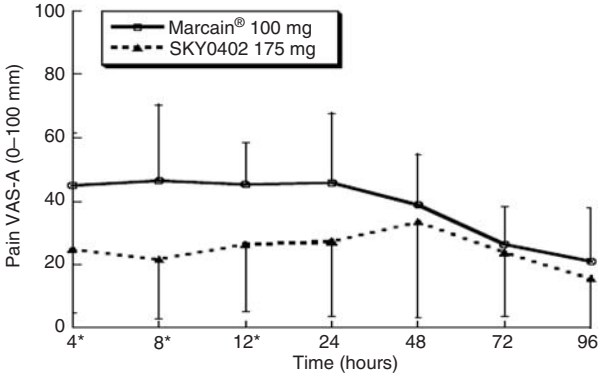
Background and Goal of Study: SKY0402 is a liposomal formulation of bupivacaine intended for the management of post-operative pain (POP). In this study, the safety and efficacy of SKY0402 were compared with a commercially-available conventional bupivacaine (CB) solution (i.e., Marcain® 0.5%), in patients undergoing inguinal hernia repair surgery.

Materials and Methods: This is a Phase 2, double-blind study, in which 25 patients were randomized to receive SKY0402 175 mg (n = 12) or CB 100 mg (n = 13). The study drug was administered via surgical wound infiltration (40 mL total injection volume). Supplemental use of analgesics (taken as needed after surgery) and pain scores (VAS) were recorded for 96 hours post-dose. The study has a dose-escalation, sequential cohort design and is currently ongoing. Cohort 1 data is reported below.

Results and Discussions: (1) *Safety*: The incidence and severity of adverse events, as well as the wound healing scores were similar in the two treatment groups. (2) *Efficacy*: There were no clear differences between SKY0402 and CB groups regarding the time from end of surgery to the first supplemental pain medication (opioid or non-opioid). The proportion of patients requiring supplemental opioid pain medication was higher in the CB group (50%) compared with the SKY0402 group (25%). Pain intensity scores at rest (VAS-R) and particularly with activity (VAS-A) were lower for the SKY0402 group.



*Difference was statistically significant (95% confidence interval)

Conclusion: These data suggests that SKY0402 presents an advantage over the reference product in managing POP after inguinal hernia repair. Higher doses may be required for extended duration of action.

A-896

Continuous paravertebral or epidural analgesia for post-thoracotomy pain: a prospective, randomized comparison

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Background and Goal of Study: The aim of this prospective, randomized study was to compare analgesic efficacy of continuous paravertebral and epidural analgesia for post thoracotomy pain.

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Materials and Methods: With Ethical Committee approval and patients' written consent 42 ASA physical status II–III patients undergoing lung resection surgery were randomly allocated to receive post-thoracotomy analgesia with either a thoracic epidural (group EPI, n = 21) or paravertebral (group PVB, n = 21) infusion of 0.2% ropivacaine (infusion rate: 5–10 ml/h). The degree of pain at rest and during coughing, hemodynamic variables, and blood gas analysis were recorded every 12 h for the first 48 h.
Results and Discussions: The area under the curve of the VAS during coughing over time was 192 (60–444) cm/h in group EPI and 228 (72–456) cm/h in group PVB (P = 0.29). Rescue morphine analgesia was required in 4 patients of group EPI (19%) and 5 patients of group PVB (23%) (P = 0.99). The PaO_2/FiO_2 ratio reduced significantly from baseline values in both groups without between-group differences. The maximum reduction of systolic arterial blood pressure is shown in the figure, while clinically relevant hypotension (SAP decrease > 30% of baseline) was observed in 4 patients of group EPI only (19%) (P = 0.04). Patient satisfaction with the analgesia technique was 8.5 (8–9.8) cm in group EPI and 9 (7.5–10) cm in group PVB (P = 0.65).
Conclusion(s): Continuous thoracic paravertebral analgesia is as effective as epidural blockade in controlling post-thoracotomy pain, but is associated with less hemodynamic effects.

A-897

Patient-controlled epidural analgesia with and without night-time infusion in colorectal surgery

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Background and Goal of Study: Patient-controlled epidural analgesia. (PCEA) with background infusion could improve analgesia but could increase the incidence of side effects. The goal of this study was to asses the analgesic efficacy, sleep quality, side effects of a supplemental night-time infusion in PCEA after colorectal surgery.
Materials and Methods: 63 patients ASA I/II scheduled for elective colorectal surgery were included in a prospective, double-blind study and were randomized in 2 groups: PCEA alone and PCEA plus night time infusion (from 8:00 PM to 8:00 AM). An epidural catheter was inserted preoperatively at T10–T12 level. A PCA pump containing fentanyl 5 μg/ml and 0.125% bupivacaine was connected to the epidural catheter and started as soon as the patient was extubated (5-ml bolus on demand, 15 minutes lockout interval, ± 4-ml basal infusion). Pain scores (VAS) at rest, on mobilization and coughing, average hourly demands, sleep score (0–2) and the incidences of nausea/vomiting, pruritus were recorded at: 8:00 PM on the day of surgery, 8:00 AM, 2:00 PM, 8:00 PM on postoperative day 1 and 8:00 AM on postoperative day 2. Statistics included: Mann-Whitney, chi-square test and ANOVA ($p < 0.05$).
Results and Discussions: VAS pain scores on movement and coughing were significantly lower ($p < 0.05$) in the PCEA plus night-time infusion group than PCEA alone during the night following postoperative day 1. The sleep scores were significantly lower in the PCEA plus night-time infusion group than PCEA alone at 8:00 AM postoperative day 2 (p = 0.004). The average hourly demands were lower (0.56 ± 0.40 vs. 0.99 ± 0.67 and 0.46 ± 0.44 vs. 0.84 ± 0.64) in the PCEA plus night-time infusion group than PCEA alone during the nights but the incidence of pruritus was greater ($p < 0.05$).
Conclusion(s): PCEA with night-time infusion provide better control of pain on mobilization and coughing. Night-time infusion reduces sleep disturbances but increase the incidence of pruritus.
References:
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A-898

Continuous or single shot sciatic nerve block to improve postoperative analgesia after total knee arthroplasty

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Background and Goal of Study: Continuous femoral nerve block is an useful technique for postoperative pain treatment after total knee replacement (1). We observed a high incidence of postoperative pain located in the popliteal fossa in spite of continuous femoral block in our clinical practice. So we added a single shot sciatic block besides continuous femoral nerve block for postoperative pain after total knee arthroplasty in our protocols (2). The goal of study is to determine if continuous sciatic block is better than single shot scitatic block after total knee replacement.
Materials and Method: A continuous femoral nerve block was placed using a stimulating catheter with 0.2% ropivacaine P.C.A. after total knee arthroplasty. We prospectively included patients in two randomized groups. Group 1: continuous sciatic block using stimulating catheter with continuous infusion of 0.2% ropivacaine and Group 2: single shot sciatic block with 0.5% ropivacaine, 20 ml. We registered: age, gender, height and weight; distance from the skin to the nerves; the catheter length catheters introduced far from the tip of the needle and the lowest current intensity we observed motor response; postoperative analgesia at rest and movement and sensory and motor block at 8, 16, 24, 36, 48 and 72 hours after surgery. Statistical analysis was made using SPSS 11.5 Test non parametrics were used for quantitative data. A p value lower than 0.05 was considered significative.
Results and Discussion: Were included 20 patients (group 1: 10, group 2: 10). Postoperative pain measured was similar in two groups. Pain at rest was higher in group 2 for 36 hours without significative difference. Pain at movement was higher in group 2 at 24 (p = 0.03), 36 (p = 0.04), 48 (p = 0.003) and 72 (p = 0.001) hours. Postoperative pain always was located at popliteal fossa level. Patient in group 2 demanded more rescue analgesia (p = 0.003). Both techniques have provided similar analgesia at rest. Continuous sciatic block has provided better analgesia at movement, according to Phan-Dang (3). It could be interesting for knee postoperative rehabilitation.
Conclusion: Continuous sciatic nerve block is better than single shot sciatic block added to continuous femoral nerve block for postoperative pain treatment after total knee arthroplasty.
References:
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3 Pham-Dang Ch, Gauteron E, Guilley J, et al. Reg Anesth Pain Med 2005;30(2): 128–33.

A-899

Continuous epidural analgesia with ropivacaine, fentanyl and adrenaline versus sequential bolus epidural analgesia with ropivacaine and morphine after total hip and knee arthroplasty

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Background and Goal of Study: The aim of this study was to compare the postoperative analgesic effect and the side effects between the methods of continuous and sequential epidural analgesia after scheduled total hip or knee arthroplasty.
Materials and Methods: This retrospective study based on the records of our Postoperative Analgesia Service, included 141 patients ASA I–III who underwent total hip or knee arthroplasty. All patients received combined subarachnoid-epidural anesthesia and postoperative epidural analgesia with one of the above methods. 13 patients were excluded. The remaining 128 patients ASA I–III were divided in two groups. Group C (n = 47, 17M/30F), aged 68 ± 8 yr received continuous epidural analgesia through an infusion pump with solution of ropivacaine 2 mg/ml, fentanyl 2.5 mcg/ml and adrenaline 2 mcg/ml. The mean infusion rate was 6.3 (5–8) ml/hr. Group S (n = 81, 30M/51F), aged 67 ± 9 ys received sequential epidural analgesia with bolus doses of a 10 ml solution with morphine 0.3 mg/ml and ropivacaine 0.6 mg/ml every 12 hours. All patients also received tropisetron 5 mg/24 hr IV and parecoxib 40 mg/12 hr or lornoxicam 8 mg/12 hr. We studied pain scores at rest and during mobilization which were recorded every 6 hours by the Verbal Rating Score (VRS 1–5) for the first two postoperative days and the incidence of nausea and vomiting, pruritus, sedation, respiratory depression and hemodynamic instability. Student's t-test and Chi-square were used for statistical analysis with $P < 0.05$ accepted as statistically significant.
Results and Discussions: Demographic data were statistically comparable. Group C had significantly lower pain scores during mobilization ($P < 0.05$) during the first (P = 0.001) and second (P = 0.003) postoperative day. Pain scores at rest were not statistically significant between the 2 groups at the same period although they differ slightly. Side effects were higher in Group S but the difference was not statistically significant.
Conclusion(s): After total hip or knee arthroplasty, continuous epidural analgesia with ropivacaine, fentanyl and adrenaline is superior to sequential bolus epidural technique with ropivacaine and morphine.

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A-900

Evaluation of postoperative continuous ropivacaine infusion for pain management after radical retropubic prostatectomy

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Background and Goals: The use of continuous infusions of local anesthetics may have the potential to provide long term postoperative analgesia while reducing postoperative requirements and possibly opioid-related side effects.

The aim of our study was to determine the effectiveness of an incisional infusion of local anesthetic through a continuous infusion elastomeric pump for the management of postoperative pain after radical retropubic prostatectomy.

Material and Methods: Double blind study of 60 patients undergoing radical prostatectomy prospectively randomized to receive either ropivacaine (total volume 100 ml, concentration 5 mg/ml) or saline continuously for 48 hours at 2 ml/hour through use of an elastomeric continuous infusion pump (ON-Q Pain Relief System). Data sources were reviewed for mean opioid use, pain score (Visual Analogue Scale) and complications. Comparisons between the groups were made by applying the Mann-Whitney rank sum test and analysis of variance with treatment as a fixed effect in the model.

Results: In the ropivacaine group 25% (versus 5% in the placebo group) required no opioids ($p < 0.05$) postoperatively. Daily and total opioid usages were significantly less ($p < 0.05$) in the ropivacaine group. There were no complications in any patient at the catheter insertion site or surgical wound site.

Conclusion: Continuous infusion of 5 mg/ml ropivacaine at 2 ml/hour through the ON-Q elastomeric infusion pump is a safe and effective adjunct in postoperative pain management for radical retropubic prostatectomy.

Reference:

1 Vintar N, et al. Can J Anesth 2002; 49:481–486.

A-902

Sensory and chronic pain related sexual dysfunction following groin hernia repair

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Background and Goal of Study: Chronic pain impairing daily activities occurs in about 10% of all patients after groin hernia repair (1). In a previous nationwide questionnaire study (n = 1015) we showed that chronic pain related sexual dysfunction affecting sexual life moderately or severely, occurs in about 3% of younger male patients after groin hernia repair. Pain during sexual activity was reported from the previous hernia site, genitals and during ejaculation. The aim of the present study was to describe the sensory function and psycho-sexological profile of these patients.

Materials and Methods: A descriptive study of patients complaining of moderate or severe pain related impairment of sexual function due to pain from genitals or during ejaculation.

Bilateral sensory function of the groin was examined by quantitative sensory testing (QST) (Tactile, and brush detection and pain thresholds, thermo detection and pain thresholds and pressure algometry). Structured interviews by a psychologist highly experienced in evaluation of sexual dysfunction were performed to evaluate the psychological and sexual profile of the patients.

Results and Discussions: 10 patients were examined. Sensory dysfunctions in the operated groin compared with the non operated groin were present in all, with decreased thermo and tactile detection threshold and increased pressure pain detection threshold. Maximum pain was always located over the annulus inguinalis externus. Psychological evaluation did not reveal any psychological disturbances, and the sexual dysfunction disturbance was attributed to the chronic pain state.

Conclusion: Sensory disturbances, especially decreased pain detection threshold from deep somatic structures are present in patients with chronic pain related sexual dysfunction following groin hernia repair. Psycho-sexual evaluation indicates a somatic origin rather than a psychological calling for further exploration of the pathogenesis (nerve damage).

Reference:

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A-903

Intraoperative infusion of dexmedetomidine reduces postoperative analgesic requirements

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Background and Goal of Study: This prospective, randomized, double-blind study was designed to assess whether intraoperative infusion of dexmedetomidine provides effective postoperative analgesia.

Materials and Methods: Fifty women were randomly assigned to two groups. Group D ($n = 25$) received an intravenous loading dose of 1 $\mu g \cdot kg^{-1}$ dexmedetomidine during induction of anesthesia, followed by infusion of this drug at 0.5 $\mu g \cdot kg^{-1} \cdot h^{-1}$ throughout the operation. Group P ($n = 25$) received a similar bolus and infusion of placebo (0.9% saline). For each case, heart rate, peripheral oxygen saturation, and systolic and diastolic blood pressure were recorded intraoperatively and in the first 48 hours postoperatively. Patients used a patient-controlled analgesia (PCA) device to receive bolus doses of morphine after surgery. The number of PCA demands, total morphine consumption, pain scores, and sedation scores were recorded for the first 48 hours.

Results and Discussions: There were no significant differences between the groups' mean results for time to extubation, recovery time, number of PCA demands in the PACU, or pain scores and sedation scores at any of the time points assessed in the first 48 hours. Group D consumed significantly less morphine in the PACU and on the ward, and registered significantly fewer PCA demands on the ward. Significantly fewer patients in Group D experienced itching or nausea/vomiting.

Conclusion(s): Continuous intravenous infusion of dexmedetomidine during abdominal surgery provides effective postoperative analgesia. This method significantly reduces postoperative morphine requirements without affecting recovery time.

A-904

Antihyperalgesic effect and local cytokine modulation by perineural clonidine at different time points after peripheral nerve injury

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Background: Local release of proinflammatory cytokine TNFα drives degenerative changes and hypersensitivity after nerve injury. α_2-adrenoceptor stimulation modulates immune responses and perioperative injection of clonidine (CLO) at injury site reduces mechanical hypersensitivity (MH) development after nerve injury (1). Local CLO injection also alleviates established MH at 4 to 6 weeks after partial sciatic nerve ligation (PSNL) in rats (2). The study evaluates local CLO antihyperalgesic effect and TNFα modulation in longlasting neuropathic pain.

Materials and Methods: Adult male Wistar rats (n = 10 per group) underwent PSNL. Four weeks (4W) and 6 months (6M) later, animals received percutaneous injection at injury site with either saline (Sal) or CLO 30 μg. Paw Withdrawal Threshold (PWT, g) was assessed by Von Frey filaments. At day7, some animals were euthanazed and ispilateral sciatic nerve, DRG L4–L6 and spinal cord harvested to measure TNFα level (ng/g tissue wet weight) with ELISA. TNFα levels in non-injured animals were also run as Control values. Results are mean ± SD. Statistical analysis used ANOVA and posthoc test, $P < 0.05$ significant with Sal at same time (*), with Controls (‡).

Results and Discussions: PWT 32 ± 6 g before surgery dropped to 3.4 ± 2 g at 4W and 3.5 ± 2 g after 6M. Perineural CLO at 4W significantly relieved MH (day 3 until day 21, reaching 14.7 ± 8 g (* with Sal 5.3 ± 3 g) at day 7) but was ineffective at 6M after PSNL. TNFα levels and effects of CLO injection are expressed in Table.

TNF (ng/g)	Nerve	DRG	Spinal
Controls	0.79 ± 0.4	0.59 ± 0.2	0.83 ± 0.4
PSNL 4W + CLO	0.83 ± 0.5	2.79 ± 1.2‡	0.55 ± 0.2
	1.23 ± 0.8	0.77 ± 0.9*	0.48 ± 0.2
PSNL 6M + CLO	0.23 ± 0.04‡	1.51 ± 1.2	0.95 ± 0.7
	0.13 ± 0.1	1.58 ± 0.7	1.27 ± 0.9

Conclusion: Perineural CLO efficacy to modulate MH after nerve injury is related to anti-inflammatory effect, through cytokine modulation. With time, neuropathic pain expression relies less to local inflammation. The results

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plaid for early administration of local CLO in neuropathic pain, i.e. preventively or immediately after nerve injury.

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A-905

The association between clinical findings and pre-operative quantitative sensory testing parameters in patients undergoing lumbar discectomy

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Background & Objective: Pre-operative low back pain increases the vulnerability to chronic pain due to central facilitation (1). Neuroplasticity, is measurable using non-invasive quantitative sensory testing (QST) and occurs in patients with chronic low back pain (LBP) (2). The objective of this study is to examine the association between the clinical findings and defined pre-operative QST parameters in patients undergoing lumbar discectomy.

Methodology: With institutional ethical approval and having obtained written obtained consent 20 ASA I–II consecutive patients with LBP for three months or more undergoing elective lumbar discectomy were studied. Patients were categorized on their pain history in the two weeks prior to discectomy as: (1) no pain, (2) pain in the leg only, (3) pain in the back only, (4) pain in both back and leg. The mean of three values for sensory threshold (St), pain perception threshold (PPt), and pain tolerance threshold (PTt) was recorded using a standardized technique in the forearm, ipsilateral and contralateral lower limbs. The "delta threshold" for each QST parameter was calculated by subtracting the forearm threshold (in the same patient) from the corresponding lower limb threshold and termed δST, δPPt, δPTt respectively.

Results: 20 consecutive patients (14 males, 6 females 43 ± 8 years) with LBP of mean duration 4.0 ± 0.8 months were studied. The δPPt was greater in the leg only group compared to the back only group (8.7 ± 6.4 v −0.9 ± 4.16 mA, $p < 0.01$). δPPt was greater in the ipsilateral leg of the combined back & leg pain group compared to the back only group (11.0 ± 9.47 v −0.9 ± 4.16 mA, $p < 0.01$). The δPPt was greater in the ipsilateral leg of the combined back & leg group compared to the contralateral leg in the same group (11.0 ± 9.4 v 4.4 ± 7.0 mA, $p < 0.002$).

Conclusions: The results indicate that the site of pain in patients presenting for lumbar discectomy is associated with a change in perception and sensory thresholds.

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A-906

Two doses vs. single dose of topiramate for the treatment of neuropathic pain

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Background and Goal of Study: Topiramate is an antiepileptic drug, also employed in the treatment of migraine, and as rescue therapy for neuropathic pain (1,2). The usual regimen schedule is 100 to 400 mg/day in two daily doses (3). However, its long half life (20–30 hours) could allow a single daily dose with the same effectiveness. The goal of this study is to assess the effectiveness of topiramate in a single daily dose at night as opposed to twice daily and whether this new dosing schedule is associated with less adverse effects.

Materials and Methods: After obtaining Institutional Review Board approval, we included 34 patients with different diagnoses of neuropathic pain or migraine in a randomized, controlled trial, in two groups. In the One Dose group (n = 17) we administered progressively in a month, a daily dose at night to achieve a target dose of 400 mg/day. In the Two Doses group (n = 17) we administered the same dose progresively twice a day. We evaluated the effectiveness of the treatment (with three scales: VAS, Latinnen and McGill), and tolerance (adverse effects were graded as mild, moderate or severe). After a month of treatment and after fifteen days administering the target dose, two blood sample were drawn to measure plasma levels of the drug (polarized fluorescence immunoassay).

Results and Discussions: No statistically differences were observed in VAS, Latinnen and McGill scores, and plasma levels of topiramate between the two groups. The pain was completely or partially controlled similarly in both groups. The One Dose group had plasma levels of 8 ± 4 ng/ml, and the Two Doses group 9 ± 1 ng/ml (all the patients were in the therapeutic range 2–12 ng/ml). A no significant reduction in the incidence and severity of adverse effects with one daily dose at night was found.

Conclusion(s): Topiramate could be given as a daily dose, with probably better tolerance and with no loss of effectiveness.

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3 Chong MS, Libretto S. Clin J Pain 2003; 19: 59–68.

A-907

The use of parecoxib sodium as an adjuvant of the levobupivacaine for the inactivation of the trigger points with injection therapy

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Background and Goal of Study: Myofascial pain syndrome (MPS) is one of the most frequent causes of widespread musculoskeletal pain and disability. MPS can be described as a regional disorder accompanied by trigger points the underlying pathophysiology remains somewhat of a mystery. Muscle contraction leads to increase metabolic rate with accumulation of metabolites including serotonin, histamine and prostaglandins. The aim of the study was to evaluate the action of parecoxib when it was added to the local anesthetic vs. local anesthetic alone for injection therapy for the inactivation of trigger points.

Materials and Methods: Forty patients, ASA I–III, age 22–75 who needed to be treated were enrolled in arandomized, double-blind study to receive an infiltration Group LP with levobupivacaine 2.5% (10 ml) plus parecoxib 40 mg (2 ml) and Group L with levobupivacaine 2.5% (10 ml) plus normal saline (2 ml). Next, 2 ml of the solution were injected in and around the trigger point. Each patient had 3 sessions, one every week for three consecutive weeks. Pain score was assessed with VAS pain (0 = no pain, 10 = worse imaginable pain) score before the begging of the therapy and one week after the last injection.

Results and Discussions: Forty patients, twenty per group enrolled in the study. No patient was excluded. Demographic data were comparable in both groups. Wilcoxon test was used for statistical analysis. $P < 0.05$ was considered statistically significant. Results are expressed as mean ± standard deviation (SD).

The mean ± SD in group LP were 5.05 ± 1.69 and in group L were 5.15 ± 1.75 before the treatment.

The mean ± SD were in group LP 1.75 ± 0.64 and in group L 2.80 ± 0.62 after the treatment ($p < 0.0001$). No adverse effects were noted.

Conclusion(s): The conjunction of the non steroidal anti-inflammatory drug (parecoxib) with local anesthetics seems to be beneficial in the treatment of the trigger points and MPS Further study is necessary to validate this combination.

A-908

The management of low back pain; retrospective analysis of 226 consecutive patients

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Background and Goal of the Study: The management of chronic low back pain (LBP) remains controversial (1). A variety of therapeutic options of benefit are available for patients with radicular leg symptoms or chronic LBP (2). The objective of this retrospective study was to document the treatment choices of patients with a symptomatic lumbar herniated nucleus pulposus (LHNP) who are not surgical candidates and in patients with previous lumbar disc surgery during one year period in our pain clinic.

Materials and Methods: We retrospectively analysed 226 patients with a symptomatic lumbar herniated nucleus pulposus who are not surgical candidates (n = 157) and with previous lomber disc surgery who had persistent low back or radicular pain (n = 69) over three months period. Patients who had no improvement after a minimum of six weeks of noninvasive treatment were evaluated. The success rate was measured using a patient satisfaction scale with choice options of 0 (poor), 1 (fair), 2 (good), 3 (very good) and 4 (excellent); and a visual numeric pain scale ranging from 0 to 10. A successful outcome required a patient satisfaction score of 2 or more and pain reduction greater than 50% on visual numeric pain scale three months after the last injection. Frequency test was used for data analysis.

Results: The treatment spectrum of LBP were as follows; translaminar epidural steroid 173 (76.5%), transforaminal anterior epidural steroid 59

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(26.1%), caudal steroid 44 (19.5%), neuroplasty 7 (3.1%), percutaneous disc nucleoplasty 58 (25.7%), botulinum toxin injection 7 (3.1%), transcutaneous electrical nevre stimulation 7 (3.1%) and lomber sympathetic block 2 (0.9%). Global success rate of LBP treatment with available therapeutic options was 75.5% after three months period follow up.

Conclusion: Although there is currently no exact treatment of chronic LBP for complete cure, several therapeutic options are effective up to three months for the patients who had no improvement with six or more weeks of noninvasive care for the management of pain originated from operated and nonoperated LHNP.

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A-909

Chronic pain after surviving sepsis

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Background and Goal of Study: In Germany about 90,000 patients survive sepsis per year. Few data are available indicating quality of life and chronic pain states of sepsis long-term survivors (1).

Materials and Methods: 152 patients were approached who survived severe sepsis or septic shock on our ICU. In order to obtain specific information about chronic pain states, these patients received the SF36 as well as the BPI (Brief Pain Inventory) questionnaire.

Results and Discussions: 64 patients returned the questionnaires. Mean age was 62 $\pm$ 15 years. SF 36 items concerning bodily pain occurred in septic survivors significantly more frequent compared to the healthy normal population (49.4 $\pm$ 29.9; norm: 79.1 $\pm$ 27.4; $p < 0.0001$). In most of the BPI items, patients scored over 3 on a 11 step numeric rating scale (0 = no pain, 10 = worst possible pain). 44% of the patients reported a maximal NRS value of 0–3, but 56% a maximal value of 4–10 (mean: 4.1 $\pm$ 3.4). Mean values of pain-associated functional interference ratings were (0 = no interference, 10 = worst possible interference): general activity: 4.2 $\pm$ 3.1; mood: 3.4 $\pm$ 3.0; walking ability: 4.5 $\pm$ 3.5; work: 5.1 $\pm$ 3.5; relationship: 3.1 $\pm$ 3.1; sleep: 3.7 $\pm$ 3.0; enjoyment of life: 3.7 $\pm$ 3.1. Previously, differences in the quality of life were evaluated in adult survivors of critical illness investigating general ICU populations compared to healthy controls (1). We found highly significant differences in the pain-associated domain of SF 36 between survivors of severe sepsis or septic shock compared to German healthy population. Furthermore, the interference due to pain revealed to be high in septic survivors.

Conclusion: For the first time, we demonstrated additionally a higher incidence of pain in these patients.

Reference:

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A-910

The incidence of chronic pain after cardiac surgery

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Background and Goal of Study: There is growing evidence that after successful surgical treatment many patients suffer chronic pain. The most common estimates of chronic post-sternotomy pain are between 28–54%. The aims of our study were not only to discern the prevalence of post-cardiac surgery pain, but also to try to identify risk factors which may be associated with its occurrence, and to obtain basic information about the quality and efficacy of pain therapy.

Materials and Methods: An anonymous questionnaire was developed, which consisted of several parts: demography, type of the surgery, the presence of pain and its characteristics and the type and efficacy of analgesic therapy. The questionnaire was distributed to patients after 6–12 months after cardiac surgical procedures.

Results and Discussions: Total 244 of the 350 questionnaires distributed were completed and returned (69.7% response rate) and 237 could be evaluated 78 women, 159 men). Chronic pain was described by 58 (24.5%) respondents. Age lower than 60 years ($p = 0.017$), BMI > 30 ($p = 0.002$) and anamnesis of strong postoperative pain ($p < 0.002$) were predictors of developing post cardio surgery pain. The intensity of pain was usually mild or moderate; only 9 respondents experienced strong and sever pain. Chronic pain was related to the trend of decreased physical activity of respondents ($p = 0.09$) and sleep disturbances ($p = 0.09$). There was no apparent relation between pain and depression (self-assessment of the patients), type of procedure, anaesthesia (standard general, general fast-track, combined general-epidural) and postoperative analgesia (systemic vs. epidural).

Conclusion(s): We can summarise, that the prevalence of chronic pain after cardiac surgical procedures was lower than in other countries, but the predictors were the same.

A-911

The effects of preemptive applied tramadol and lornoxicam on analgesia and stress response during early postoperative period

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Background and Goal of Study: The aim of this study was to determine the effects of preemptive applied tramodol and lornoxicam on analgesia and stress response during early postoperative period.

Materials and Methods: Sixty patients to be performed open cholecystectomy in ASA Group I–II were divided randomly into three groups. Placebo in Control Group (Group K), 100 mg iv tramodol in Tramadol Group (Group T) and 8 mg iv lornoxicam in Lornoxicam Group (Group L) were applied 10 minutes before anesthesia induction. Anesthesia induction was performed with 0.1 $\mu g\,kg^{-1}$ fentanyl and 4–7 $mg\,kg^{-1}$ thiopenthal sodium. 0.1 $mg\,kg^{-1}$ vecuronium was used for muscle relaxation. 4–6% desflurane and 50–50% N_2O–O_2 were used for maintenance.

In pre and peroperative period, the patients' hemodynamic parameters were measured. In the postoperative period, the patients' hemodynamic parameters, Visual analog Pain Scale (VAS) values, first analgesic necessity and total analgesic consumption were recorded. Three blood sampling were taken in preoperative period before drugs prescribing, in peroperative 30 min. and in postoperative 2 hour and the levels of serum glucose, insulin, cortisol, prolactin, ACTH were measured.

Results and Discussions: In our study, there was significant difference between control and tramodol groups in 15 and 30 minutes regarding visual analogue scale values. There was also significant difference between control and tramodol groups in postoperative 60 minutes ($p < 0.05$). Regarding timing for first analgesic necessity, total analgesic consumption and patient's satisfaction tramodol group was better than control group and lornoxicam group and also lornoxicam group was better than control group.

When the insulin values were compared in the postoperative 2nd hours, group K values were found lower than group T and group L ($p < 0.05$). ACTH values of group L were also lower than group T ($p < 0.05$).

Conclusion(s): In conclusion, it's determined that preemptive applied tramodol and lornoxicam are effective to eliminate postoperative pain and are ensures good postoperative analgesia. But, both drugs are insufficient to suppress the stress response.

A-912

Intravenous paracetamol or parecoxib or a combination for pain relief following thyroid surgery: a randomised placebo-controlled trial in 140 patients

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Background and Goal of Study: Basic non-opiod analgesia is a routine prescription for many types of surgery. If a combination of non-opioids improves analgesia is open to debate (1).

Materials and Methods: Therefore, following ethic committee approval and written informed consent 140 patients for thyroid surgery without signs of renal, hepatic, pulmonary or bleeding disorders were randomised to receive double-blinded one of the following treatments for analgesia.

Placebo (00), Paracetamol (1 g i.v. 30 min prior to end of surgery, 4 g/day i.v.) (Pl/0), Parecoxib (40 mg i.v. bolus at the end of surgery and 40 mg i.v. bolus 8 h postoperatively) (Pb/0), or a combination of these non-opioids (Pl/Pb).

A balanced anaesthesia using propofol, sufentanil and rocuronium for induction and desflurane plus remifentanil for maintenance was applied as well as a PONV-prophylaxis using dexamethason (8 mg) and dolasetron (12.5 mg). Escape analgesia was achieved with PCA opioids (piritramid bolus 2 mg). Pain relief was measured using a NRS (0–10) at 0, 1, 8, and 24 h postoperatively.

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Results and Discussions: Demographic data, anaesthetic and surgical characteristics of the patients in the four groups did not differ. The postoperative NRS-pain scores showed a trend towards a lower pain intensity in the groups treated with parecoxib but the differences were not of clinical relevance. Cumulative opioid consumption was significantly lower in all three treatment groups at 1 and 24 h postoperatively ($p < 0.05$) with no evidence for an additive effect of both non-opioid analgesics (table shows mean (SD)).

	00	Pl/0	0/Pb	Pl/Pb
1 h postop	7.3 (5.1)	4.8 (3.3)	4.1 (3.1)	4.1 (3.3)
24 h postop	23.5 (15.3)	14.2 (12.3)	12.5 (10.9)	11.9 (10.7)

Conclusion(s): Both i.v. paracetamol and parecoxib show an opioid sparing effect of 35–45% and can be recommended due to the documented lack of relevant side-effects. The combination of i.v. paracetamol and parecoxib does not provide an additional analgesic effect.

Reference:

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A-913

Comparative study of presurgical intravenous dexketoprofen or paracetamol plus wound local infiltration for pain management after laparoscopic cholecystectomy

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Background and Goals: The purpose of our study was to compare pain scores and morphine consumption after laparoscopic cholecystectomy among patients who received intravenous preoperative dexketoprofen 50 mg or paracetamol 1 g and surgical wound infiltration with bupivacaína 0.5%.

Material and Methods: A prospective double-blind study was carried out on 45 patients, aged 20 to 61 years, undergoing elective laparoscopic cholecystectomy. Patients were randomized to receive intravenous dexketoprofen 50 mg, paracetamol 1 g or saline, 30 min before skin incision. All patients received skin incisions infiltration (cannula introduction) with bupivacaína 0.5%. The degree of postoperative analgesia was assessed by the visual analog scale (VAS) at rest and on coughing, verbal rating scores (VRS) and Total Pain Relief (TOTPAR). Also, morphine consumption, vital signs, and side effects were recorded for all patients during 24 hours.

Results: Demographic features, duration of pneumoperitoneum and anaesthetic time of the three groups were comparable. The total dose of morphine at 24 hours was smaller in the dexketoprofen and paracetamol groups than in saline group (2.4 ± 0.8, 2.2 ± 0.6 *vs* 6.7 ± 1.1 mg; $P < 0.001$). There were significant differences between the dexketoprofen and paracetamol groups *vs* saline group in relation to pain scores (at rest, coughing) during the study in regard to shoulder, incisional and intraabdominal pain scores, in which pain was significantly lower ($P < 0.05$). No patient developed relevant complications during the study.

Conclusion: In our study, the administration of dexketoprofen or paracetamol plus surgical wound infiltration with local anaesthetic before skin incision had good analgesic efficacy in terms of both opioid-sparing effect and control of pain after laparoscopic cholecystectomy.

A-914

Effect of preemptive multimodal analgesia in lumbar discectomy

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Background and Goals: The purpose of our study was to compare pain scores and paracetamol consumption after lumbar disk surgery in patients who received a multimodal analgesia with IV parecoxib and surgical wound infiltration with bupivacaína 0.25% either before surgery or immediately at the completion of the surgical procedure.

Material and Methods: A prospective double-blind study was carried out on 30 patients, aged 21 to 49 years, undergoing elective lumbar discectomy. Patients were randomized to receive parecoxib 40 mg IV and surgical wound infiltration with 30 ml bupivacaína 0.25% with epinephrine, 30 min before skin incision (group 1, n = 15) or immediately after skin closure (group 2, n = 15). The degree of postoperative analgesia was assessed by the visual analog scale (VAS), verbal rating scores (VRS), Total Pain Relief (TOTPAR) and by the amount of paracetamol administered during 24 h postoperatively. Postoperative nausea and vomiting were recorded throughout the study period.

Results: Demographic features, surgical procedure and anaesthetic time of the two groups were comparable. The mean time for rescue analgesic was 58 ± 33 min in group 1 *vs* 30 ± 17 min in group 2 ($P < 0.05$). There was no difference in pain scores between groups at any study period. Also, there were no significant differences in total amount of paracetamol consumption (1.1 ± 0.7 g, group 1 *vs* 1.7 ± 0.8 g, group 2). No patient developed relevant complications during the study.

Conclusion: In our study, the administration of parecoxib plus surgical wound infiltration with local anaesthetic before skin incision or at completion of surgery, had a similar effectiveness for pain management after lumbar discectomy. Preemptive multimodal analgesia was not observed in this study.

A-916

Effects of an intravenous infusion of ketamine given for 24 h before stopping epidural analgesia on pain during the transition from epidural to systemic analgesia after abdominal surgery

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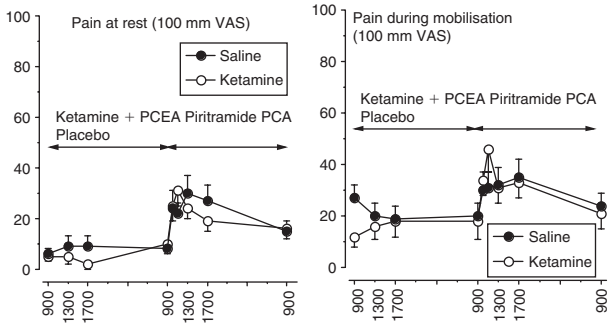
Background and Goal of Study: The interruption of epidural analgesia after surgery coincides frequently with the appearance of moderate to severe pain. We investigated whether ketamine smoothened the transition from epidural to systemic analgesia when given 24 h before stopping epidural analgesia.

Material and Methods: With IRB approval and informed consent, 40 patients scheduled for major elective abdominal surgery were included in this randomised double-blind placebo-controlled study. Postoperative analgesia was provided with a standardized patient-controlled epidural analgesia (PCEA) with ropivacaine 0.2% for three days postoperatively. Twenty four hour before stopping PCEA patients were randomly allocated to receive ketamine (bolus = 0.15 mg/kg then 1 μg/kg/min for 24 h) or the same volume of saline. Then PCEA and ketamine infusion were stopped and replaced by piritramide PCA. The following parameters were measured during the infusion of the study drug and for 24 h after the end of PCEA: pain scores (100 mm VAS) at rest, during mobilisation, and when coughing, consumption of ropivacaine solution and of piritramide. Data (mean ± sem) were analyzed by ANOVA; $P < 0.05$ = statistically significant.

Results: Patient data were similar in the two groups. Pain scores did not differ significantly between both groups (Fig.).



Ropivacaine consumption (146 ± 6 ml *vs* 140 ± 6 ml) and piritramide consumption (28 ± 3 mg *vs* 27 ± 4 mg) were also similar in both groups.

Conclusion: A low dose of ketamine given for 24 h before the interruption of epidural analgesia does not affect the transition from epidural to systemic analgesia.

A-917

Diclofenac/orphenadrine versus paracetamol for analgesia after total hip arthroplasty

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Background and Goal of Study: Intravenously NSAIDs are still very popular for postoperative analgesia in hip arthroplasty[1]. Our hypothesis was that using a combination of a NSAID with a muscle relaxant provides better analgesia than a NSAID alone.

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Materials and Methods: After Institutional Ethical Board approval and patient informed consent, 100 patients scheduled for total hip arthroplasty under spinal anesthesia were enrolled in a prospective, randomized, double-blind, placebo-controlled study over 6 months period (May–Oct 2005). After completion of surgery, patients received an iv infusion over 90 minutes of either paracetamol 1 g (Group P, n = 34), either diclofenac 75 mg + orphenadrine 30 mg (Group N, n = 34), or placebo (Group C, n = 32); the infusions were repeated in each group every 6 hs, up to 4 g paracetamol and 150 mg diclofenac + 60 mg orphenadrine within first 24 hs. Primary endpoints were VAS (1–10 cm), morphine consumption as rescue analgesic and patients satisfaction after 24 hours. Secondary endpoints were postoperative blood loss and gastrointestinal adverse events. Statistics used were one-way ANOVA, t-test and Mann-Whitney U-test ($p < 0.05$).
Results and Discussions: No significant differences were found between groups regarding demographics, surgery duration, postoperative blood loss or gastrointestinal adverse events. Total morphine consumption over 24 hs was significantly different between all 3 groups (28.81 ± 9.32 vs 11.41 ± 5.69 vs 6.17 ± 5.61 mg in groups C, P and N, respectively; $p = 0.000$). Patients satisfaction significantly differed between groups (N > P > C). VAS values were lower in group N vs P and in groups P and N vs C (see table).

Gr	n	4 hs*	8 hs*	12 hs*	24 hs*
C	32	4.59 ± 1.47	4.79 ± 1.25	4.46 ± 1.48	4.15 ± 1.32
P	34	3.97 ± 1.36	4.01 ± 1.25	4.00 ± 1.35	3.29 ± 1.18
N	34	2.92 ± 1.34	2.83 ± 1.35	3.30 ± 1.30	2.60 ± 1.21

* $p < 0.05$ in groups P, N vs C and in group N vs P.

Conclusion: Diclofenac/orphenadrine intravenously administered after total hip arthroplasty provides better analgesia than both placebo and iv paracetamol.
Reference:
1 Simanski C, et al. Eur J Anesth 2004; 21(S32): A-780.

A-918

Does perioperative low-dose S(+)-ketamine reduce postoperative morphine requirements after major surgery?

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Background and Goal of Study: NMDA receptor antagonists, such as S(+)-ketamine, may have beneficial effects on perioperative pain modulation. We studied, if low-dose S(+)-ketamine would reduce postoperative opioid requirements and if this effect is dependent on the timing of administration.
Materials and Methods: After IRB approval and consent, 47 patients undergoing major abdominal surgery were randomized to either pre-emptive (group 1: start of anaesthesia to 6 hr. after surgery), prophylactic (group 2: end of surgery to 6 hr. after surgery) or no (group 3: control, saline) S(+)-ketamine, administered by infusion of 1 μg/kg/min after an initial bolus of 0.075 mg/kg in a double-blind design. Anaesthesia was provided by BIS-guided propofol/remifentanil TCI. All patients received morphine and metamizol prior to end of surgery and PCA morphine was commenced in PACU. Cumulative morphine consumption and postoperative pain scores (VAS) were documented in intervals up to the fourth postoperative day. Statistical analysis was performed with Kruskall-Wallis test.
Results and Discussions: The table shows cumulative morphine consumption. Day 0 = day of surgery. (Median, mg)

Group	Day 0	Day 1	Day 2	Day 3	Day 4
1	26.1	57.3	94.8	128.2	151.6
2	28.0	63.6	96.2	134.0	171.5
3	31.8	87.7	115.0	152.9	184.1

Although the overall median morphine requirements of the pre-emptive group was 19.9 mg less than the prophylactic and 32.5 mg less than the control group across the observation period, this effect was not statistically significant. There was no difference in postoperative pain scores and sedation levels. The preemptive group had less morphine-related side effects.
Conclusion(s): Unlike a recent study with higher doses, we could not demonstrate any significant opioid-sparing effect either by pre-emptive nor by prophylactic low-dose S(+)-ketamine.
References:
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2 Joly V, et al. Anesthesiology 2005;103:147–55.

A-920

Is the effect of small-dose ketamine on postoperative hyperalgesia influenced by parecoxib?

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Background and Goal of Study: Both COX-2 and NMDA receptors may facilitate transmission of and central sensitisation to the nociceptive input in the CNS[1,2]. The study investigated the effects of iv administration of parecoxib, a COX-2 inhibitor, of ketamine and of the combination of both on postoperative opioid consumption and pain intensity.
Materials and Methods: The study was randomized and placebo-controlled. After protocol approval by the Ethical Committee of the University and written informed consent, twenty patients (ASA I–II) undergoing elective abdominal hysterectomy under remifentanil-propofol anesthesia were enrolled. Ketamine (Ket) groups received a bolus of 0.5 mg/kg ketamine followed by a continuous infusion of 0.1 μg/kg/min ketamine until 6 h after emergence from anesthesia. Placebo groups (Plac) received saline solution in the same sequence. Half of the patients in the placebo and ketamine groups received parecoxib 40 mg iv bid (Prx) during 72 h, the other half of patients received saline, with the first dose given just before incision. All patients received 15 μg sufentanil 20 min before anticipated end of surgery and PCA-piritramide (2 mg/dose, 10 min lockout) afterwards. Pain scores and opioid consumption were recorded until 72 h postoperatively.
Results and Discussions: Mean piritramide consumption at 24 h, 48 h and 72 h was 78 ± 29 mg, 117 ± 44 mg and 139 ± 47 mg in the Plac/Plac group compared to 44 ± 20 mg, 54 ± 23 mg and 59 ± 25 mg in the Prx/Plac group, 35 ± 15 mg, 54 ± 21 mg and 58 ± 26 mg in the Prx/Ket group and 19 ± 7 mg, 26 ± 13 mg and 31 ± 12 mg in the Plac/Ket group. The dose of piritramide 72 h was reduced by 57% in the Prx/Plac group, 58% in the Prx/Ket group and 77% in the Plac/Ket group. Mean pain intensity scores tended to be higher in the Prx/Plac and Plac/Plac group until 6 h post-operatively. The findings confirm that ketamine inhibits hyperalgesia only in presence of enhanced peripheral input from surgical inflammation as shown in animal models[3].
Conclusions: The clinical effect of ketamine on hyperalgesia is reduced by blocking the inflammatory response with COX-2 inhibition.
References:
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A-921

Amitriptyline suppresses neuroinflammation and up-regulates glutamate transporters in morphine-tolerant rats

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Background and Goals: The present study was performed to evaluate the potential role of the tricyclic antidepressant, amitriptyline, in the development of morphine antinociceptive tolerance in rats.
Materials and Methods: Male Wistar rats were implanted with two intrathecal (i.t.) catheters with or without a microdialysis probe, then received a continuous i.t. infusion of saline (control) or morphine (15 μg/h) and/or amitriptyline (15 μg/h) for 5 days.
Results: The results showed that chronic morphine infusion induced antinociceptive tolerance and down-regulation of spinal glutamate transporters (GLAST, GLT-1, and EAAC1) in the rat spinal cord dorsal horn. Co-administration of amitriptyline and morphine resulted in no development of morphine tolerance and up-regulation of GLAST and GLT-1 expression. On day 5, morphine challenge (10 μg/10 μl) resulted in a significant increase in levels of the excitatory amino acids (EAA), aspartate and glutamate, in CSF dialysates in morphine-tolerant rats. Amitriptyline co-infusion not only markedly suppressed this morphine-evoked EAA release, but also preserved the antinociceptive effect of morphine seen after acute challenge at the end of infusion. Glial cell activation and increased cytokine expression (TNFα, IL-1β, and IL-6) in the rat spinal cord were induced by 5-day morphine infusion and these neuroimmune responses were also prevented by amitriptyline co-infusion.
Conclusions: These results show that amitriptyline not only attenuates morphine tolerance, but also preserves its antinociceptive effect, and acts by inhibiting the inflammatory response and preventing glutamate transporter down-regulation (even causing up-regulation of glial GLAST and GLT-1),

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thus attenuating the morphine challenge-induced EAA release, which may be responsible for the reduction of the antinociceptive effect of morphine in tolerant rats.

A-922

Mitochondrial ATP-sensitive potassium channels are involved in the antiallodynia induced by R-PIA, an adenosine A1 receptor agonist in neuropathic rats

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Background and Goal of Study: The activation of adenosine A1 receptor has antiallodynic action in patients with chronic neuropathic pain. Therefore, opening of mitochondrial ATP-sensitive potassium (K_{ATP}) channels afforded by adenosine A1 receptor activation may be involved in the neuronal pathophysiologic mechanisms of pain. In this study, we evaluated the effect of selective mitochondrial K_{ATP} channel blocker, 5-hydroxydecanoate (5HD), on the antiallodynia induced by R-PIA, an adenosine A1 receptor agonist in neuropathic rats.

Materials and Methods: Neuropathic pain was induced in male Sprague-Dawley rats by tight ligature of the left lumbar 5th and 6th spinal nerves. Intrathecal catheterization was performed on the 3rd day. The threshold of mechanical allodynia was evaluated by the up-down method using withdrawal response to stimulus with a von Frey filament. Rats with a threshold of less than 4 grams were selected as neuropathic rats. On the 7th day, intraperitoneal injections of 5HD 20, 30, 40 mg/kg followed by intrathecal injection of R-PIA 2 μg, five minutes after, were performed. The antiallodynic effect of R-PIA was evaluated at baseline, 10, 20, 30, 40, 50, 60, and 90 min after.

Results and Discussions: The threshold of mechanical allodynia in R-PIA treatment rat was significantly higher than that in neuropathic rat ($p < 0.05$). However, pretreatment of 5HD had a tendency to attenuate the antiallodynic effect of R-PIA in proportion to the dosage of 5HD.

Conclusion(s): These results suggest that mitochondrial ATP-sensitive potassium channels are involved in the antiallodynia induced by R-PIA, an adenosine A1 receptor agonist in neuropathic rats.

Reference:

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A-925

Pregabalin reduces primary and secondary hyperalgesia in a rat model of chronic non-inflammatory muscle pain

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Background and Goal of Study: Pregabalin, (S-(+)-Isobutylgaba) is a structural analogue of gamma-aminobutyric acid (GABA) approved by FDA for partial epilepsy and neuropathic pain. It is not active at GABA receptors and does not alter brain GABA concentrations, but is a selective high-affinity ligand at the calcium channel α_2–δ protein. Effectiveness of pregabalin in musculoskeletal pain has not, as yet, been tested. Two intramuscular injections of acid saline produce bilateral long-lasting cutaneous and muscle hyperalgesia. Therefore, we evaluated the effect of pregabalin on hyperalgesia induced by muscle insult.

Materials and Methods: Male Sprague-Dawley rats (270–320 g) were used. Primary hyperalgesia of the muscle was evaluated with withdrawal threshold to compression of the muscle, and secondary hyperalgesia of the paw was evaluated with withdrawal threshold to von Frey filaments. After baseline measurements, pH 4 saline was injected twice 5 days apart in the gastrocnemius muscle. Pregabalin was then administered systemically 24 h after the second injection in separate groups of animals as follows: 0 (saline), 10, 30, 60, and 100 mg/kg.

Results and Discussions: There was a significant decrease in the both withdrawal threshold to mechanical stimulation of the paw and to compression of the muscle bilaterally 24 h after the second intramuscular acid injection. The decreased withdrawal threshold of the paw and the muscle was significantly reversed 1 h and 2 h after administration of 30–100 mg/kg dose of pregabalin.

Conclusion: Bilateral cutaneous and muscle hyperalgesia induced by repeated intramuscular acid injections are reversed by systemically administered pregabalin. We suggest that pregabalin may be an effective treatment for people with chronic non-inflammatory muscle pain.

A-926

Role of spinal Substance P in expression of acute opioid hyperalgesia under normal and neuropathic conditions

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Background: We previously reported acute opioid hyperalgesia (OH) supported by increased MACbar under Sevoflurane anesthesia (MACbar SEVO) and very low dose of IV Sufentanil (SUF).(1) While μ-agonists inhibit noxious stimulus-evoked Substance P (SP) (NK1-Receptor ligand) release, sustained morphine treatment and nerve injury increase both spinal sensitivity to SP and NK1-R expression. (2,3) The study evaluates the role spinal SP in acute OH development in normal (C) and neuropathic (NP) rats.

Materials and Methods: In adult male Wistar rats (n = 5 per group), the MACbar SEVO was determined by tail clamp stimulus before and during low dose SUF infusion (0.005 μg/kg/h) in C and NP rats (3 months after partial ligation of sciatic nerve). Intrathecal (IT) saline or NK1-R antagonist 500 μg (L-732,138) was administered before MACbar SEVO determinations. Results are expressed as MACbar SEVO (%, mean ± SD) and % rats developing acute OH defined as >20% increase of MACbar SEVO after SUF infusion. Statistics used ANOVA and χ^2 tests.

Results:

C group	SEVO (%)	SEVO + SUF (%)	% OH
IT saline	1.9 ± 0.3	3.1 ± 0.6*	72%
IT Anti NK-1	1.0 ± 0.5	0.7 ± 0.4*	0%
NP Group			
IT saline	1.7 ± 0.6	1.5 ± 0.8	22%¥
IT Anti NK-1	1.4 ± 0.4	1.9 ± 0.5*	100%¥

$P < 0.05$ significant with SEVO (*), with C group (¥).

Conclusion: In contrast with normal rats, NP rats do not display acute OH. Spinal plasticity already triggered pain facilitatory processes masking OH. Pretreatment with IT NK1-R antagonist prevents acute OH in normal rats but restores its development in NP rats. Neuroadaptive changes in spinal regulatory mechanisms might be involved.(2,3)

References:

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A-927

The role of glutamate transporters for pain behaviours after plantar incision in the rat

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Background and Goal of Study: Spinal glutamatergic transmission plays a major role for different pain states including postoperative incisional pain. Little is known, however, about the role of spinal glutamate transporters, regulating the uptake of glutamate, for spinal sensitization and pain behavior after tissue injuries. Here, we investigated the expression of glial glutamate transporters in the spinal cord after plantar incision in the rat and the effect of a specific glutamate transporter inhibitor (TBOA) on incision-induced pain behaviours.

Materials and Methods: Expression of glutamate transporter 1 (GLT-1) and L-glutamate–L-aspartate transporter (GLAST), the 2 glial glutamate transporter (GT) in the spinal cord, was examined in spinal cord tissue of rats 2 hrs and 1, 4 and 14 days after plantar incision (n = 3 per group) by Western Blot analysis. In behavioral experiments, the effect of intrathecal (IT) TBOA injection (0.5 μg/10 μl or vehicle, n = 7–9 per group) on spontaneous pain behavior (licking or biting the paw and tail), non-evoked pain behaviors based on weight bearing of the incised paw and response latencies (RL) to radiant heat were assessed. Tests were performed in non-incised rats and rats on day 1 and day 4 after incision.

Results and Discussions: GLAST was up regulated 1.6, 2.7, 2.1 and 2.3 fold in the ipsilateral lumbar spinal cord 2 hrs, 1, 4 and 14 days after incision, respectively ($P < 0.05$ vs. sham). Similar, spinal expression of GLT-1 was increased 1.4, 2.2, 1.9 and 2.2 fold 2 hrs, 1, 4 and 14 days after incision ($P < 0.05$ vs. sham). IT TBOA induced spontaneous pain behaviours in rats 1 and 4 days after incision but not in non-incised rats ($P < 0.05$ vs. vehicle). Furthermore, non-evoked pain behaviors on day 1 and 4 after incision increased 30 and 60 min after IT TBOA injection ($P < 0.05$). In contrast, reduced RLs to heat 1 and 4 days after incision were unchanged by TBOA ($P > 0.05$).

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Conclusion(s): Expression of spinal glial GT increased ipsilateral to an incision. Blocking spinal GT activity with a low dose of TBOA in incised rats (but not in non-incised rats) evoked spontaneous pain and enhanced none-evoked pain behavior; however, heat hyperalgesia was unchanged. Thus, the increase in glial GT expression may contribute to incision-induced spontaneous pain behavior (but not heat hyperalgesia) by diminishing it.

A-928

Effects of oxidative stress on rat model of complex regional pain syndrome-type I (CRPS-I)

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Background and Goal of Study: Reactive oxygen species (ROS) and inflammatory responses contribute to development of neuropathic pain.[1,2] Superoxide (O_2^-) and nitric oxide (NO) serve to mediate cell signaling processes, directly induce tissue injury during inflammation. A neuropathic pain syndrome was produced in rats following prolonged hindpaw ischemia/reperfusion, creating an animal model of complex regional pain syndrome-Type I (CRPS-I).[3] This study was designed to evaluate the effects of NO and O_2^- on the development of CRPS-I.

Materials and Methods: Male adult SD rats were used for CRPS-I model. Plasma O_2^- production rate was measured by cytochrome c reduction in the presence xanthine (without xanthine oxidase, kinetic, 550 nm). Allopurinol (LA; 4 mg/kg, HA; 40 mg/kg), SOD (4000 U/kg) or L-NAME (10 mg/kg) was administered just after tourniquet application and for 2 days after reperfusion. Mechanical and cold allodynia were measured in both hindpaws. The effects of antioxidants were confirmed by histologic changes of the hindpaws. Data were expressed as mean ± SEM and statistical significance ($P < 0.05$) was determined by Repeated measures ANOVA for nonparametric data and post-hoc testing with Wilcoxon signed-ranked test.

Results and Discussions: HA-inhibitable, xanthine oxidase-mediated plasma O_2^- production was the highest at the just reperfusion and lasted at least 1 week. Mechanical and cold allodynia were present in both hindpaws as early as 4 hr after reperfusion, and lasted at least 4 weeks. Pain behavior was significantly attenuated for those treated with HA or SOD. LA or L-NAME treatment also decreased pain score but less than HA or SOD. Microscopic findings showed inflammatory reaction was significantly reduced in the HA or SOD group compared to LA or L-NAME group.

Conclusion(s): This study suggests that the generation ROS, especially O_2^- is partly responsible for CRPS-I. Superoxide inhibition via allopurinol or SOD is more effective than NO inhibition through L-NAME.

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3 Coderre TJ, et al. *Pain* 2004; 112: 94–105.

A-929

The interaction of gabapentin and R-PIA on mechanical allodynia in rats with a spinal nerve ligation

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Background and Goal of Study: Nerve ligation injury may produce a tactile allodynia. Intrathecal adenosine receptor agonists or gabapentin have an antiallodynic effect. Adenosine receptors, probably of the A1 subtype localized in excitatory amino acid terminals, have been shown to inhibit the release of aspartate and glutamate. It is known that gabapentin presynaptically inhibits glutamate transmission.

In this study, we examined the effect of intrathecal gabapentin on the antiallodynic state induced by the adenosine A1 receptor agonist, N^6-(2-phenylisopropyl)-adenosine *R*-(-) isomer (R-PIA), in a rat model of nerve ligation injury.

Materials and Methods: Rats were prepared with ligation of left L5–6 spinal nerves and intrathecal catheter implantation for drug administration. Tactile allodynia was measured by applying von Frey filaments to the lesioned hindpaw. Thresholds for withdrawal response were assessed. Gabapentin and R-PIA were administered respectively to obtain the dose-response curve and the 50% effective dose (ED_{50}). Fractions of ED_{50} were administered concurrently to establish the ED_{50} of the drug combination. The drug interaction was analyzed using the fractional analysis and isobolographic method. Side effects were also observed.

Results and Discussions: Intrathecal gabapentin and R-PIA and their combination produced a dose-dependent antiallodynic effects without severe side effects. Intrathecal gabapentin synergistically enhanced the antiallodynic effect of R-PIA when coadministered.

Conclusion(s): These experiments suggest that the antiallodynic action of a gabapentin and R-PIA combination is synergistic at the spinal level.

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A-930

Analgesic effects of perioperative methadone on the prevention and treatment of experimental neuropathic pain. Comparison with morphine and ketamine

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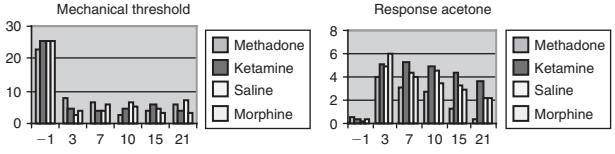
Background and Goal of Study: Neuropathic pain developed after nerve injury is especially difficult to manage with conventional analgesics (1). Therefore, the efforts to prevent its development become paramount to avoid postoperative drug-resistant pain syndromes.

Objective: To evaluate the effects of perioperative administration of subcutaneous methadone on the prevention of development of experimental neuropathic pain following unilateral nerve injury in rats compared with morphine and ketamine.

Materials and Methods: 67 male Sprague-Dawley adults rats divided in 4 groups underwent unilateral tight ligation of the L5 and L6 spinal roots (SNL model) (2). Rats received the following drugs: 5 mg/kg methadone (N = 19); 10 mg/kg ketamine (N = 15); 5 mg/kg morphine (N = 15); saline (N = 19). Drugs were administered 24 and 12 h before the SNL injury, and 24 and 48 h postoperatively. Behavioral tests (tactile allodynia with Von Frey filaments; cold allodynia with drop of acetone) were conducted before the injury and during the postoperative period (days 3, 7, 10, 15, 21). Analysis: comparison values in each group with their baseline and with others groups. Neuropathic pain was assumed in rats with value more than 50% difference of baseline.

Results and Discussions: 8 rats receiving methadone and 1 rat receiving morphine died by respiratory depressing. All rats receiving ketamine presented light and time limited excitement.



Conclusion(s): Administration of 5 mg/kg methadone is more effective than 5 mg/kg morphine and 10 mg/kg ketamine in prevention cold allodynia in rats. Although death was too high to consider and adjust of the dose.

References:

1 Finnerup NB, et al. Pain, 2005;118:289–305.
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A-931

Analgesia after adenotonsillectomy in children – comparison of tramadol and acetaminophen

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Background and Goals: Pain control after tonsillectomy in children must be sufficiently safe and effective (1). Hypothesis, that tramadol received intravenously (i.v.) after induction of general anaesthesia provides better postoperative analgesia after adenotonsillectomy in children compared to acetaminophen (2), was tested.

Materials and Methods: In a prospective, blinded study we included 108 children (age 3 to 7 yrs, ASA 1, 2) scheduled for adenotonsillectomy. They were randomly divided into two groups: 54 children (age 5 ± 1 yr) received tramadol 2 mg · kg^{-1} of body weight (BW) i.v. (group T), while the other 54 children (age 5 ± 1 yr) received acetaminophen elixir 15 mg · kg^{-1} of BW before operation (group A). A standard anaesthetic technique was used (propofol,

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alfentanil, vecuronium) for endotracheal intubation and maintenance of anaesthesia in both groups. The intensity of pain (VAS) and pulse frequency (pf) were assessed every six hours until the second postoperative day. Rescue medication consisted of codeine and phenobarbital analgesic suppositories (AS). Differences between the two groups were compared with Student t-test (*) and chi square test (**), $p < 0.05$.

Results and Discussions: Data (Mean ± SD) are shown in the Table:

	Group-T	Group-A	p-value
BW (kg)	19.8 ± 4.2	18.9 ± 4.7	0.32*
Sex (m/f)	29/25	34/20	0.6**
VAS after 6 h	4.2 ± 1.4	4.0 ± 1.3	0.58*
pf-6 h(beat/min)	98 ± 13	97 ± 11	0.74*
AS (n/day)	1.8 ± 0.7	1.4 ± 0.6	0.003*

m-male, f-female, n-number.

Pain score 6 h after operation was lower in group-A. Consumption of AS was higher in group-T ($p < 0,05$).

Conclusion: It is concluded, that tramadol i.v. does not provide better postoperative analgesia compared to acetaminophen elixir, after adenotonsillectomy in children.

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1 Morton NS. *Br J Anaesth* 1999; 83: 118–129.
2 Shipton EA. *Anaesth Intens Care* 2000; 28: 363–374.

A-932

An audit of post-operative analgesia for major joint surgery

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Background and Goal of Study: Major joint procedures are common. Good post-op analgesia can be challenging but is important for patient comfort, satisfaction and outcome.

Materials and Methods: An audit of analgesic technique, quality and side effects was carried out to compare available methods. Data was collected for pain score (0–3), sedation score (0–3), respiratory rate, blood pressure, nausea/vomiting and pruritis for 24 hours post-op or until cessation of the technique for all major joint procedures between July 1999 and May 2003.

Results and Discussions: 401 procedures were audited. 177 total knee replacements, 205 total hip replacements and 19 fractured neck of femur repairs. 400 patients were managed on the general ward. 249 patients had PCA alone, 91 had spinal diamorphine plus PCA, 2 had spinal diamorphine alone and 59 had an epidural infusion. No data was collected on LA nerve blocks. 18.2% patients had inadequate analgesia (pain score >1 for >10% time). The majority of these (80.8%) had PCA alone. Spinal diamorphine (+/−PCA) provided the best analgesia, adequate in 93.4% of patients. Respiratory depression (10.4% with RR <8 bpm) and sedation (22.5% with sedation score >1) were problematic with PCA. This was not the case with spinal diamorphine (1 patient had respiratory depression and 6 were oversedated). 31.4% patients had nausea/vomiting. This was worse with neuraxial opioids (39.6% with spinal diamorphine plus PCA and 38% with epidural opioid). 57.6% patients received no peri-op antiemetic. Current practice includes greater use of prophylactic antiemetics therefore hopefully future audits will show less nausea/vomiting.

Conclusion(s): Spinal diamorphine provides the best analgesia following major joint surgery and is safe to use in patients managed on a general ward, providing adequate monitoring is available. As such our current practice is moving towards the use of spinal diamorphine for major joint procedures. LA nerve blockade may also provide good post-operative analgesia without the need for opioid administration.

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A-933

Preoperative lamotrigine reduces postoperative pain after modified radical mastectomy

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Background and Goal of Study: The antiepileptic agent lamotrigine has at least two antinociceptive properties: it stabilizes the neuronal membrane through blocking activation of voltage-sensitive sodium channels and it inhibits the presynaptic release of glutamate (1, 2). We thus tested the hypothesis that premedication with lamotrigine would decrease postoperative pain and improve postoperative analgesia in patients after modified radical mastectomy. Primary outcome measure was evaluating pain intensity over 24 hours after surgery. Secondary efficacy measures included analgesic consumption and safety and tolerability of lamotrigine.

Materials and Methods: This study was designed as a randomized, double-blind and placebo controlled trial. The institutional review board of our hospital approved the study and written informed consent was obtained from each participant. Sixty-eight ASA I and II patients scheduled for mastectomy in general anesthesia were randomly allocated into two equal groups to receive oral lamotrigine 200 mg or placebo two hours before surgery. After surgery, the pain was assessed on a visual analogue scale (VAS) at intervals of 0–6, 6–12, 12–18, and 18–24 hr at rest. Total morphine consumption in the first 24 hr after surgery was also recorded.

Results and Discussions: Patients in the lamotrigine group had lower VAS scores at all time intervals of 0–6, 6–12, 12–18, and 18–24 hr than those in the placebo group (3.2 ± 2.1, 2.5 ± 1.5, 1.5 ± 1.3, 1.2 ± 0.6 *vs* 5.8 ± 2.5, 4.5 ± 1.8, 2.2 ± 1.4, 2.1 ± 1.2, Mean ± SD; $p < 0.05$).

The total morphine consumption after surgery in the first 24 hr in the lamotrigine group (5.2 ± 2.5 mg, Mean ± SD) was significantly less than in the placebo group (9.8 ± 3.5 mg; $p < 0.05$).

Conclusion(s): Premedication with 200 mg lamotrigine reduces the severity of postoperative pain and improves postoperative analgesia in patients who undergo modified radical mastectomy.

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A-934

Analgesic effects of preemptive tramodol and lornoxicam administration in percutaneous nephrolithotomy

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Background and Goal of Study: The aim of this study was to evaluate the effect of preemptive administering of tramodol and lornoxicam in early postoperative analgesia of patients undervent percutaneous nephrolithotomy (PCNL).

Materials and Methods: Forty-five patients with ASA I and II group which to be planned PCNL were divided into three groups. Group T was administered 100 mg iv tramodol, group L was administered 8 mg iv lornoxicam and group K was administered serum physiologic 30 minutes before anesthesia induction. In pre and peroperative period, the patients' hemodynamic parameters were measured. In the postoperative period, the patients' hemodynamic parameters, Visual Analog Pain Scale (VAS) values, first analgesic necessity and total analgesic consumption were recorded. Postoperative advers effect, complication and patients' pleasure were also evaluated.

Results: Operation times and demographic data were similar in all groups. Preoperative, peroperative and postoperative hemodynamic values were not significantly different between groups. Pain scores of group T were significantly lower in group T (Table 1) ($p < 0.005$). Total analgesic dose was lower, time of postoperative first analgesic requirement was later and pleasure of patients was higher in group T.

Table 1. VAS measurements

	Group K $X \pm S_D$	Group L $X \pm S_D$	Group T $X \pm S_D$
Postop.15 min	3.53 ± 1.68	1.93 ± 0.59*	1.33 ± 0.61*
30 min	4.33 ± 1.83	2.93 ± 2.57	1.73 ± 1.16*
1 h	4.66 ± 1.98	3.20 ± 1.61*	1.80 ± 6.77*†
2 h	4.33 ± 2.12	3.26 ± 1.53	2.66 ± 1.54*
4 h	4.60 ± 1.84	3.40 ± 1.80	2.60 ± 1.45*
6 h	4.80 ± 2.17	3.33 ± 1.83	4.86 ± 1.24
12 h	4.13 ± 1.80	2.60 ± 1.12*	2.46 ± 0.99*
24 h	2.00 ± 0.53	2.06 ± 0.59	2.26 ± 0.59

*Significant decrease according to Group K. † Significant decrease according to Group L.

Conclusion(s): While preemptive administrations of tramodol and lornoxicam had no significant effect on hemodynamics, they are more effective than

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placebo in prevention of postoperative pain. This effect of tramodol was significantly higher than that of lornoxicam.

A-935

Cost effectiveness analysis of PCA versus continuous elastomeric pump for postoperative pain treatment with tramadol and metamizol

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Background and Goal of the Study: One of the most important activities at an acute pain service is to review the costs and effectiveness of their postoperative pain treatments (1). The current study was designed to compare costs and effectiveness of two different administration systems for an intravenous postoperative analgesia with tramadol and metamizol: PCA and Elastomeric Pumps.

Material and Methods: A prospective study was carried out in 50 patients, ASA I or II undergoing scheduled gynaecological mayor surgery. Two grams of metamizol and 100 mg of tramadol were administrated intravenous as loading dose, followed by 8 g of metamizol and 400 mg of tramadol diluted in 100 ml of physiologic serum as maintenance. Patients were randomised located in two groups of treatment: Group 1 PCA with 1.5 ml/h as continuous rate, 1 ml bolus and 20 minutes lockout interval. Group 2 Elastomeric pump with a continuous rate of 2 ml/h. Analgesic effectiveness was analysed in the first 48 hours after surgery as well as adverse effect events, patients satisfaction and direct and indirect costs of each system.

Results: Both groups were homogeneous at demographic evaluated data. Analgesic effectiveness was similar in the 27 patients in group 1 and the 23 in group 2, measured by VAS 0 to 10. However Elastomeric pump group required iv morphine in 61% of patients versus 33% in PCA group ($p < 0.05$). Postoperative nausea and vomiting incidence was similar in both groups (about 50%). In PCA group 81% of patients would repeat the analgesic treatment versus 56% in Elastomeric group ($p < 0.05$). The average number of nurse staff interventions was 15.6 for PCA group and 19 for Elastomeric group, with an average spent time of 51 and 57 minutes respectively. Costs frommaterial (not including the PCA pumps, provided by the brand) were higher than costs from staff analgesic interventions and altogether were in average 40.06€ per patient in PCA group and 53.83€ in Elastomeric group (measured in 2004 values).

Conclusions: Both groups had a similar analgesic effectiveness but the PCA resulted to be more satisfactory and a 37% cheaper. At our hospital, where we carried the study out the PCA amounted to be better comparing costs and effectiveness than the Elastomeric Pump.

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A-936

The contribution of parecoxib to postoperative function recovery after total knee arthroplasty

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Background and Goal of Study: Parecoxib, a selective COX-2 enzyme inhibitor, has opioid-sparing properties in acute postoperative pain.[1] This study evaluated the impact of this property on patient outcomes after a 4-day treatment with parecoxib added to standard of care with patient controlled intravenous morphine (PCA).

Materials and Methods: The study was double blinded, randomized and placebo-controlled. After protocol approval by the Ethical Committee of the University and written informed consent, 46 patients scheduled for elective total knee arthroplasty were randomly assigned to receive either parecoxib 40 mg BID or placebo BID treatment i.v. for 4 days. All patients received PCA morphine (bolus dose 1 mg/ml, lockout 6 min, max dose 25 mg/4 h). Pain VAS on movement, cumulative morphine consumption, joint function (Knee Society Clinical Rating Score, CRS) and of respiratory function (FEV_1) assessments and incidence of side effects were evaluated for 4 days postoperatively. Analysis of variance for repeated measures, Neuman Keuls' test for post-hoc comparisons and Chi Square testing were used for data analysis.

Results and Discussions: Parecoxib ($n = 24$) decreased the total consumption of PCA morphine at 48 and 72 h post-operatively by 23% versus placebo ($n = 22$; $P < 0.05$). Compared with placebo, patients receiving parecoxib experienced similar postoperative pain intensity, but had significantly less opioid-related side effects (confusion: 5/24 vs.11/22; vomiting: 7/24 vs.15/22; bladder spasm: 2/24 vs. 9/22; $P < 0.05$) during the first 72 h postoperatively. A significant improvement of FEV1 was seen during the first two days in the parecoxib group (98% vs. 76% of the normalized FEV1 at baseline vs. placebo group; $P < 0.05$). In the parecoxib group, the clinical knee function score improved by 43% and maximal angle of joint flexion by more than 10° compared with patients receiving placebo ($P < 0.05$). Parecoxib use was safe and well tolerated.

Conclusions: Administration for 4 days of IV parecoxib sodium 40 mg BID with PCA morphine improved significantly rehabilitation of the knee joint and of respiratory function and contributed to a decreased incidence of opioid-related side effects.

Reference:

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A-937

Does intraperitoneal instillation of THAM improve postoperative analgesia after laparoscopic cholecystectomy?

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Background and Goal of Study: The purpose of this randomized double blind and prospective study was to evaluate the postoperative analgesic efficacy of the intraperitoneal instillated THAM sol (trometamol-N®) vs. bupivacaine 0.5% in patients submitted to laparoscopic cholecystectomy.

Materials and Methods: 58 patients ASA I/II undergoing laparoscopic cholecystectomy, after intraperitoneal insuflation of CO_2 received subdiaphragmatically saline 0.9%, bupivacaine 0.5% or trometamol. Patients were assigned in one of three groups: control group S ($n = 20$) which received 100 ml saline 0.9%, group B ($n = 19$) in which we instillated 100 mg bupivacaine 0.5% and group T ($n = 19$) in which we instillated 100 ml sol Trometamol. All patients received a general anaesthesia with isoflurane. We evaluated the postoperative abdominal pain, the right shoulder pain at 1, 3, 6, 9, 12 and 24 hrs after surgery, as well as analgesic requirement. The postoperative respiratory function expressed as peak expiratory flow and the incidence of vomiting were also investigated. Results were analyzed using chi-square and Fisher's test and Student's t-test with statistical significance $p < 0.05$, and the confidence interval (CI) 95%. Data were expressed as mean ± SD.

Results: Intraperitoneal instillation of 100 mg trometamol compared to bupivacaine 0.5% provided a significant reduction in the incidence and intensity of postoperative right shoulder pain. The overall dose of analgesic (pethidine) used for postoperative analgesia was significantly reduced by the instillation of trometamol. The incidence of vomiting was influenced neither by trometamol nor by bupivacaine, but the administration of bupivacaine significantly reduced the PEF at 6 hours postoperatively.

Conclusion(s): The intraoperative administration of trometamol-N® improved the postoperative analgesia, reduced right shoulder pain, and postoperative opioid dose. In comparison to bupivacaine, 0.5% instillation of trometamol-N® did not influence respiratory function. The incidence of postoperative vomiting was influenced neither by trometamol-N® nor by bupivacaine 0.5%.

Reference:

1 Pasqualucci A, De Angelis V, Contardo R, et al. Anesthesiology 1996; 85:11–20.

A-938

The effectiveness of endoscopic epidurolysis and ozone, ciprofloxacine and hyaluronidase medication in treatment of degenerative spondylolisthesis: a prospective analysis

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Background and Goal of Study: To evaluate the effectiveness of endoscopic epidurolysis in the treatment of degenerative spondylolisthesis.

Materials and Methods: Forty four patients that did not want lumbar fusion and, Oswestry Low Back Pain Disability Index from 20% to 60% were enrolled and treated prospectively with epiduroscopy by means of a flexible fiberoptic endoscope introduced into the caudal epidural space and adhesions nearby degenerative spondylolisthesis were mechanically mobilized and 150 UI hyaluronidase, 50 mg ciprofloxacina and 8 ml of ozone at 38 γ/ml concentration were applied close to the abnormal areas under direct vision by endoscopy. Short and long term efficacy (1 week, 3 months, 6 months, 12 months, 24 months) was prospectively evaluated; pain scores were measured by visual

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analog scale (VAS) modified by the identification of three qualitative rates: very good (VAS 0–2), good (VAS 3–4); and not sufficient (VAS ⩾5). Disability were evaluated by Oswestry Low Back Pain Disability Index.

Results and Discussions: Short term follow-up of one week demonstrated significant relief of pain in 100% of patients and Oswestry Index until 40% in 79% of patients. At medium term follow-up (12 months) showed 74% with significant relief of pain and 26% with no pain relief and Oswestry Index until 40% in 82% of patients. Longer term follow-up (24 months) demonstrated 67.5% with significant relief of pain and 32.6% with no relief and Oswestry Index until 40% in 77.5% of patients.

Discussion and Conclusion(s): Epiduroscopy by mechanical adhesiolysis and administration on targeted areas of hylarunidase, ciprofloxacina and ozone seems to be, in this prospective study, an effective technique to provide a sensible and persisting pain relief and act of improving Oswestry Low Back Pain Disability Index in chronic low back pain for degenerative spondylolisthesis with neurogenic claudication/radiculopathy.

A-939

The effect of intravenous dexmedetomidine and midazolam premedication on pain and sedation scores in burned patients undergoing wound dressing change with ketamine anaesthesia

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Background and Goal of Study: The present study was designed to compare the sedative and analgesic effectiveness of intravenous dexmedetomidine and midazolam premedication in burned patients undergoing wound dressing change.

Materials and Methods: Following ethic committee approval and informed patient consent, 90 burned patients (Grade I–III) undergoing wound dressing change were randomized into the following three groups. Ten minutes before the wound dressing change; patients in Group D (n = 30) received 1 microg kg^{-1} of dexmedetomidine, patients in Group M (n = 30) received 0.05 mg kg^{-1} of midazolam and patients in Group S (n = 30) received equal volume of saline intravenously. One minute before the wound dressing change; all patients received a standardised dose of ketamine (1 mg kg^{-1}) for anaesthesia. Patient characteristics, haemodynamic variables, duration of anaesthesia after single dose of ketamine, cumulative ketamine consumption and time to recovery were recorded. Pain, discomfort, and sedation scores and any side effect were also recorded after recovery and at 1, 2, 6, 12 and 24 hours after the procedures.

Results and Discussions: There was no significant difference in patient characteristics, recovery time and cumulative ketamine consumption. However, the number of patients requiring supplement ketamine was significantly higher in S Group than in D and M Groups ($p < 0.05$). Duration of anaesthesia after single dose of ketamine was significantly longer in D and M Groups than in S Group ($p < 0.05$). Pain, discomfort, and sedation scores were significantly lower at the first postoperative hour in D group than in M and S groups ($p < 0.05$). No significant side effect was recorded.

Conclusion(s): In burned patients undergoing wound dressing change, both dexmedetomidine (1 microg kg^{-1}) and midazolam (0.05 mg kg^{-1}) supplemented to ketamine anaesthesia, provided effective intraoperative analgesia and patient comfort without causing any haemodynamic or respiratory discrepancy. However, dexmedetomidine offered longer postoperative pain relief and sedation compared to giving midazolam and saline.

Education, Research and Presentation

A-941

The CompuFlo® helps unexperienced operators identify the epidural space in a simulator model

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Background and Goal of Study: The initial success rate of finding the epidural space by untrained residents is low and the learning curve is slow (1). CompuFlo® (C) [Milestone Scientific, Livingston, NJ, USA] is a novel computerized device capable of injecting fluids with a precise rate and pressure setting. The pressure is displayed in real time visually as well as with a corresponding audible tone that reflects the pressure data. We successfully used this device for identification of the epidural space in 20 parturients (2). We tested the hypothesis that using C will help inexperienced operators to successfully identify the epidural space in a simulator model.

Materials and Methods: With IRB approval and signed informed consent, 30 subjects with <10 previous epidural placement experience were enrolled the study. A Life/form® spinal injection simulator (Nasco, Fort Atkinson, WI, USA) was used as a model. After the techniques of finding the epidural space using loss of resistance (LOR) with saline and with C use were described, the subjects were asked to identify the epidural space using both methods. The starting method was randomized and after correctly identifying the space, or failing 5 attempts, the subjects were asked to use the alternate approach. Subjects were instructed to report the difficulty of each approach on a 1–10 scale. The main study outcome was the number of attempts and the difficulty score. The results were analyzed using t-test 2 paired samples for mean.

Results and Discussions: 96% of the subjects correctly identified the epidural space using LOR and 100% using C in 5 attempts or less. There was a significant difference ($p < 0.05$) between the two methods both with regard to number of attempts (1.8 vs. 1.2) and reported difficulty score (5.4 vs. 3 in LOR and C respectively).

Conclusion: Using CompuFlo® significantly improved inexperienced operators' success rate for the identification of the epidural space in a simulator model. All subjects tested found CompuFlo® less difficult to use in comparison to LOR.

References:

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2 Ghelber R, Gebhard P, Szmuk et al. Anesth Analg 2005; 100: S–255.

A-942

The value of debriefing in simulation-based education: oral versus video-assisted feedback

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Background and Goal of Study: Videotape feedback may enhance the impact of instructor's debriefing during simulation-based education. The purpose of this study was to investigate the value of the debriefing process during simulation and to compare the educational efficacy of two types of feedback against control (no debriefing): oral feedback and videotape-assisted oral feedback.

Materials and Methods: We pre-tested 42 anesthesia residents during a simulated crisis scenario using a high fidelity mannequin. Participants were then randomly assigned to receive no debriefing (control), oral feedback (oral), or videotape-assisted oral feedback (video-assisted) (n = 14 in each group). The debriefing focused on crisis resource management principles. Participants were then required to manage a post-test scenario. The performances were later reviewed by two blinded assessors who rated participants' anesthesia non-technical skills (ANTS) using a validated scoring system (1). The mean changes in score were analyzed using an ANOVA and Tukey's test for post-hoc comparisons.

Results and Discussions: Participants' non-technical skills did not improve in the control group whereas the provision of oral feedback, assisted or not with videotape review, resulted in significant improvement ($p < 0.005$). There was no significant difference in score changes between oral and video-assisted feedback groups.

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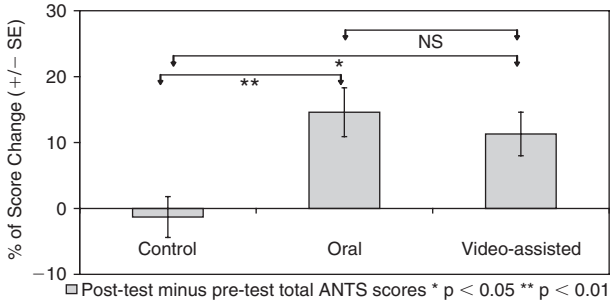

Conclusion(s): Exposure to a simulated crisis without constructive feedback given by instructors offers little educational benefit. The addition of video review did not offer any advantage over oral feedback alone. Valuable simulation training can therefore be achieved even when video technology is not available.

Reference:

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A-943

Continuing education in postoperative pain

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Background and Goal of Study: The underuse of opioids during postoperative period is common in many hospitals, because of expected adverse effects by nursing staff. Our objectives were to assess the efficacy and nurse perceptions of a refresher course about analgesia and postoperative pain.

Materials and Methods: Fifty six staff nurses who completed a 12 h refresher course of analgesia and postoperative pain were assessed regarding the theoretical knowledge achieved. Before and after the course nurses were asked to anonymously complete a 10-point questionnaire about opioids, NSAIDS and their adverse effects. In addition, the contents and the importance of the course were evaluated (0–10). Statistical analysis: Mc Nemar and Wilcoxon signed rank test.

Results and Discussions: The median of correct answers before and after course were 6 and 10, ranges were (1–9) and (6–10) respectively. Percentages of nurses with 10 right answers before and after course were 0% and 61% respectively. Correct answers related to side effects induced from opioids and its treatment improved significantly after course ($p < 0.007$). The same trend was observed for knowledge about NSAIDS and their adverse effects ($p < 0.005$). Suitability of multimodal treatment for postoperative pain was significantly understood after course ($p < 0.001$).

The median and range of the contents and importance of the course were 9 (7–10).

Conclusions: Involvement of nursing staff is essential for improving postoperative pain outcomes. Continuing education is necessary to increase nurse knowledge about treatment of pain.

A-944

Comparison of two didactic methods in teaching resuscitation

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Background and Goal of Study: The amount of remembered information depends on the attractiveness of teaching method. Most of the university centres prefer traditional method of teaching skills, which consists of demonstration with vocal commentary and practices with teacher supervision. ERC spreads four stage method of teaching skills. In our students teaching process we modified this method and two students were involved in the third stage. The aim of our study was to compare the results achieved by the students in a group taught in traditional method and in modified four stage method.

Materials and Methods: Each four year students group was divided into two smaller groups and in randomised way one of those groups was taught endotracheal intubation in traditional manner while the other in four stage method. Then their skills were assessed. Students also filled out anonymous poll assessing four stage teaching skills method.

Results and Discussions: Student might receive from 1 up to 7 points for correct endotracheal intubation. Missing or incorrect performance of any activities caused subtraction of 1 point from total score. Students who were taught intubation using four stage method showed better knowledge and effectiveness of intubation procedure and they remembered more details. They achieved on average 6.69 points (min. 6, max. 7 points), which makes 95.57% effectiveness of remembered material. While students taught traditional method got on average 5.72 points (min. 3, max. 7 points) and effectiveness of remembered material amounted to 81.71%. We decided to check if students understood the essence of the four stage method of teaching skills in additional poll. Most of them (82.35%) described it precisely and faultlessly. Students carried out qualitative and quantitative assessment of these two methods. Scale from 1 to 10 points was applied to this end. Four stage method received average 8.82 points (min. 7, max. 10 points), however traditional method received average 3.85 points (min. 1, max. 6 points).

Conclusion: Taking into consideration the high effectiveness of four stage method and its enthusiastic reception, it should be recommended and spread.

A-945

Improvement of anaesthetic management during liver transplantation: training program in animal model

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Background and Goals: Liver transplant survival is highly related to the surgical and anaesthesiology team expertise (1). We propose a training program in animals for anaesthesiologists, in order to improve assistance quality during the performance of this highly complex surgical procedure.

Materials and Methods: The critical points in which the trainee should gain adequate skills for the anaesthetical peritransplant management in swine are described, presenting one case (weight = 45 kg.) from a total series of ten that each trainee needs to perform. The surgical protocol includes total crossclamping of the cava vein, under total balanced anaesthesia (isoflurane in oxygen/air, remifentanyl and cisatracurium). Standard monitoring ($EtCO_2$, BIS, TOF, T^a, ECG, SpO_2, hourly diuresis), and invasive haemodynamic monitoring (Swan-ganz and LiDCO) were performed. Serial blood sampling was performed, analysing GAB, Na, K, Ca, Hb, glucose, lactate and coagulation parameters. Specific drugs, as well as fluid therapy were used.

Results and Discussion: During the dissection phase, the anaesthesiologist focused on adequate control of fluid therapy to keep a relatively high arterial pressure (MABP = 100–110 mmHg). During the anhepatic phase a sudden decrease in cardiac output was observed (from 4.26 to 0.78 L/min), as well as in vascular resistance (from 2250 to 1200 dinas sec/cm^2) along with metabolic changes (pH < 7.20, HCO_3 < 16 mmol/L, Ca < 0.7 mmol/L, K = 5.8 mmol/L) requiring the administration of noradrenaline (0.5–2 μg/kg/min), bicarbonates (330 meq), and calcium chloride (750 mg), as well as renal protection measurements (furosemide, 20 mg) and fluid reposition adjustment (hydroxyethyl starch 60 ml/kg and crystalloids 60 ml/kg). On de-clamping, the anaesthesiologist focuses on the management of metabolic and cardiac changes. On the postimplantation phase, metabolic and cardiac changes needed to be addressed.

Conclusions: Using our model, relevant physiologic changes taking place during liver transplantation are understood and addressed. Familiarity with fluids, drugs and monitoring management may be gained.

Reference:

1 Steadman RH. Anesthesiology Clin N Am; 22 (2004): 687–11.

A-946

Tolerance to stress affects medical students attitudes toward cardiopulmonary resuscitation

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Background and Goal: Every doctor is expected to master cardiopulmonary resuscitation and defibrillation (CPR-D). After traditional CPR-D training, both skills acquisition and retention have shown to be poor (1). The aim of this study was to examine if stress tolerance and learning style affect attitudes toward CPR-D.

Materials and Methods: An e-mail questionnaire with 63 items was distributed to one hundred 5th year medical students in University of Helsinki, who had been given traditional CPR-D education by the teachers in anaesthesiology a year before. The questionnaire included 5 background items, 24 items about attitudes and beliefs concerning CPR-D, 13 items about tolerance

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to stress (2) and 21 items concerning learning style (3). The students had two weeks to answer and a reminder was sent via e-mail after one week. Statistics: Mann-Whitney U, Pearson correlation, Cronbach's alpha.

Results: Fifty-six students (56%) answered the questionnaire, 18 males and 36 females. Reliability of the questionnaire was acceptable (Cronbachs' alpha > 0.6). Thirty-seven percent of the students had not witnessed a resuscitation and they were sceptic about their own ability to perform effective CPR-D ($p < 0.05$). Low tolerance to uncertainty and the ability to become easily embarrassed correlated significantly with anxiety about meeting a very ill patient ($p < 0.01$) or with hesitation to start CPR-D ($p < 0.01$), Students expressing uncertainty and proneness for embarrassment had poor preparedness to work as a member of the resuscitation team ($p < 0.05$). They were lacking confidence in their CPR skills ($p < 0.05$), their ability to defibrillate ($p < 0.01$) and they felt no need to annual CPR-D practising ($p < 0.05$) Low tolerance to stress correlated positively with fragmentary learning style ($p < 0.05$).

Conclusions: Type of personality affects beliefs and attitudes toward CPR-D. Those with low tolerance to stress have little confidence in themselves as members of resuscitation team as well as in the need for continuous training in CPR-D. Probably, specific educational methods are needed to teach and practice these students.

References:

1 Chamberlain, et al. Resuscitation 2003; 59: 11–43.
2 Pirttilä-Backman AM, Kajanne A. J of Adult Devel 2001; 8: 81–98.
3 Meyer JHF. Reflections on Learning Inventory. 2000.

A-947

Levobupivacaine injection flow pattern and distribution in a spinal canal model with nerve roots

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Background and Goal of Study: Previous spinal canal models lack essential anatomical elements such nerve roots that can modify drug distribution in simulation studies[1]. Our aim is to study an isobaric 0.5% levobupivacaine injection in a low spinal canal model.

Materials and Methods: Model A: nerve roots (T11-S5) and distal spinal cord were modelled in silicone and attached to the inner wall of a 15 mm diameter PVC tube (T11-S2 segments) or to its bottom (S3–S5). Roots size were based in data reported by Hogan[1]. Cerebrospinal fluid and levobupivacaine-blue methylene (LBM) solutions were based in previous reports[2,3]. A second model without nerve roots was used for control (model B). 2 ml of LBM were administered through a Quincke spinal needle between L3 and L4 in model A during 1 minute. Flow pattern and time to reach the top were registered. This was repeated with a Pajunk needle. Both injections were made in model B. Each experiment was repeated five times.

Results and Discussions: With Quincke needles jet followed the needle direction but with Pajunk both lines formed an angle of 30 degrees. In all cases flow pattern was laminar. In model A stream line was interrupted when it encountered a root but a defined "blue cloud" moving upwards was still visible. Mean time to reach top in model A was 50.2 s (standard deviation 5.5 s) with Quincke needles and 43.4 s (2.07 s) with Pajunk. Model B: mean times for Quincke needles was 39.6 s (5.18 s) and 34.2 s (3.35 s) for Pajunk. Using paired t test LBM reached the top of the model later in model A than in model B with both Quincke ($p < 0.05$) and Pajunk needles ($p < 0.01$).

Conclusion: When nervous structures are considered in spinal canal models flow and distribution patterns vary and probably they become more accurate.

References:

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2 Stienstra R, Gielen M, Kroon J, et al. The influence of temperature and speed of injection on the distribution of a solution containing bupivacaine and methylene blue in a spinal canal model. Reg Anesth 1990; 15: 6–11.
3 Parlow J, Money P, Chan P, et al. Addition of opioids alters the density and spread of intrathecal local anesthetics? An in vitro study. Can J Anesth 1999; 46: 66–70.

A-948

Succinylcholine usage – striking differences in various countries

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Background and Goal of Study: Succinylcholine (Sux) has been in clinical use for more than 50 years. There are some useful clinical features, but also significant side effects. There are some recommendations that it should not be used in elective surgery of children and adolescents because of the risk of rhabdomyolysis, hyperkalemia, and cardiac arrest associated with undiagnosed myopathies. However, it seems it is still widely used despite of newer neuromuscular blockers, e.g. rocuronium (1).

Materials and Methods: A total of 170 randomly selected anesthesiologists from 5 countries (Croatia, Bosnia and Herzegovina, Hungary, UK, USA), anonymously filled out the five section questionnaire about the use of Sux. Its usage in adult elective and emergency surgery, as well as in pediatric anesthesia, opinion about Sux, and experienced side effects were tested. The difference in regional use was tested using chi-squared test. $p < 0.05$ was considered significant.

Results and Discussions:

Table 1. Use of Sux in countries tested; (n).

	Adult elective		Adult emergency		Pediatric surgery		
Country	Use	No	Use	No	Use	No	Not practice
CROATIA	30	7	36	1	28	9	0
BOSNIA	31	3	33	1	33	1	0
HUNGARY	9	24	33	0	6	7	20
UK	18	15	31	2	27	4	2
USA	29	4	32	1	17	10	6
Total	117	53	165	5	111	31	28
	$\chi^2 = 45.8$; $p < 0.001$				$\chi^2 = 80.96$; $p < 0.001$		

There is significant difference between usage of Sux among various countries in adult elective and pediatric anesthesia. The most acceptable features reported were: rapid onset (76%), short duration (64%) and effective relaxation (61%). Forty-seven per cent never experienced a complication from drug usage. The most frequently reported side effects were myalgias (47%), bradycardias (42%) and prolonged blockade (39%). Asystole was reported by 23% of physicians. Allergy is only six-ranked side effect (13%).

Conclusions: Succinylcholine is still widely used in clinical practice in Europe and USA in adult and pediatric surgery, despite of its possible drawbacks. Therefore, indications for its use and medico-legal aspects should be precisely defined based on scientific evidences.

Reference:

1 Geldner G, et al. Anesthesist 2003;52:435.

A-949

Effectiveness and security of trained nurses in preoperative assessment within the outpatient preoperative evaluation clinic

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Background and Goal of Study: The study analysed the trained nurses preoperative assessment (using screening questionnaires, locally-developed protocols, and with overall supervision by a consultant anaesthetist): effectiveness and security. The nurses assess: patients between 10 and 60 years of age; none comorbidity before; low level surgical procedures that excluding neoplastic surgery, prothesic surgery, back surgery, airways surgery, and emergency eyes surgery. All the patients had a full blood count and coagulation profile.

Materials and Methods: The study analysed data over 1 year period (November 2004–2005) in which patients visited the outpatient preoperative evaluation clinic (OPEC). The number of day of surgery cancellations (failures of the preoperative assessment system (PAS)) was collected.

Results and Discussions: Patients: 7343 elective surgical inpatient. 6111 (83,2%) visited the OPEC. Of these, 4366 (71,5%) were assessed by the anaesthetist (Anest) and 1745 (28,5%) by the trained nurses (Nurs). There were 475 cancellations (6,47%) on the day of surgery, but only 78 (16.4%) of this 475 were considered a "failure" of the PAS.

Cancellations due to "failure" of the PAS Nov 2004–2005

	N	Anest assess	Nurs assess	None
Comorbidity	24	17	5	2
Use of antiagregants	16	12	0	4
No surgical conditions	8	7	1	0
Anxiety	6	0	0	6
Preoperative tests	6	2	2	2
Different surgical opinion	6	3	2	1
Allergic reactions	6	1	1	4
Insufficient work-up	2	2	0	0
Other reasons	4	2	0	2
Total	78	46	11	21

Conclusion(s): By allowing trained nurses in preoperative assessment, with overall supervision by a consultant anaesthetist, to serve as a diagnostic filter

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to identify the subgroup of patients who may safety undergo surgery without further diagnostic workup, anaesthetist can focus who require additional attention before surgery.

A-950

Comparison of the new perilaryngeal airway (CobraPLA™) with the laryngeal mask airway (LMA™) by an anesthesia beginner

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Background and Goal of Study: The Laryngeal Mask Airway (LMA™) is a well established supraglottic airway that is frequently used when endotracheal intubation is not required(1). The perilaryngeal airway (CobraPLA™) is a novel cuffed airway device. Actually, it is difficult for most of anesthesiologists to evaluate LMA™ and CobraPLA™ equally because they have enough experience in using LMA(2). Therefore, we compared the CobraPLA™ with the LMA™ in regard to insertion time, airway sealing pressure and recovery characteristics by anesthesia beginners.
Materials and Methods: Forty ASA physical status I–II patients having minor elective orthopedic surgery were randomized to receive LMA™ or CobraPLA™. Two of the investigators, all of whom had <2yr clinical anesthesia and hardly experience in LMA™, were selected to insert the airways; these investigators were trained with 5 CobraPLA™ and LMA™ insertions before the study started. Anesthesia was induced with propofol, and either airway was inserted. We measured insertion time, airway sealing pressure, number of attempts. Postanesthetic complications (bleeding, sore throat, dysphonia, and dysphagia) were also evaluated. Results were presented as means ± SD or actual numbers; $P < 0.05$ was considered statistically significant.
Results and Discussions: Patients characteristics were almost identical between the two airway groups. Insertion time was significantly shorter with CobraPLA™ than LMA™. Airway sealing pressure was significantly greater with CobraPLA™ than LMA™. Number of attempts, and postanesthetic complications were similar in both groups.
Conclusion(s): CobraPLA™ has better insertion characteristics and airway sealing capabilities than LMA™.
References:

1 Anesth Analg 1996; 82: 129–33.
2 Anesth Analg 2004; 99: 272–8.

Insertion and removal of LMA or CobraPLA

	LMA (n = 20)	CobraPLA (n = 20)	P value
Insertion time (s)	19 ± 7	8 ± 3	0.039
Attempts (1/2/3)			
Laryngospasm (Y/N)			
Airway sealing pressure (cmH_2O)	17 ± 3	23 ± 3	0.007
Blood staining (Y/N)	1/19	2/18	NS
Sore throat VAS score (mm)	8 ± 15	12 ± 14	NS
Dysphonia (Y/N)			
Dysphagia (Y/N)			

Data presented as means ± SD. VAS = visual analog scale (0 mm = no pain; 100 mm = worst imaginable pain).

A-952

The system of quantitative assessment of postgraduate training improves the performance of residents

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Background and Goal of Study: It was hypothesized that quantitative evaluation of postgraduate anesthesia training would stimulate resident activity. The goal of the study is to assess whether the quantification of training by credit assignment would influence trainees' performance.
Materials and Methods: 28 postgraduate residents were randomly divided into 2 groups. In the experimental group (n = 14), a previously validated system of quantitative evaluation was applied for assessment, with the principle to assign a special number of credits to each demonstrated activity [1]. In the control group (n = 14) training was assessed by conventional methods without quantification of performance and credit assignment. During a two-year experiment, detailed data on theoretical, practical and scientific activity in all fields of training is collected. Training was organized in a multidisciplinary hospital having all types of surgical services with intensive workload and rapid turnover of patients, which provided the same training conditions for both groups. The study was strictly blinded to both trainees and research assistants dealing with data collection.
Results and Discussions: Performance of residents in all fields of training is presented in the table (mean ± SD).

	Activity				
Groups	Attended seminars	Clinical presentations	Published works	Attended conferences	Managed clinical cases
Experimental	*98 ± 9	8 ± 2	*5 ± 2	12 ± 4	*975 ± 56
Control	*54 ± 6	5 ± 3	*0	8 ± 3	*568 ± 61

*Statistically significant difference ($P < 0.05$) between both groups.

Experimental group trainees demonstrated markedly higher performance in all the fields of training, which may be explained by the stimulating role of quantitative assessment.
Conclusion: Quantitative assessment of postgraduate training based on the credit assignment principle significantly stimulates the overall activity of residents and can be routinely used as a training improvement tool.
Reference:

1 Varosyan A. A system of quantitative evaluation of residency training in anaesthesiology. Materials of 13th World Congress of Anaesthesiologists. Paris. 2004. S031.

A-954

An anaesthetist on nurse-led preoperative assessment within outpatient preoperative evaluation clinic (OPEC): workload and efficiency

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Background and Goal of Study: To assess whether trained nurse (TN) preoperative assessment using screening questionnaires, locally-developed protocols, and with overall supervision by a consultant anaesthetist is efficiency within the OPEC. To determine the workload to the anaesthetist. TN assessment included: patients 10–60 years; none comorbidity; low level surgical procedures, excluding neoplastic, prothesic, back, airways, and emergency eyes surgery. All of them had a full blood count and coagulation profile.
Materials and Methods: To analyse the rate replacement of the anaesthetist preoperative assessment (Anest PA) by the nurse preoperative assessment (Nurs PA): the patients labels "ready" by the nurse with/without consulting the anaesthetist before. To assess number of days without carring out Anest PA. To determine the anaesthetist workload to the Nurs PA (10 minutes for consulting).
Results and Discussions: 6111 patients visited the OPEC (November 04–05). 71.5% were assessed by Anest and 28.5% by the Nurs (from them 1624 (93.1%) were "ready" for surgery). 317 (19.5%) patients were consulted to the anaesthetist before.

Means reasons for consulting to the anaesthetist

	n	%
Comorbidity	129	40.7
Laboratory test abnormalities	125	39.4
Pulmonary instability	25	7.8
Likely difficult intubation	23	7.3

121 (6.9%) patients were referred to the anaesthetist for further evaluation. The mean reasons were: comorbidity 54 (44.6%), administrative mistakes 38 (31.4%), medium or high laboratory test abnormalities 11 (9.1%). The rate replacement of the AnesPA/NursPA was 26.6% and the number of days without caring out Anest PA was 116 (1624/14 patients-day). The workload to the anaesthetist with overall supervision was estimated in 3170 minutes. It was 14 minutes/day if dividing among 226 working days.
Conclusion(s): A system for preoperative evaluation that uses TANs to deliver high quality and efficient patient preparation can be developed with low workload to the anaesthetist of the OPEC and efficiency.

A-955

Irish anaesthesia research in peer reviewed journals – the last decade

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Background and Goal of Study: A recent report in *Anaesthesia* ranks Ireland in the top twenty for share of articles for research in anaesthesia (1). We sought to determine the number of articles published between 1995 and 2004 and elicit any changes in publication trends over time.
Materials and Methods: Six journals on anaesthesia were selected from the category "Anesthesiology" set by the Institute for Scientific Information (*Anesthesiology*, *British Journal of Anaesthesia*, *Anesthesia and Analgesia*, *Anaesthesia European*, *Journal of Anaesthesiology*, and *Canadian Journal of*

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Anesthesiology). Journals selected had all ranked within the top 10 list of anaesthesia journals according to published impact factors. Only journal articles were included for analyses, i.e. correspondence, news *etc* were excluded. Each journal was handsearched. Publications were further categorized according to journal in which they were published, year of publication, originating institution and article type. The study involved review of all publications in the relevant journals, documenting each Irish publication, the institution of origin and category in which it was published. This was done using hardcopies of journals where available and also online databases.

Results and Discussions: A total of 142 Irish articles were published in the 10 year time period (figure). We observed a 49.12% increase in the number of articles published 2000–2004 as compared with 1995–1999 ($P < 0.001$). 55% of articles published were original articles. In order of number, articles appeared in *EJA* (36), *CJA* (33), *BJA* (27), *Anaesthesia* (19), *Anaesthesia & Analgesia* (19), *Anaesthesiology* (8). Breakdown of articles published per journal per year is graphically represented below.

Conclusion(s): There has been a substantial increase in the number of Irish articles published over the past 10 years. Original articles being the most common publication type. There has been a positive trend towards European journals in particular European Journal of Anaesthesiology is the most frequent journal of publication.

A-956

An alternative method for low flow anaesthesia with desflurane

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Background and Goal of Study: Most experienced authors$_{(1,2)}$ recommend to start low-flow anaesthesia (LFA) with an initial phase of high fresh gas flow (FGF) rates, to compensate the first period of high intake by the patient$_{(1,3)}$. It was proposed by Mas-Marfany$_{(4)}$ to start LFA with desflurane keeping FGF low from the beginning of the anaesthesia, to minimize desflurane wasting.

Materials and Methods: We started this technique as elective for general anaesthesia for all our adult patients, ASA status I–III (From 2000 to date, >2500 patiens of both sexes). Induction was performed by IV propofol, a muscle relaxant, and fentanyl 0.10–0.15 mg. With the induction phase completed, we selected a FGF of 1/10 of the estimated minute volume (10 mg/kg/min$_{(5)}$) and opened the vaporizer to the maximum output value of 18% (12% if >70 years). When the desired F_{et} was reached (about 6–7% young adults$_{(6)}$), we put a vaporizer setting of 10% (8% if >70 years). After a time, we found an increase of the F_{et} of desflurane indicating the end of the high intake phase. We then set the vaporizer to 1–2% above the F_{et} value$_{(1)}$ to maintain the desired desflurane F_{et}. Tiny corrections ($\pm$0.5–1%) on the vaporizer setting were needed to keep the desired F_{et} values constant. To increase F_{et}, we opened the vaporizer to the max. output (18%) until the desired F_{et} was reached, reducing then the vaporizer output to a value about 1–2% over F_{et}. To reduce the F_{et} of desflurane, we only had to close the vaporizer until the desired lower F_{et} value was obtained, and then the vaporizer opening was set 1–2% over F_{et}.

Results and Discussions: Following these steps it was easy to maintain the F_{et} of desflurane between the desired range. The pharmacokinetic properties and the short time constant of low-flow desflurane anaesthesia facilitates the control of the anaesthetic concentrations$_{(1)}$. For all the volatile anaesthetics, and under normoventilation conditions (F_{et} CO_2 = 35–40%), the difference between F_i and alveolar fraction (equivalent to F_{et}) will tend to be equal to 0.5 $\pm$ 0.2% when the intake reaches the steady status$_{(4)}$.

Conclusion(s): We propose an alternative and easy method of LFA with desflurane, keeping low FGF constant (O_2/N_2; 10 ml/kg/min) from the beginning of the anaesthesia, validated with more than 2500 anesthetics.

Patient Safety

A-957

Morbid obesity: sevoflurane or desflurane is the volatile anesthetic of choice for maintainance of anesthesia?

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Background and Goal of Study: Morbid obesity is a growing problem of our societies associated with significant comorbidities especially concerning safe recovery from anesthesia. In this prospective randomized study we compared sevoflurane to desflurane as anesthetic agents in morbidly obese patients.

Material and Methods: We studied 206 morbidly obese patients (BMI $\geq$ 35 kg/m^2), receiving anesthesia for laparoscopic placement of a gastric band in order to lose weight. They were divided into two groups. Group A (n = 103), received 1 MAC of sevoflurane for maintenance of anesthesia whereas group B (n = 103), received 1 MAC of desflurane for the same reason. Demographic data [age 50(35–65) years, body mass index 40 (35–45 kg/m^2) and length of anesthesia 2(1–3) hours, were not significantly different in both groups]. All 206 patients received general anesthesia with propofol and fentanyl, had succinylcholine-facilitated tracheal intubation and received rocuronium for paralysis. Analgesia was provided from continuous remifentanyl infusion. Depth of anesthesia was monitored using Bispectral Index Analysis (BIS values between 40 and 60 U).Hemodynamic parameters (heart rate, arterial blood pressure) and oxygen saturation were recorded throughout the operation. During emergence, we assessed the following: time to follow commands, time till extubation, mini mental status test after extubation, oxygen saturation, postanesthesia nausea and vomiting, as well as time for discharge from the PACU (postanesthesia care unit).

Results: Intraoperative BIS values and hemodynamics were pretty much the same in both groups (BIS values from 40 to 60 U and mean arterial blood pressure up to $\pm$20% of baseline values $P < 0.05$). The only difference noticed was that patients of the sevoflurane group had lower oxygen saturation values on admission to PACU (94% $\pm$ 2%) compared to 97% $\pm$ 4% of the desflurane group, a fact however that was not noticed on discharge from the PACU. All the other parameters studied had no statistically significant difference.

Conclusions: There are no differences in emergence and recovery profiles in morbidly obese patients receiving sevo- or desflurane if concentration is carefully titrated.

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A-958

Compund A production from sevoflurane and seven types of carbon dioxide absorbents in a patient model

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Background and Goal of Study: Compound A (CA) as a degradation product of sevoflurane is known to be nefrotoxic in rats[1]. This degradation to compound A depends on the composition of the carbon dioxide absorbent used. The purpose of this study is to measure the maximum amounts of CA for sevoflurane with seven different types of carbon dioxide absorbents.

Materials and Methods: We investigated seven different types of carbon dioxide absorbents: Drägersorb 800 plus®, Medisorb®, Spherasorb®, Amsorb®, LoFloSorb®, Superia® and Lithiumhydroxide (LiOH). The absorbents were used in normally hydrated and completely desiccated conditions in a patient model, using a circle anesthesia system connected to an artificial lung. A low flow anesthesia with a oxygen/nitrous oxide mixture was maintained using 0.8 vol.% sevoflurane. For quantification of CA, a portable gas chromatograph was connected to this set up. All experiments were performed in duplicate (28 experiments in total).

Results and Discussions: No CA was measured with LoFloSorb® and Superia®. Amsorb® and LiOH produced peak amounts of respectively 22 and 3 ppm CA in desiccated conditions and no CA at all in hydrated form. Desiccated Drägersorb®, Medisorb® and Spherasorb® produced respectively 8, 5 and 5 ppm CA; in normally hydrated conditions concentrations of 12, 7 and 2 ppm CA were measured.

Conclusion(s): In this patient model we demonstrated that different types of absorbents produce very small amounts of CA or no CA at all. The CA concentrations found appear not clinically relevant[2], therefore we consider

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every one of these carbon dioxide absorbents safe for clinical use considering possible production of compound A.

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A-959

Preparation of the Dräger Primus anaesthetic machine for malignant hyperthermia susceptible patients: improving washout time by exchanging internal machine components

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Background and Goal of Study: To prepare anaesthetic machines for use in malignant hyperthermia susceptible (MHS) patients, residual anaesthetic vapour has to be removed. We studied the washout profile for isoflurane (Iso) in the Dräger Primus anaesthetic machine, and investigated various ways to accelerate the washout time of Iso.

Materials and Methods: Six groups of machines were studied. The machines were primed with 1.5% Iso. After completion of priming, the vapouriser was removed and various components of the machine were replaced. In all groups, including the control group (group 1), the CO_2 absorber, circle circuit and test lung were replaced with components that had not been exposed to Iso. Internal components were replaced with the following: new ventilator bellows (group 2), autoclaved ventilator bellows (group 3), autoclaved internal breathing circuit (group 4), flushed internal breathing circuit (group 5), autoclaved ventilator bellow and internal breathing circuit (group 6). During the washout phase the FGF was set at 10 l/min. The Iso concentration in the breathing circuit was measured every minute until a concentration of 5 ppm was reached. The FGF was then reduced to 3 l/min and the concentration of Iso was measured every min for an additional hour or until 5 ppm was reached again.

Results and Discussion: Washout time for Iso increased in the following order: group 6 (3.2 $\pm$ 0.4 min) $<$ group 4 (11.7 $\pm$ 1.5 min) $<$ group 5 (43.3 $\pm$ 9.5 min) $<$ group 2 (49.5 $\pm$ 4.1 min) and group 3 (49.5 $\pm$ 5.7 min) $<$ group 1 (66.5 $\pm$ 6.5 min).

A rebound increase of Iso concentration was observed in all groups when the FGF was reduced to 3 l/min.

Conclusion: To prepare the Dräger Primus anaesthetic machine for MHS patients we recommend replacing the ventilator bellows and internal breathing circuit with autoclaved components and flushing the machine for 5 min at a FGF of 10 l/min. The same FGF should be maintained throughout the duration of anaesthesia.

A-960

Diagnosis of malignant hyperthermia susceptibility in Switzerland

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Background and Goal of Study: Twenty years ago the only Swiss Malignant Hyperthermia (MH) Investigation Unit was established in order to provide a diagnostic MH service on the basis of the *in-vitro* muscle contracture test (IVCT) [1]. Molecular genetic investigations of the ryanodine receptor type 1 (RYR1), the primary locus of MH, were initiated in 1999. In 2001 the diagnostic approach combined IVCT and molecular genetics [2], according to the European guidelines [3]. The aim of the present study was to analyze the continuous progress of diagnostic tools used in our MH unit since 1986, namely to determine the value of non-invasive genetic screening.

Materials and Methods: IVCT was performed following the protocol of the European MH Group. Molecular genetic methods used were: polymerase chain reaction, sequencing, restriction fragment length polymorphism and dHPLC. IVCT data and genetic results from all subjects and families registered in the Swiss MH database since 1986 were included.

Results and Discussions: 785 individuals were tested for MH susceptibility by IVCT. MH causative RYR1 mutations were identified in 31 of 80 families, including 377 members. Segregation of familial mutations and IVCT phenotypes were in good accordance, allowing us to apply genetic testing as the first diagnostic method for MH susceptibility (MHS) in families with known RYR1 mutations. Already in 2001 more patients were diagnosed MHS by genetic testing (29), than by IVCT (14). Due to the identification of new causative mutations and registration of new families another 12 of 16 MHS diagnoses were obtained by genetic testing in 2005. Three novel RYR1 mutations were identified in 9 families with 182 members: R2336H was identified in 7 families, 17 of 21 MHS were mutation carriers. In 2 other families, all 17 and 4 MHS carried mutations D2730G and D544Y, respectively. All MH normal subjects were negative for these novel mutations.

Conclusion: A good correlation was obtained between the IVCT results and genetic testing. Investigating the causative effect of the three novel mutations will further increase the number of MH mutations to be used for genetic testing in MH.

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A-961

Antiinfective wound dressing reduces catheter-related infections in oncological patients

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Background and Goal of Study: Immunocompromised patients as under chemotherapy are endangered by catheter-related infections (CRI). Routes of infection lie in the insertion and the suture site, contaminations via three-way tabs and lines and in bloodstream infections. Besides meticulous clinical attention, impregnation of central venous catheters (CVC) reduces CRI in these patients (1). We studied in a randomized, prospective, open clinical trial in 601 catheters (9,781 catheter days) if a wound dressing impregnated with chlorhexidine (biopatch®, Ethicon, Hamburg, Germany) could further reduce CRI in patients receiving CVCs for antineoplastic therapy.

Patients and Methods: Following Ethics Committee approval, the study was conducted according to a three-step sequential analysis protocol (Pampallona-Tsiatis, power 0.8, a 0.05). Patients received impregnated triple-lumen CVCs (Arrogard blu®, Arrow, Erding, Germany) under standardised sterile conditions. After informed consent, patients admitted for chemotherapy of haematological or malignancies were randomized to the groups either receiving an impregnated wound dressing or a standard sterile dressing. Daily routine included clinical assessment of the insertion site (swelling, pain, redness), body temperature and white blood count and c-reactive protein. Catheters were removed when not needed any longer or if CRI was suspected. Catheters with an insertion duration of at least five days were included. CRI was confirmed with blood cultures via the catheter lumina and peripheral blood cultures according to the time-to-positivity method (2).

Results and Discussions: The groups were comparable cf. demographic and clinical data. In the treatment group (300 pts., 4,986 days), 19 cases of CRI were found. In the control group (301 pts., 4,795 days), 34 cases of CRI were determined which was significantly higher ($p = 0.0271$). After the first unblinding, there were no differences among the groups. After the second analysis the results allowed to close the study.

Conclusion: Impregnated wound dressings were superior in reducing CRI in patients under chemotherapy.

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A-962

Evaluation of intraoperative medication error reporting and tracking in major US teaching hospitals

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Background and Goal of Study: Institute of Medicine (IOM) has reported that 44,000–98,000 people die annually in US hospitals secondary to preventable medical errors.[1] Many public safety agencies have advocated the implementation of better systems for reporting medical errors. Previous studies have suggested that anesthesiologists administer as many as 25% of all medications dispensed by hospital pharmacies. Institutional medication error (ME) data demonstrate a disproportionately low percentage of ME reported by anesthesiologists.[2] This may occur because of the lack of an organized, convenient intraoperative system of reporting that may be transmitted to the pharmacy department. Our objectives were to: 1) identify if a standardized intraoperative medication error (IME) reporting system exists

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at the institution and define the method of reporting; 2) identify percentage of medications administered by the anesthesia department; and 3) identify the percentage of total ME that are reported by the anesthesia department.
Materials and Methods: We investigated IME reporting systems of ten major US teaching institutions via telephone survey of anesthesia and pharmacy personnel.
Results and Discussions: Of the 10 institutions surveyed, only 30% had a standardized system of reporting IME's to pharmacy. An average of 15.8% of total medications dispensed by pharmacy was administered by anesthesia. However, the anesthesia department reported $<1\%$ of the total institutional medication errors.
Conclusion: Current pharmacy medication error reporting systems may be inadequate in tracking IME's; therefore, institutional data on medication errors may be inaccurate. A convenient, standardized system of reporting IME's may improve patient safety by identifying IME's so strategies can be developed to help prevent them from occurring in the future. The true risk of anesthesia can only be determined by identifying the risk of IME.
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A-963

Performance of oxygen therapy masks when oxygen and nitrous oxide are coadministered

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Background and Goal of Study: Some clinicians use nitrous oxide (N_2O) through air entrainment masks (AEM) during minor procedures. Previous studies concerning with O_2 and N_2O delivered by oxygen therapy devices have assumed that concentrations of these gases in gas supply and air are simply additive[1,2]. This is probably wrong because pressure gradient between room air and the AEM will be modified if source gas composition changes, according to Bernouilli's principle. The aim of the study is to test if negative pressure inside an AEM varies with source gas composition: 100% O_2 versus 30% O_2 and 70% N_2O.
Materials and Methods: An AEM mixing chamber and pipe were attached to a wood base. A 18G cannula was connected to an air filled pressure transducer. The cannula was placed inside the chamber, perpendicularly to the gas stream with its tip "touching" the nozzle border (in a front view). AEM pipe was connected to an anesthesia machine fresh gas outlet. Pressure transducer was zeroed to show 15 mmHg because it showed 0 mmHg with a flow of 10 l min^{-1} of 100% O_2. We verified that pressure was 0 mmHg with 100% O_2 10 l min^{-1}. Then a 30% O_2 and 70% N_2O admixture was selected and pressure registered after 1 minute. The experiment was repeated 15 times.
Results and Discussions: Mean pressure measured during 30% O_2 and 70% N_2O 10 l min^{-1} was -1.26 (standard deviation 0.46) mmHg compared with 0 mmHg 100% O_2 ($p < 0.01$, paired t test). We have measured a lower negative pressure when N_2O is administered with O_2. Probably more air will entry the AEM diluting both O_2 and N_2O higher than calculated in previous studies. This concentrations may be inappropriate for both oxygen therapy and for analgesia.
Conclusion: AEM are reliable if 100% O_2 is administered but probably not if there is a change in gas composition. Considering this and the risks of professional exposure to N_2O, this practice should raise concern.
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A-964

A comparison of the incidence and cost of needlestick injuries in Germany, the United Kingdom, France, and the United States

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Background and Goal of Study: Needlestick injuries (NIs) are the most frequent occupational accidents that occur in hospitals, and they can have severe economic consequences. The goals of this analysis were to determine the incidence and estimate the costs of NIs.
Materials and Methods: A search of published literature and the Internet in Germany (GER; 1990–2004), the United Kingdom (UK; 1985–2004), and the United States (US; 1990–2004) was conducted. Databases included MEDLINE, EmBASE, SOMED, DAHTA, EPINET, MEDIKAT, and the Cochrane database, among others. In addition, interviews were conducted with 4 physicians at different institutions in France (FRE) to assess the current management of NIs in French hospitals.
Results and Discussions: Annual estimates of NI incidence were: 700,000 in GER, 100,000 in the UK, and 600,000 to 800,000 in the US, primarily in the inpatient setting. In a recent US survey, 24% of nurses reported having had $\geqslant$1 NI compared with 18% of healthcare workers (HCWs) in general in the previous year. Results of interviews (FRE) indicated that surgeons and nurses were the most exposed HCWs, with physicians frequently underreporting NIs, and that approximately 1.3–3 hours are generally required to treat each NI. Annual cost estimates of NIs were: €12–30 million/year (GER); £300 million/year (UK); and $37–173 million/year (US). Intangible costs that are difficult to assess include: emotional and societal costs, drug toxicities, and lost time from work. The General Accounting Office in the US estimates that 29% of the 236,000 NIs that occur annually in US hospitals could be prevented by the adoption of safer devices.
Conclusion(s): NIs are common occupational hazards among HCWs, and costs of NIs to HCWs and institutions are significant. Thus, the adoption of safer devices may reduce the incidence and economic costs of NIs.

A-965

Dysfunctions and failures in an anesthesia department: a two year survey

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Background and Goal of Study: Systems to monitor and analyze dysfunctions and failures are spreading, especially in anesthesia. We report the features and the results of a return of experience system in our anesthesia department.
Materials and Methods: In January 2004, we started off a return of experience system in our anesthesia department. The principles of this system are voluntary reporting of the events, confidentiality with anonymity of informations, initial management of the informations independent of the hierarchy, feedback to collectivity, follow-up of the initiated effects, commitment of the hospital management team not to ask for the withdrawal of anonymity. In fact, any personnel are entitled to report a failure event (FE), defined as any event that has been or could have been dangerous for the patient, the personnel or the structure. A structured form is filled with the nature of the FE, the facts that preceded and followed the FE with day and time, the dangerousness of the FE out of a visual scale, real or supposed possible consequences, corrective measures implemented or to implement to avoid recurrence. Forms are dropped off in a mailbox managed by 2 people who capture the data in an anonymous way. Initial data are then destroyed. Every trimester, the whole personnel meet with the management team to discuss the data.
Results and Discussions: From January 2004 to December 2005, 130 FE have been reported: 30 about organization (lack of personnel, late surgeon), 23 about equipment (lack of equipment, technical problems), 30 about operating room program (too heavy, wrong side surgery noted, name error), 9 about drugs (use-by date, dilution), 15 about reception area (jewelry, wrong file), 3 about pharmacy (supply), 13 about transfusion (computer prescription, incomplete file) and 7 about hygiene (tracability, decontamination). In several cases, people reported their own mistakes. Almost 1/3 of the cards had formulated solutions. 14 solutions were instituted. One of them led to a secondary FE which was reported with a new formulated solution.
Conclusion: The described system enables the inventory of potentially serious events and the implementation of corrections. It also keeps the memory of the events. Its efficiency depends on a collective culture of safety and on a "professional" confidence.

A-966

A one year report of a critical incidence reporting system and its function in error prevention at an anaesthesia department

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Background and Goal: In one year of critical incident reporting system (CIRS) 97 anonymous reports were made. The departmental CIRS circle issued 4

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recommendations for improvements. These improvements were communicated via staff meetings on all levels of the department, the clinic information bulletin, and CIRS information meetings. We did a cross-sectional survey to assess whether the change implementation succeeded.

Materials and Methods: With informed consent the appropriate anesthesia staff were asked to answer a questionnaire about the recommendations and all anesthesia working places were checked to see if the changes were carried out. The 4 changes were: 1) elimination of a red tape used to write on drug concentrations; 2) green stickers were introduced to alert the staff about the use of a drug which is not within the department standards; 3) part of the new staff member introduction is information about drug standards; 4) establishing a new standard operating procedure (SOP) in bariatric surgery (removal of gastric tubes).

Results and Discussions: 1) red tape was still found in 22% of all anesthesia working places; 2) We asked 30% of the anesthesia staff and all working places were checked for the green stickers. Remarkably, 83% of the staff knew about the stickers but they were still only at 46% of the working places; 3) Only half of the 23 new anesthesia staff knew about the information on departmental standard drug concentrations; 4) All abdominal-surgery anesthesia staff answered the questionnaire about the new SOP. Overall 60% of the personnel knew about the new standard and the correct SOP, although no written SOP was found. Resident knowledge differed significantly ($P < 0.01$) from attendings and nursing staff.

Conclusions: We reached over 50% of the target personnel with verbal and written distribution of the information. To increase the success of the change management we recommend involving the operational level of staff members in the decision and in the change management process. Consequently, in our own institution we had to determine the personnel who will be responsible and the time allotted for the realization of the changes. A formal process of evaluation of the accomplishment of changes has to be made.

A-967

Proactive approach for patient safety in the operative theatre: a national pilot survey

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Background and Goals: Nowadays the clinical risk management and no blame culture are becoming common in Italy. The Italian Anaesthesia, Analgesia and Intensive Care Society (SIAARTI) policy is centred on guidelines and CME programs held by Study Group for Safety in Anaesthesia and Intensive Care: moreover in 2004 a Safety Task Force was set up to fulfil a project for the operating theatre for Ministry for Health (1). The knowledge of the complexity of every anaesthesia process suggested to apply a proactive analysis of the activities in a prospective, multicentric national survey (2).

Material and Methods: The Task Force issued a process analysis and two Check-lists to detect latent failures of anaesthesia related procedures: A) for every patient, B) for the environment, drugs, and devices management in the operating theatre and related rooms, to be applied at every starting of surgery even in emergency (3). After a test in January 2005 (to assess the form and the power of the study), the Check-lists were adopted by Anaesthesiological Departments of 3 General Hospitals and 6 Universitary Clinics. In order to guarantee patient safety in a multidisciplinary process, the forms were fulfilled by the responsible (nurse or physician) according the usual local procedure.

Results: In a two month period 3811 forms were collected: correctly fulfilled were 2551 forms A) and 1228 forms B). Failures detected by check-list A) were 25.6%, while 33.2% were detected by B), respectively 9.8% for drugs and 23.4% for equipment. Mean failure per form was 1.3, highest frequency detected in the morning (7–14 hour) and in the early days of the week, related to the highest working charge.

Conclusions: The primary end point, to test the Check-list efficacy in preventing errors, was satisfied. The final goal was to emphasize how a simple and quick tool, easy to be recommended by the Scientific Society, is able to standardize controls and procedures for improving the patient safety in anaesthesia field (4).

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A-968

Automated anesthesia medication dispensing systems: current technology and design do not prevent intraoperative medication errors

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Background and Goal of Study: Automated Anesthesia Medication Dispensing Systems (AAMDS) were introduced into the US market in 2000, modeled after automated dispensing systems designed for nursing units. Pharmacy literature has shown improved patient safety and reduced medication errors with the use of automated systems in the nursing environment. In the operating room, however, it has not been shown that AAMDS reduce or prevent medication errors. We present 3 cases of inadvertent medication error despite AAMDS and suggest an improvement in design that is more suited to the OR than is currently available.

Case Presentations: 4 mg of undiluted norepinephrine was given instead of dexamethasone after misreading the label of look-alike vials found in close proximity to each other in the AAMDS, despite careful design to prevent this. In the second case, 1 mg of undiluted phenylephrine was given instead of diphenhydramine when the AAMDS dispensed phenylephrine from the same drawer as the diphenhydramine, and both vials looked nearly identical. In the third case, vecuronium was given instead of cefazolin during an awake procedure under axillary block when "backup" vecuronium and cefazolin vials, which were similar in appearance, were found in the same, unlocked drawer of the AAMDS, placed there by a pharmacy tech to prevent changing par levels in the controlled-access AAMDS drawers.

Discussion: Studies showing reduced medication error using automated systems relate to those designed strictly for nursing units. Due to the lack of pharmacist "review" prior to dispensing medication in the operating room, the anesthetist can inadvertently administer an incorrect med if vials are similar in appearance and found in an unlocked drawer of the AAMDS or it is stocked incorrectly. Barcode scanning of vials may help confirm the vial dispensed is the one intended for administration, in lieu of pharmacist review of medication order as occurs on nursing units.

Conclusion(s): AAMDS, with their current design and technology, do not prevent medication error in the operating room. More advanced technology is necessary.

A-969

Critical incident reporting system: ambulatory vs. inpatient surgery

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Background and Goal of Study: Critical incident (CI) analysis is now firmly established in anaesthesia. The aim of this study was to assess if the type of elective surgery (ambulatory [AS] vs. inpatient surgery [IS]) influences the CI reporting pattern.

Materials and Methods: This study was conducted between January 1st, 1999 and December 1st, 2005. Obstetrics, vascular, renal and genitourinary, orthopaedics, ENT, eye and general surgery procedures were carried out. A computer–based form was designed, and every anaesthesiologist could report a CI in an anonymous and voluntary way. CI was defined as any situation that could have led (if not discovered or corrected in time) or did led to an undesirable outcome.

Results and Discussions: A total of 50607 elective surgical procedures were performed (29453 IS, 21103 AS). 328 CI were reported (260 IS vs. 68 AS). The reporting ratio were 0.9% in IS vs. 0.3% in AS (RR 2.73, 2.09–3.56; $\chi^2 < 0.01$). A total number of 14817 IS were performed under regional anaesthesia (50.3%), 75 CI were communicated in this situation vs. 15194 regional anaesthesia (72%) with 34 CI in AS (RR 2.26, 1.51–3.39; $\chi^2 < 0.01$). Eight cases of permanent damage or death were communicated in IS, whereas no one was reported in AS.

Conclusion(s):

- Surgical procedures made in AS are associated with lesser reporting and severity of CI.
- Although regional anaesthesia is performed more often in AS, regional techniques are a more important source of CI report in IS.
- The pattern of CI reporting is different between AS and IS.

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A-970

Contributory factors in severe anaesthetic critical incidents

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Background and Goal of Study: The system analysis of the Critical Incidents (CI), focuses less on the individual than on the pre-existing organisational factors (1). This work has been designed to study the contributory factors (CF) in CI that resulted in major morbidity or death.

Materials and Methods: We have performed a retrospective analysis of our departmental critical incident reporting system (CIRS) during a seven-year period (1999-December 2005). CIRS is based on a confidential and anonymous computerised questionnaire form. The CI reported were evaluated afterwards and those showing major morbidity or death are presented in this study. CI has been defined as any occurrence that causes or may cause patient injury. Major morbidity has been defined as any harm that resulted in permanent consequences.

Results and Discussions: Six hundred and two CI were reported out of 66430 anaesthesia procedures during the study period. The evaluation committee found 16 CI with a serious outcome: there were four deaths and nine produced major morbidity. Patient (P), task (Ta), individual (I), team (Te), environmental (E) and organisational (O) CF were assigned as follows:

P CF	Ta CF	I CF	Te CF	E CF	O CF
10	7	11	7	3	7

Ten CI cumulated three or more contributory factors. The most frequent CF was patient complex conditions (8 cases) followed by basic safety violations (7 cases) and verbal or written communication errors (6 cases).

The analysis of these CI allowed the evaluation committee to develop a new clinical guide for renal ultra-filtration, modify the anaesthetic and pain unit consent form, removal of the saline hypertonics solutions from the operating theatre, purchase of new theatre items and several departmental clinical sessions to inform and change practises.

Conclusion(s): The CI with major morbidity outcome tends to cumulate different CF. CF analyses leads directly to strategies for enhancing patient safety.

Reference:

1 Vincent Ch et al. BMJ 2000; 320; 777–81.

A-971

Errors by anaesthetists in calculating paediatric drug doses; can they prevented by a paediatric drug doses chart?

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Background and Goal of Study: Errors in calculating paediatric anaesthetic and resuscitation drugs are not uncommon (1) and can be fatal (2). We investigated whether the practical incidence of these errors can qualify for an assistance tool e.g. a paediatric drug doses chart.

Materials and Methods: A questionnaire audit distributed to anaesthetists in Morriston Hospital, Swansea that included calculations of doses for a hypothetical 12 kg boy presenting for an emergency open reduction of a compound tibial fracture.

Results and Discussions: 15 anaesthetists returned their answers; none of them was a dedicated paediatric anaesthetist. 44% of answers were either wrong or blank. Best performances were by specialist registrars and the highest score (80%) belonged to one of them. The worst answers belonged to consultants; one of them scored 20%. Anaesthetic drugs were marginally better answered than resuscitation drugs.

Age; Months (M) or Years (Y)	3 M	6 M	1 Y	2 Y	3 Y
Weight (kg)	5	7	10	12	15
ET Tube mm	3.5	4	4.5	4.5	5
LMA Size	1	1.5	2	2	2
Initial Defibrillation	10	15	20	25	30
I.V Adrenaline 1: 10 000	0.5	0.7	1	1.2	1.5
Dextrose 10% (5 ml/Kg)	25	35	50	60	75
Fluid Bolus (20 ml/Kg)	100	140	200	240	300
Dantroline 20 mg/60 ml	40	55	75	85	115
Propofol 10 mg/ml	2.5	3.5	5	6	7.5
Thiopentone 25 mg/ml	1	1.4	2	2.4	3
Suxamethonium	0.2	0.3	0.4	0.5	0.6
Atropine 600 mcg/ml	0.15	0.2	0.3	0.4	0.5
Paracetamol supp. (mg)	120	240	360	360	500
Paracetamol syrup	1.5	2.5	4	5	6

Conclusion(s): Quick assistance tools e.g. a paediatric drug doses chart for each weight ready calculated in milliliters are advisable to prevent paediatric patients receiving wrong drug dosages. A sample copy is provided.

References:

1 Kozer, et al. pediatrics vol. 110 no. 4 October 2002, pp. 737–742.
2 Rowe, et al. *Arch Dis Child* 1998;79:56–58 (July).

A-972

Does the rapid feedback of close-call (near-miss) reports to theatre teams improve teamworking and patient safety?

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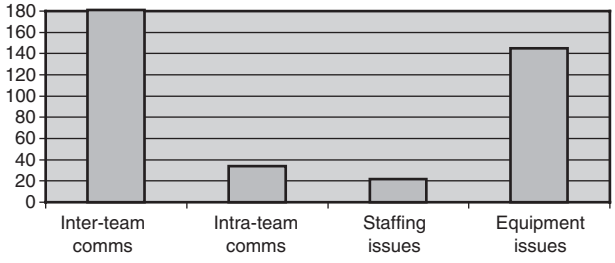
Background and Goal of Study: Cumulative small errors in the operating team (OT) practices may compromise patient safety[1]. Will feeding back the team communication errors reported by individuals lead to safer teamwork?

Materials and Methods: 340 close-calls, containing 400 issues, reported over two years from 12 OTs were analysed by domain and human factors experts. The results were fed back quarterly to staff for their considered action, which included significant practice changes.

Results and Discussions: 54% of reports describe poor, ambiguous or rhetorical ward-theatre communications. 12% of reports concerned lateralisation issues, including consent form errors; 11% describe theatre list issues. Feedback has prompted system and protocol changes leading to reduced reporting. Equipment issues included malfunctions and unavailability but also unskilled use. Although these have been addressed, reports continue, illustrating the necessity of ongoing maintenance and training. Reports suggest staffing issues may lead to skills shortages. Evidence from debriefs suggest significant under-reporting of *intra-team* issues. OT teams may blame the 'other' (ward staff) as a rhetorical strategy to avoid confronting internal (*intra-team*) issues[2].



Conclusions: Rapid feedback of close-call reports to OT staff has produced process changes that may increase patient safety. Education in rhetoric and writing of narrative reports could improve reporting. Reduced reporting may indicate a shifting team focus. The need for further scrutiny of intra-team dynamics is indicated.

References:

1 Carthey J, et al. *Safety Sci.*2003;**41**: 409–25.
2 Lingard L, et al. *Med Educ.* 2002:**36**:728–34.

A-973

The Thai anesthesia incidents study (THAI study) of anesthetic adverse outcomes

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Background and Rationale: The purposes of the Thai Anesthesia Incidents Study (THAI Study) of anesthetic outcomes were to survey patients, surgical, anesthetic profiles and determine factors related to adverse events.

Methods: A prospective descriptive study of occurrence screening was conducted in 20 hospitals comprised of 7 university, 4 general and 4 district hospitals across Thailand. Anesthesia personnels were required to fill up patient-related, surgical-related, anesthesia-related variables and adverse outcomes on a structured data entry form. The data were collected during the preanesthetic evaluation, intraoperative period and 24 hr postoperative period. Adverse events specific forms were used to record when they occurred. All data were keyed at data management unit with double entry technique and descriptive statistics was used in the first phase of this study.

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Results: A total of 163403 consecutive cases were recorded during first 12 months .The ASA PS 1,2,3,4,5 of patients were 50.8%,36.3%,10.7%,2.0% and 0.2% respectively. Nurse anesthetists took a major involvement in hospitals run by the Ministry of Public Health. Two-thirds of cases did not receive any premedication (67%) and midazolam was most frequent premedication administered (20%). Common monitoring were noninvasive blood pressure (NIBP) (97%), pulse oximetry (96%), electrocardiography (80%), urine output (33%) and capnometry (19%) respectively. The choices of anesthesia were general anesthesia (62%), spinal anesthesia (23%), total intravenous anesthesia (6%), monitor anesthesia care (4%), brachial plexus block (3%) and epidural anesthesia (1%). The adverse events were oxygen desaturation (31.9:10000), cardiac arrest (30.8:10000), death within 24 hr. (28.3:10000), difficult intubation (22.5:10000), re-intubation (19.4:10000), unplanned ICU admission (7.2:10000), coma/cva/convulsion (4.8:10000), equipment malfunction/failure (3.4:10000), suspected myocardial ischemia or infarction (2.7:10000), awareness during anesthesia (3.8:10000), late detected esophageal intubation (4.1:10000), failed intubation (3.1:10000), anaphylaxis or anaphylactoid reaction (2.1:10000), nerve injury (2:10000), pulmonary aspiration (2.7:10000), drug error (1.3:10000), unplanned hospital admission (0.1:10000), total spinal block (1.3:10000) and mismatch blood transfusion (0.18:10000)

Discussion and Conclusion: Respiratory adverse events were common anesthesia direct related events. High incidence of cardiac arrest and death within 24 hr. highlighted concerns for prevention strategies. Incidents of adverse events can be used for institutional quality improvement, educational quality assurance and further research for patient safety in anesthesia.

A-974

A structured what if? analysis to identify risks in anaesthesia and perioperative care

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Background: In industry, retrospective analysis of accidents is complemented by risk analysis techniques applied before accidents have occurred (1). This approach is now being transferred to healthcare but has not yet been used in anaesthesiology.

Method: We convened a group of clinical staff from primary and secondary care, with representatives of relevant professional organisations and governmental agencies. Working in sessions facilitated by a trained risk analyst, the group worked through each stage of the perioperative period at a time. For each, the group created 'what if …?' questions to help address the issues e.g. 'What if the wrong premedication were given?'.

The existing controls and checks in the system were also noted. Each possible hazard was graded by likelihood and consequence and then a risk matrix was used to rank them. Recommendations were made for reducing the significant risks identified, which were further categorised for speed and cost of implementation and effectiveness at overall risk reduction.

Findings: The group sessions lasted for more than 30 hours, spread over 5 days. In all, 103 risks were identified. Of the 30 recommendations with the greatest potential for risk reduction, only 10 were judged to be predominantly within the domain of the anaesthesiologist, and related to continuous presence of the anaesthesiologist/avoiding distractions, availability of senior staff, artificial airway control, inadvertent hypothermia and the use of a peripheral nerve stimulator when neuromuscular blockade is used. The remaining 20 require a wider, interdisciplinary approach to reduction.

Conclusions: A thorough assessment of this type needs a multidisciplinary team, expert facilitation and considerable time. It can, however, enable the production of a robust, ranked set of risks and a prioritised list of risk reduction recommendations. It is clear, too, that the risks to patient safety under anaesthesia may arise from a wide range of sources and hence concentrating our efforts to improve safety within departments of anaesthesiology will not tackle the whole problem.

References:

1 Van der Schaaf TW. *Qual. Saf. Health Care* 2002; 11: 205–6.

A-976

Safety-oriented reformulation of the anesthetic processes in a burn unit of a developing country

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Background and Goal of Study: Attention to the processes required for medical care is an important way of increasing safety[1]. Our aim is to describe the changes initiated in a burn unit after two serious adverse events.

Materials and Methods: In an 18-bed burn unit, including 4 intensive care beds and a dedicated operating room (OR), there were two serious adverse events within 6 months: an intraoperative death and a cardiac arrest during induction. A framework for analysis was used to understand the systemic implications of these cases[1]. A management tool (TOC – Theory of Constraints) was used to help prioritize the critical points that should be changed to improve workflow and safety in anesthesia care[2].

Results and Discussions: Three aspects were addressed: 1) Personnel – a stable team of anesthesiologists was organized and training in difficult airway handling was scheduled. 2) Equipment – a ventilator that could provide SIMV, PSV, PEEP and $EtCO_2$ monitoring was brought to the OR. 3) Process – an agreement was achieved for using less endotracheal intubation and neuromuscular blockade in favor of laryngeal mask to maintain the airway, whenever possible. In conjunction with the surgical and nursing teams, a review of the transfusion practices showed that 31 red blood cells units were discarded due to inappropriate ordering and storing in 6 months (16% of the total transfused). As the major burned patients return many times to the OR, the anesthetists began to write down in a book the procedures done, the problems and the incidents presented, in order to optimize the transition phase and planning of anesthesia[3].

Conclusion(s): The group of these changes, in an interface between medicine and business management, brought a saving of resources wasted with inappropriate transfusion practices, a probable increase in the overall safety awareness and an improvement in the anesthesiology team role in the burn unit multiteam system.

References:

1 Br Med J 2000; 320: 777–781.
2 Omega 2005; 33: 506–524.
3 J Appl Psychol 2005; 90: 964–971.

A-977

Incidence and risk factors of postoperative vocal cord paralysis in 987 cases of cardiovascular surgery

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Background and Goal of Study: Vocal cord paralysis (VCP) after cardiovascular surgery has been reported to occur at the rate of 2–32% (1,2) and potentially affects on postoperative mortality. The aim of the present study was to clarify the incidence of VCP after cardiovascular surgery and the relation between the characteristics of surgery and the risk of VCP and postoperative outcome.

Materials and Methods: We retrospectively analyzed the data representing 987 cardiovascular surgery cases (cardiac; 895, aortic; 92) in our institute (1993 to 2004). Statistical analysis was performed by ANOVA, chi-square and logistic regression. $P < 0.05$ was considered significant.

Results: 23 patients (2.3%) were expertly diagnosed with VCP (left; n = 19, right; n = 2, bilateral; n = 2). The risk increased with the duration of surgery and anesthesia, and aortic procedures had higher risk than non-aortic procedures (Table). Among the VCP cases, there was a significant difference in total intubating time, ICU stay, emergency cases, minimum core temperature, and the use of double-lumen tube (DLT) in the comparison of aortic with non-aortic procedures ($P < 0.05$). The poor outcome incidences (bilateral VCP, reintubation or tracheostomy, death by aspiration pneumonia) were significantly higher in aortic surgery ($P = 0.033$).

	VCP (n = 23)	Non-VCP (n = 964)	Odds ratio, 95%CI (P-value)
Surg. time (min)	438 ± 197 *	366 ± 151	
10 hr <, n (%)	6 (26.1)*	72 (7.5)	4.4, 1.7 – 11.4 (0.003)
Anes. time (min)	523 ± 207 *	442 ± 155	
12 hr <, n (%)	5 (21.7) *	62 (6.4)	4.2, 1.5 – 11.5 (0.007)
CABG, n (%)	10 (43.5)	580 (60.2)	1.0, as reference
Aortic surg, n (%)	8 (34.8) *	84 (8.7)	5.6, 2.3 – 13.5 (0.0001)
Ascending & arch	5 (21.8) *	64 (6.6)	4.5, 1.5 – 13.7 (0.007)
Descending	3 (13.0) *	20 (2.1)	8.7, 2.2 – 34.1 (0.002)

Data are mean ± SD. *P < 0.05 vs non-VCP. CI = confidence interval.

Conclusions: This study demonstrated that aortic procedures and prolonged operation increase the risk of VCP, and most poor outcomes were found in

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aortic cases. Deep hypothermia and the use of DLT may be associated with a relatively high risk of VCP in aortic surgery as well as surgical invasion to recurrent laryngeal nerve.

References:

1 Dimarakis I et al. *Eur J Cardiothorac Surg* 2004; 26: 773–775.
2 Ishimoto S et al. *Chest* 2002; 121: 1911–1915.

A-978

Importance of anaesthesia management in carotid artery stenting (CAS)

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Background and Goal of Study: Angioplasty and stenting in the treatment of internal carotid artery stenosis is emerging as an alternative procedure to carotid endarterectomy in selected high risk patients. CAS thought to be less invasive than surgery, but it is often associated with complication such as hypotension, bradycardia or asystole. Our aim was to evaluate the alterations in heart rate (HR) and mean arterial blood pressure (MAP) during balloon dilation and stent deployment after atropine pretreatment.

Materials and Methods: 56 patients (21 females, 35 males, mean age: 67.71/63.23 yr F/M) with significant stenosis underwent CAS in the radiology suite from February 2005 to July 2005. The periprocedural check up, premedicaton (e.g. antihypertensive and β blocking agent reduction) and patient follow-up were based on local guidelines. All procedures were carried out under local anaesthesia combined with conscious sedation. Oxygen saturation (SO_2), MAP and HR with ECG were continuously monitored and data were recorded.

Results and Discussions:

Decrease in parameters	Number of patients	% of all patients
ΔMABP $\geqslant$ 30%	18	32.14
ΔHR $\geqslant$ 20%	23	41.07

Despite the preventive use of atropine (0.5 mg iv) we observed asystole in seven cases and one patient was admitted to ICU with unresponsive bradycardia-hypotension.

Conclusion(s): Our experience so far demonstrates that CAS can be performed safely under close anaesthesiological observation, which ensures the immediate control of MAP and HR in the critical period of the procedure. Good cooperation between partners and the establishment of local guidelines are essential for proper safety of the patients.

A-979

Myocardial ischemia in hip surgery detected by serial measurements of troponin Ic is frequent and associated with late adverse cardiac outcome

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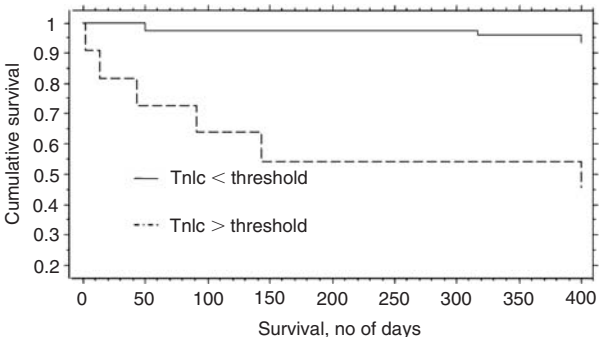
Background and Goal of Study: The aim of this study was to assess the incidence of perioperative myocardial ischemia detected by serial measurements of troponin Ic (TnIc) in hip surgery and its association with late cardiovascular outcome.

Materials and Methods: During 13 months, TnIc was measured for the first three postoperative days in patients undergoing hip surgery in a multidisciplinary hospital. Major cardiac events (cardiac death, myocardial infarction, cardiac failure and new arrhythmias) were recorded during hospitalization and one year after surgery. The incidence of major cardiac events at 1 year was compared between the patients with elevated and normal TnIc levels by Kaplan-Meier methods. To define the role of TnIc as determinant of outcome and determine other independent predictors of death, univariate and multivariate cox regression analysis were used.

Results and Discussion: 88 patients were enrolled. TnIc concentrations greater than the pathologic threshold were detected in 11 (12.5%) of the patients. After adjusting for covariates, TnIc elevation was associated with an 18.5-fold increase in one year cardiac events risk compared with the controls (95% CI, 3.5–98.2). The only other independent predictor of one year cardiac event was revised cardiac risk index class IV with a 44-fold increase in cardiac risk (95% CI, 1.26–1537.6).



Conclusions: Myocardial ischemia is common in a non selected hip surgery population and strongly associated with adverse cardiac outcome one year after surgery.

A-980

Facial skin injuries during anesthesia

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Background and Goal of Study: Facial skin injury during general anesthesia is a complication that seldom been investigated. Are they caused by inappropriate pressure (1) or other irritant materials that applied on the face? A retrospective study was performed at our Hospital (Taiwan) in 2004 to investigate this problem.

Materials and Methods: We studied 21,841 patients under regional and general anesthesia. The facial skin injury locations under different surgical positions were plotted on different figures to compare their distribution patterns. Other data of the patients with facial skin injury such as age, sex and anesthesia types were also compared.

Results and Discussions: Sixty-one patients who had facial skin injury were all under general anesthesia and intubated. Their endotracheal tubes were secured by adhesive tapes and the eyes protected by tegaderms. The overall facial skin injury incidence rate was 0.28% (61/21,841). A higher incidence rate was found in the prone position. Moreover, a strong location relationship between the facial skin injury and adhesive dressing was noticed. A higher incidence rate was also found in women with a female:male ratio of 1.8:1. The average age of those patients with facial skin injury was 59 years old and for those without it was 44.

Surgical positions in the facial skin injury group	Number of patients with facial skin injury	Facial skin injury (%)
Supine	14	23.0
Lateral	3	4.9
Lithotomy	4	6.6
Prone	40	65.6

Conclusion(s): Facial skin injury during general tube anesthesia was a result of pressure-intensified irritant dermatitis caused by adhesive dressings securing the endotracheal tube and eyes.

Reference:

1 Benjamin IA, Eric W, Jonathan LB et al. J Clin Anesth 2004; 16: 111–6.

A-981

How do anaesthetic teams communicate in unique and dynamic circumstances?

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Background and Goal of Study: Non-technical skills such as communication and shared situational understanding are a prerequisite for safe

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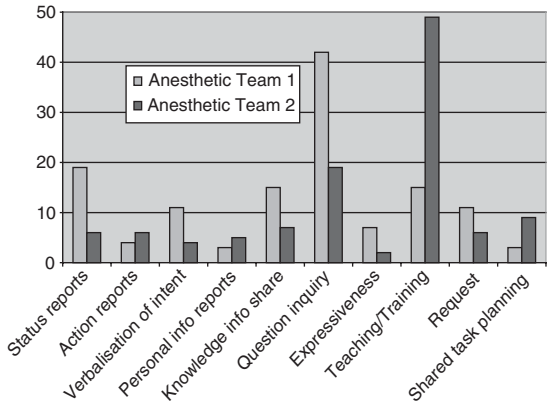
anaesthetic performance[1]. How do the dynamics of anaesthetic teams compare for a routine procedure for a stable team and a complex procedure for an ad-hoc team? Communication within anaesthetic teams is dependent on; staff experience, difficulty of procedure, time-pressure and team dynamics. Can debriefing heighten team reflection and enhance team understanding for dynamic and complex scenarios?

Materials and Methods: 30 hours of video taped orthopaedic procedures (15 operations) have been analysed for specific team interactions. This abstract isolates two anaesthetic teams for illustration.

Results and Discussions: Communication categories relating to situational awareness are mapped below Frequencies differ as illustrated:



Anesthetic Team 1: complex procedure, ad-hoc team generating increased status and action reports, more verbalisation of intent and sharing of expertise.

Anesthetic Team 2: routine procedure, regular team leading to increased explicit teaching and task allocation.

Conclusion(s): Anesthetic teams alter communication strategies to adapt to dynamic situations. An educational Intervention (debriefing) has elicited implicit teaching in complex situations. Debriefing to heighten team reflection and develop understanding of shared situational awareness is ongoing. Tacit process is being made explicit.

Reference:

1 Fletcher G et al. *B J Anaes* 2002: **88**: 418–29.

A-982

Influence of a 30 minute break on cognitive function in resident anaesthetists on a daily routine

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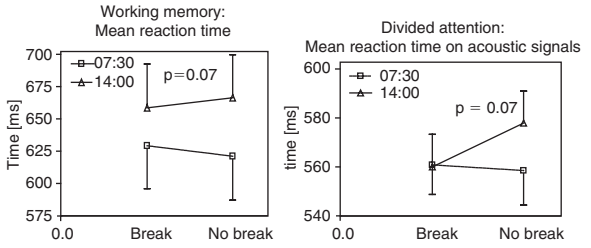
Background and Goal of Study: There is no doubt, that partial sleep deprivation of residents on-call impairs clinical and cognitive function of an anaesthetist (1). The aim of this study is, to test the hypothesis that a 30 minute standard break in a routine 7½ hour period of work makes a difference in cognitive function.

Materials and Methods: In a double-blinded, cross-over trial 30 residents in anaesthesiology were randomized to receive a 30 minute break or not between the assessment times of 7:30 and 14:00 hours of a normal working day. After at least 30 days the test was repeated with each resident in the opposite group. Primary outcome parameter is the Test for Attentional Performance with the subtest of working memory and divided attention. Secondary outcome parameters are the Stanford Sleepiness Scale and the Staite Trait Anxiety Inventory.

Results and Discussions: The sleep, caffeine and nicotine habits in both groups were comparable. There was no difference between the two groups using the Stanford Sleepiness Scale and the Staite Trait Anxiety Inventory. Although there was a trend towards a difference for the valid reactions in the visual subtest of the divided attention ($p = 0.09$), in the acoustical subtest of the mean reaction time ($p = 0.07$) and the mean reaction time of the working memory ($p = 0.07$), it did not reach significance or statistical analysis did not show a significant difference.



Conclusion: A 30 minute break during a 7½ hour working day did not influence cognitive function tests, although we observed a trend towards a difference in working memory and divided attention. These results merit further investigations in a larger population to define other potential factors influencing cognitive function.

Reference:

1 Bartel P, Offermeier W, Smith F, et al. Occup Environ Med 2004; 61: 167–170.

A-983

Anesthesiologists' reaction to arterial hypotension

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Introduction: Since 2005, we introduced an electronic anesthesia record keeping system. In order to evaluate the benefits arising from regular recording of all intraoperative events, we extracted from our database all episodes of intraoperative hypotension and analysed how the anesthesiologist reacted to this hypotensive incident. This issue may become the more important, as recently, intra-operative hypotension was found to be an independent predictor of one-year mortality (1).

Patients and Methods: From January 2005 till November 2005, all anesthesia data collected in 2 neurosurgical OR suites from adult patients scheduled for elective surgery under general anesthesia were reviewed. These data included as well all vital parameters registered during anesthesia, as patient's characteristics and anesthetic technique. Arterial hypotension was defined as one measure of systolic blood pressure below 90 mm Hg. All data underwent univariate and multivariate analysis.

Results: A total of 1865 pts were selected. The overall incidence of intra-arterial hypotension was 15.3%. Most hypotensive incidents occurred within the first 15 min after induction. In 87% of the incidents, the anesthesiologist did not immediately react. Mean duration of hypotension was 9.7 min. Most frequently observed reaction consisted in administration of vaso-active drugs, with an almost immediate normalization of blood pressure. Surprisingly, we found a significant difference in reaction to hypotension between pts with or without invasive arterial pressure monitoring. In these cases, reaction to hypotension was almost immediate, consisted in fluid loading, and hypotension was slowly countered, with significantly less risk of rebound hypertension. There were no differences in other patient characteristics (such as age or ASA classification) between patients with or without invasive arterial pressure monitoring. The main reason for invasive monitoring was related to the type of surgery (f.i. intracranial surgery).

Conclusion: Overall, we found an acceptable timely, referring to the existing literature, reaction to arterial hypotension. Nevertheless, we were surprised by the differences in reaction to hypotensive episodes between patients with or without invasive blood pressure monitoring.

Reference:

1 Monk et al., Anest Analg, 2005.

A-984

The impact of sleep deprivation on the staff anesthesiologists during in-hospital 24 hour call

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Background and Goal of Study: Fatigue caused by sleep loss and circadian rhythm disruption degrades performance and reduce many aspects of

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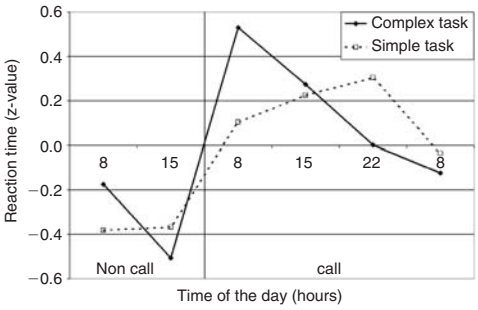
human capability. The aim of this study was to find out the possible influence of sleep deprivation on anesthesiologists' complex and simple reaction time, blood pressure (BP) and heart rate (HR) in surgical emergency service during the 24 hour in-hospital service (call).

Materials and Methods: Following the Medical Ethics Committee approval and informed consent, 23 staff anesthesiologists (11 women), 35–55 years of age, BMI of 26.9 ± 2.9 (mean, SD), taking no medications, nonsmokers, and with normal blood pressure were tested during the call. Psychological testing was performed with the Complex Reactionmeter Drenovac (CRD), a computer based system (1), in 8 h intervals during the 24 h. HR and BP were continuously monitored. Participants were registering their total sleep time during the call. Control values were obtained in a regular 8 hour day shift at 8 a.m. and 3 p.m., a few days before or after the 24 h shift. ANOVA, χ^2 and t tests were used for statistical analysis; $p < 0.05$ was considered statistically significant.

Results: During the call the total sleep time was 4.9 ± 1.0 h (mean, SD; vs. 7.4 ± 2.4 during the control), reaction time significantly increased (Fig. 1), during the tested intervals. There were 4 anesthesiologists with systolic blood pressure fall of 10% or more ('dippers') (2) vs. 12 'dippers' in control ($p < 0.05$).



Conclusions: Sleep deprivation during the call had impact on anesthesiologists' reaction times that may have influence on patients' safety. The reduced number of dippers during sleep while on 24 hours shift suggests increased stress for an on call anesthesiologist.

References:

1 Zivicnjak M et al. J Physiol Anthropol Appl Human Sci. 2001; 20: 111–18.
2 Kitamura et al. J Hum Hypertens 2002; 16: 193–7.

EAMS (European Airway Management Society) – Airway Management

A-985

Pharyngoesophageal perforation associated with difficult endotracheal intubation

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Background and Goal of Study: Management of difficult airway is the never ending interest of an anesthesiologist. Pharyngoesophageal lesion is a rare but life threatening complication of difficult endotracheal intubation.

Materials and Methods: Between January 1995 to July 2005 there were 5 patients presented with pharyngoesophageal lesion after attempted tracheal intubations. There were tree women and two men. One patient was pediatric, and 4 were adults. In all cases ASA status was I/II and all were scheduled for minor surgery. In all patients endotracheal intubations was difficult with multiple attempts (5–10).

Results and Discussions: Intubation was performed endotrachealy in four patients and in one case intubation was impossible. Most of the injuries (4) occurred at the posterior wall of crycopharyngeal area. Presenting symptoms of perforation were acute with pneumothorax and subcutaneous emphysema in 2 patients and delayed with presenting mediastinitis and uncontrolled sepsis (after 4–6 days) in 3 patients. Treatment included limitation of oral intake, tracheostomy, surgical closure and drainage and total parenteral nutrition. Overall mortality was 60%. Only one patient with delayed diagnosis survived.

Conclusion(s): Our experience suggests that the hypopharinx is particularly vulnerable to intubation trauma. Prompt diagnosis of pharyngeal perforation may be difficult, but delayed diagnosis and treatment lead to poor outcome.

A-986

Haemmorhage following tracheobroncheal reconstruction: a novel strategy for the management of an airway crisis

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Background and Goals: The laryngeal mask airway (LMA) permits rapid fibrescopic access to the larynx [1] and has been used to as a conduit to facilitate awake-fibreoptic intubation in the setting of life-threatening haemorrhage into the airway and thorax following tracheobronchial resection.

Material and Method: A case-report.

Results: A 62 years old female required an emergency thoracotomy for bleeding following carinal resection. A complex anastomosis of the trachea with the right and left main bronchi had been established during the primary surgery. In addition, the chin of the patient had been sutured to the chest in order to reduce anastomotic tension. Conscious sedation was induced with midazolam alone. The oropharynx was anaesthetised with 10% lignocaine spray (10 mg/spray) and the cuff of a conventional LMA was coated with 2% lignocaine gel. The LMA was then positioned, connected to a breathing system and 100% oxygen delivered. A 19.0 French AIC was mounted onto a fibreoptic laryngoscope and both devices were advanced through the LMA. Upon visualisation of the glottis, 1% lignocaine 5 ml was injected through the fibrescope onto the vocal cords. The fibrescope and AIC were then advanced into the trachea and the anastomoses visualised. At this point both the fibrescope and LMA were removed. An endotracheal tube was then mounted on the AIC. The fibrescope was re-introduced into the AIC and the endotracheal tube was railroaded over the AIC under fibreoptic visualisation. General anaesthesia was then induced.

Conclusion: This is the first case report to describe the use of the LMA in combination with AIC to facilitate awake-fibreoptic intubation in thoracic surgery. The technique is simple and easy to teach and master. Furthermore, it has a number of advantages in the setting of cardiothoracic surgery. Firstly, it permits administration of 100% oxygen during intubation. Secondly, respirations may be monitored and thirdly, it allows a wide calibre endotracheal tube to be railroaded over the catheter.

Reference:

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A-987

A modified knot technic for retrograde intubation

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Background and Goal of Study: Retrograde intubation has been used with various modifications to secure difficult airways in both elective and emergency cases. In this study we evaluated the efficacy of a modified knot technic for retrograde intubation using epidural catheter and a modified knot that can be easily released.

Material and Methods: Modified knot technic was applied to 14 patients who underwent retrograde intubation. The patients were sedated and, a 16 G angiocath was advanced cephalad through cricotracheal membrane at a 45° angle under local anesthesia. After removing the guidewire of angiocath an epidural catheter was inserted and pushed toward mouth. Catheter was pulled out from the mouth by a magil forceps and introduced in to endotracheal tube from the distal tip. Then the catheter was pulled out from the Murphy's eye and twisted behind the distal part of the catheter to create an easy solved knot. Proximal and distal tips of catheter were held firmly and endotracheal tube was pulled into the trachea. After intubation was confirmed by end tidal CO_2 and oscultation of chest bilaterally, the proximal tip of the catheter was released and it was pulled out from the distal end. The knot was being solved spontaneously during pulling process.

Results and Discussions: Retrograde tracheal intubation was successful in all 14 patients. In 13 patients it succeeded on the first attempt, only one patient

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needed to a second attempt. All the patients were successfully intubated without any respiratory or haemodynamic complication.

Male/Female	Age (min–max,)	Emergency/Elective	Mallampati IV/Others
11/3	26–75	4/10	9/4

Conclusion: We believe even small modifications in technics used in difficult intubation may increase the rate of success and safety of procedure. It is a reliable alternative when fibreoptic intubation is precluded, fails or is unavailable.

A-988

Negative pressure pulmonary oedema after acute airway obstruction

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Introduction: Negative pressure pulmonary oedema (NPPE) can occur after extubation. Most frequently it is induced by laryngospasm. This case report is intended to focus on this rare but serious anaesthetic complication.
Case Report: A 31-year-old female with no previous medical history underwent reoperation due to postoperative bleeding after laparoscopic gynecological procedure. Laryngospasm occurred immediately after extubation, and it resolved after a few minutes with continuous positive airway pressure ventilation. The patient remained with dyspnoea and she was noted to be hypoxaemic (SpO_2 80–94%). Bloody fluid from the airways was observed and bilateral rhonchi were audible by auscultation. The patient was treated with 100% oxygen, furosemide and hydrocortsione. Nevertheless, the patient remained hypoxemic and she was re-intubated in the ICU about one hour later. Mechanical ventilation with high PEEP level (15 cmH_2O) was initiated. Chest X-ray showed marked interstitial infiltrates bilaterally, compatible with pulmonary oedema. Four hours later arterial blood gas measurement showed normal values, and she was extubated the following day. Radiographic changes diminished gradually and the patient was discharged from the hospital after one week.
Discussion: In acute hypoxemia after anaesthesia one should first consider aspiration, anaphylaxis and cardiogenic pulmonary oedema. Simultaneously one should consider pulmonary oedema due to airway obstruction. This condition was first described in 1977 and the incidence is estimated to be 1 in 1000 anaesthetic cases. Probably NPPE is underreported and in some cases misinterpreted as cardiac failure or overhydration. NPPE is the result of acute increased transudation due to high negative airway pressure caused by forced inspiration efforts against the closed glottis. This is reinforced by a alpha adrenergic mediated peripheral vasoconstriction due to hypoxia and increased exudation caused by mechanical damage of lung capillaries. In serious cases re-intubation and mechanical ventilation may be necessary. Prophylactically, airways must be secured immediately if laryngospasm develops. One should be liberal with administration of muscle relaxants and re-intubation.
Conclusion: Anaesthetic personnel must remember NPPE, so that they can react fast and correctly in the case of emergency.

A-990

Use of helium for tracheostomy under sedation

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Background: If the airway is significantly compromised and the potential for complete obstruction exists, an awake tracheostomy with local anesthesia is usually performed. General anaesthesia may be required with the potential risk of airway closure.
Case Presentation: A 76-year-old patient with laryngeal cancer which was going to be treated with radiation and was scheduled for an urgent tracheostomy. We administered helium in oxygen (70%–30%: Heliox®) via a nonrebreathing mask at 15 liters per minute and soon noticed that his stridor and oxygenation significantly improved. This facilitated the administration of local anaesthesia and surgical exposure. The patient remained comfortable with the use of incremental boluses of ketamine intravenously (total dose, 100 mg). He had a good respiratory effort and did not desaturate. Once the trachea was secured with the tube, midazolam 5 mg was administered i.v. and the patient was transferred to the postanesthesia care unit breathing spontaneously where he recovered uneventfully.
Conclusion(s): It is generally recommended to administer only general anaesthesia with inhalation agents to these patients. Our case demonstrates a safe alternative technique that improves gas flow through the stenotic orifice.
References:
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2 Rees L, Mason RA. British Journal of Anaesthesia. CEPD Reviews 2002; 2: 134–138.

A-991

Emergency transtracheal jet ventilation with a self-made device compared with a hand-triggered jet injector in a pig model

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Background and Goal of Study: Percutaneous transtracheal emergency ventilation is an effective way for oxygenation in the "cannot intubate cannot ventilate situation", if supraglottic devices do not produce adequate gas exchange. We build a self-made device consisting of a three-way stopcock connected to a transtracheal airway catheter and to an oxygen supply tubing attached to the sideport of a transportable emergency respirator or a wall outlet in the operation theatre. Inspiration and expiration can be adjusted by opening or closing the non-connected hole of the stopcock at will by a finger placed over the hole. To test the efficacy of this simple device we compared it in an animal model with a hand triggered emergency jet injector.
Materials and Methods: With approval of the animal protection committee six pigs (20 $\pm$ 1 kg) were anesthetized, intubated and mechanically ventilated. After instrumentation an emergency transtracheal airway catheter was inserted into the trachea and a situation of partial expiratory airway obstruction was created. In randomized order each animal was ventilated for 15 minutes with the self-made device and the hand triggered emergency jet injector. At the end of each phase hemodynamic and respiratory parameters were determined. Wilcoxon test was used for statistical analysis and $P < 0.05$ was considered significant.
Results and Discussions: There was no significant difference with regard to oxygenation, ventilation and hemodynamics between the two devices.

	PaO_2 mmHg	$PaCO_2$ mmHg	CO l/min	MAP mmHg
Jet Injector	575 $\pm$ 103	51 $\pm$ 10	2.9 $\pm$ 1.3	59 $\pm$ 10
Self-made Device	555 $\pm$ 108	52 $\pm$ 10	2.8 $\pm$ 1.1	64 $\pm$ 15

CO: Cardiac Output; MAP: Mean Arterial Pressure.

Conclusion: In this animal experiment the efficacy of the cheap self-made device was comparable with the efficacy of the hand triggered emergency jet injector.

A-992

Tracheal stenosis: myths and realities

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Background: The tracheal stenosis is one of the most feared complications of prolonged tracheal intubation (TI) but: Is there a really direct relationship between them? The aim of this study is to determinate whether the most common risk factors, time course and ultimate outcome of the (TI).
Methods: This is a controlled not blinded retrospective study design. We collected data for five years on the clinical characteristics of the patients with tracheal proteses by bronchoscope. A 135 patients (M: 58%, F: 42%) were found. We retrospectively observed them and recorded the clinical etiology for each patient. They were divided in 2 groups. A (n = 87, not previous EIT); B (n = 48 previous TI). The endpoint of the study was the TI diagnostic motives, and the periods of time in the B group. We discarded the cases with any added risk factor for tracheal stenosis and then analysed every case.
Results: In our study group of 48 patients with tracheal stenosis diagnostic, we discarded 3 cases because confounded risk factors (papilomatoses). A total of 45 group was studied. They were divided in three subgroups depending the TI. motive: trauma (n = 16); medical (n = 23); post-surgery (n = 9). The media of the period time of TI was 16 $\pm$ 2d in a interval [2d–31d]. The media age 61 $\pm$ 3 years. ASA 1 to 4. Standard deviation, 95% confidence intervals We did not find statistical difference between the three subgroups.
Conclusion: Our start hypothesis was the existents of relationship between prolonged TI with tracheal stenosis. We studied a homogeneous group of patients just with common risk factor: previous endotracheal intubation. We did not find statistical difference between them to demonstrate our start hypothesis.

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We conclude may be there is something more important and relevant in all the process. The pressure cuff? The rutin nurse care of the ventilated patients? **Thinking About That:** Can we decrease the incidence of the tracheal stenosis?

A-994

Effect of tracheostomy tube size, geometry, and rigidity on tracheal anatomy: A cadaver study

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Background and Goal of Study: Disposable PVC tracheostomy tubes are available in a variety of sizes and designs, yet no published studies address the impact of design on tracheal anatomy. The aim of this observational study was to examine the effects of tube size, geometry and rigidity on tracheal anatomy in the cadaver.

Materials and Method: With consent, a Bjork flap tracheostome was sited between tracheal rings 2 to 4 in five formalin fixed cadavers. Trachea exposure was by left neck dissection. Four tubes – Shiley Fen, Portex Blueline, Portex Adjustable flange and Tracoe Twist – were compared. The antero-posterior distance from flange to posterior rim of the distal lumen was measured and the geometry, rigidity and outer diameter recorded. In each cadaver, stomal length was measured and then tracheal displacement, ease of insertion and removal was observed.

Results and Discussions: Measurements were completed in 3 male and 2 female cadavers, age 73–86, weight 63–98 kg. There was a clear relationship between tracheal displacement and both large outer tube diameter and long AP distance relative to stomal length ($p < 0.05$). No tracheal displacement occurred with the smaller tubes (6,8) but in 17 out of 20 size 10 tubes (see Table 1), posterior displacement was identified. In 8 of these, marked distortion of the trachea occurred and this was associated with tracheal tenting on removal. No relationship was found between geometry or rigidity and displacement.

Table 1. Specifications of the size 10 tubes tested. U = Uniform curve; SCS = straight portion, curve, straight; OD = outside diameter; AP = anteroposterior length (mm).

	Geometry	OD (mm)	AP	Rigidity(20°)
Shiley Fen	U	13.8	54	Hard
Portex Blu	SCS	13.8	50.5	Soft
Portex AF	SCS	13.7	N/a	Soft
Tracoe Tw	U	13.8	56.5	Hard

Conclusion(s): Data generated from this observational study provide the clinician with an improved understanding of the importance of selecting an appropriately sized tube for each patient if the potential for tracheal damage is to be avoided. Geometry, rigidity and design had no effect on tracheal anatomy.

A-995

Direct measurement of forces applied by the laryngoscope blade on the base of the tongue and the relation with postoperative sore throat

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Background and Goals: The forces applied by the laryngoscope blade onto the base of the tongue have been measured indirectly by some investigators (1,2). The relationship between these forces and postoperative sore throat has not been studied previously. The aim of this study was to directly measure above mentioned forces and their relation with incidence and severity of sore throat.

Materials and Methods: following institute ethics committee approval and informed consent 100 patients candidate for abdominal or lower limb surgery under general anesthesia were enrolled in this cross sectional descriptive study. To measure pressure applied by the tip of the laryngoscope blade a small non-compliant balloon was attached on the distal end of lingual surface of Macintosh laryngoscope blade and connected it to transducer using a short non-compliant tube. Calibration was performed before laryngoscopy in each case.

Results: Forces applied by the laryngoscope blade on to the base of the tongue and surface area under the force-time curve are shown in the table.

Parameters	Maximum	Minimum	Mean
Maximum Force (Newton)	69	57	61.56 ± 8.07
Mean force (Newton)	53.90	32.66	38.29 ± 6.74
Mean Surface Area (Newton Sec)	570	345	404.72 ± 71.24

There was a positive relation between sore throat intensity and maximum and also mean forces ($p = 0.001$ and $p = 0.004$ respectively).

Conclusion: this study showed that these forces where higher than previous reports. Instant forces applied by the laryngoscope blade onto the base of the tongue may be a more important factor than duration of applied forces regarding the severity of postoperative sore throat.

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A-997

Hemodynamic responses to tracheal intubation with laryngoscope versus lightwand intubating device in adults with difficult airway

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Background and Goal of Study: Laryngoscopic tracheal intubation causes acute hemodynamic changes, and when intubation is difficult, much hemodynamic change occurs. Lightwand device is effective and safe alternative to tracheal intubation. We compared hemodynamic responses in anesthetized paralyzed patients with difficult airway between the Macintosh laryngoscope and the lightwand intubating device.

Materials and Methods: Following institutional approval and informed consent, 40 patients with Mallampati grade 2 or 3 were randomly assigned to each intubation devices. General anesthesia was induced with propofol 1–2 mg/kg, fentanyl 1 mcg/kg, followed by rocuronium 0.8–1.0 mg/kg. After loss of eyelash reflex the lungs were manually ventilated with 3–4% sevoflurane in oxygen. After bispectral index fell below 40 and paralysis was confirmed with nerve stimulator, tracheal intubation was done with each devices. Invasive mean arterial pressure and heart rate were recorded immediately preinduction, immediately preintubation, and every 30 seconds for the first 5 min after the successful intubation. The number of intubation attempts and the time to successful intubation were recorded. Pharyngolaryngeal morbidity such as hoarseness or sore throat was assessed 24 h after surgery by a blinded investigator.

Results and Discussions: Mean arterial pressure increased significantly 90 seconds after intubation in laryngoscope group compared to in lightwand group ($p < 0.05$), and in laryngoscope group, MBP remained higher than preintubation value for longer time compared to in lightwand group ($p < 0.05$).

Conclusion: In patients with difficult airway, using a lightwand intubation technique can modify the hemodynamic response associated with endotracheal intubation as compared with standard laryngoscopy.

A-998

Flexible fibreoptic scope as Malleable lightwand

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Background and Goal of Study: Lightwand (Trachlight, Laerdal) is useful for the cases of difficult intubation. But the use is limited because it cannot mold easily to every patient's anatomy. In contrast, flexible fibreoptic broncho/laryngoscope can mold easily to any patient's anatomy. So we devised a new intubating method using fibrescope as flexible lightwand named "Firefly Intubation". The aim of our study is to evaluate the efficacy of this method comparing with Trachlight™.

Materials and Methods: 78 adult patients undergoing elective surgery were investigated. The technique of "Firefly Intubation": Attach endotracheal tube to proximal site of fibrescope (LF-2, LF-GP, Olympus). Introduce fibrescope to patient orally through Ovassapian airway or mouthpiece with jaw lift. Dim room light. Operate fibrescope until distal tip shows well-defined glow transilluminated through anterior neck of patient just below thyroid prominence. Advance fibrescope with flexing distal tip slightly posterior until glow begins to disappear at sternal notch. Pass endotracheal tube over fibrescope into trachea. After induction of general anaesthesia with propofol, fentanyl and vecuronium, 34 patients (Group A) were intubated with "Firefly Intubation". 44 patients (Group B) were intubated with Trachlight™. The success or failure and the time for intubation were recorded in each patient. Success rate and time for intubation were compared in the groups.

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Data were analysed using unpaired t-test and χ-square test. $P < 0.05$ was considered significant.

Results and Discussions: Height, age, M/F ratio showed no differences in the two groups. Body weight is heavier in group B ($P < 0.05$). Success rate and time for intubation showed no differences in the two groups ($P = 0.26$ and $P = 0.57$).

Group	Success	Failure	Succ. (%)	Time (sec)
Group A	30	4	88.2	18.9 ± 7.9
Group B	39	5	88.6	17.8 ± 7.7

Time was shown in mean ± SD.

Conclusions: This method can be applied for the case of difficult intubation, as same as Trachlight™. It may be more widely applicable. And it could be an alternative method to fibreoptic intubation in the case of copious oral secretions or bleeding.

A-999

Minimal and optimal light output of Macintosh 3 laryngoscope blades

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Background and Goal of Study: The minimal light required for laryngoscopy has been suggested to be 100 cd.m^2 (1), however this standard has not been formally adopted. Both the minimal and the optimal light output desired by anaesthetists is under-investigated in clinical conditions and with different light sources. This study investigated the minimum and optimal level of illumination required with different light sources.

Materials and Method: Three Macintosh 3 metal non-disposable laryngoscopes containing a xenon, halogen or vacuum bulb were wired directly to a variable voltage power supply, allowing the light output to be varied. 50 anaesthetists performed laryngoscopy on a manikin with these instruments under standard anaesthetic room lighting conditions. Light output of the blade was increased in 0.1 V steps to the minimum (min) level which they felt to be acceptable for intubation. The optimal light level (opt) for intubation was determined by further increasing the illumination. The voltage setting selected was calibrated against light intensity measured with a lightmeter in lux.

Results: Light output in lux.

	Xenon		Vacuum		Halogen	
	min	opt	min	Opt	min	opt
Median	21*	200	9*	36	34*†	165†
Range	2–143	37–843	5–46	10–236	1–137	34–830
IQR	14–37	97–334	6–15	21–78	19–59	92–263

*$p < 0.0001$ for within group comparisons.
†$p < 0.0001$ for between group comparisons.

Conclusion: This study demonstrated that anaesthetists can intubate at very low light levels. The optimal level of illumination was significantly greater than the minimal level. This has implications for illumination requirements in difficult intubation scenarios. In this latter situation, it would seem necessary for illumination standards to be set. Differing light sources produced minimal and optimal illumination at significantly different lux levels.

Reference:

1 Skilton RW, Parry D, Arthurs GJ, et al. *Anaesthesia*; 51: 667–72.

A-1000

A clinical comparison of two disposble and a reusable Macintosh laryngoscope blades

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Background and Goal of Study: In recent years, many laryngoscope blades have been evaluated in manikins (1–3). We evaluated three different types of Macintosh 3 blades in a patient study: Penlon Crystal (**C**) (disposable plastic), Timesco Callisto (**T**) (disposable metal) and Penlon (**P**) (metal reusable). This study compared best laryngoscopic view, time taken to achieve it and user satisfaction.

Materials and Methods: 32 patients requiring general anaesthesia and tracheal intubation were recruited to a randomised crossover study. For each patient a different anaesthetist carried out laryngscopy with each of the three blades, after which they graded view and scored satisfaction with field of view, build quality and clinical use using Visual Analogue Scores (VAS) where 0 = unacceptable and 100 = completely acceptable.

Results: Data are median [IQR], number and VAS.

	C	T	P	p-value
Time (s)	7 [6–11]	7 [6–10]	6 [4–9]	0.058
View:				0.013
Grade 1	18	21	22	
Grade 2a	9	9	9	
Grade 2b	3	1	1	
Grade 3	2	0	0	
Field of view: VAS [range]	90 [70–95]	90 [80–100]	90 [80–100]	0.029
Build quality: VAS [range]	80 [51–85]*	90 [80–100]	95 [80–100]	<0.0001
Clinical use: VAS [range]	80 [53–89]*	90 [80–100]	93 [81–100]	<0.0001

*Crystal significantly different to other two blades.

Conclusions: This clinical study demonstrates that plastic blades cannot always be regarded as equal to metal blades. Anaesthetists are more satisfied with metal blades.

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A-1001

Disposable laryngoscope plastic blades could interfere with ease of intubation in scheduled general anesthesia patients

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Background and Goal of Study: Intubation procedure is a risky cross-contamination technique because of infectious agents found on laryngoscopic devices and the lack of adequate decontamination procedures. For these reasons, disposable devices are widely used on a routine basis in anesthesia. The aim of this study was to compare the incidence of difficult intubation between plastic disposable blades and metal blades.

Materials and Methods: We performed a multicenter, prospective, randomized and single-blinded study which was approved by our human studies committee. Patients undergoing general anesthesia for surgery were randomized to three groups depending on the blade used: metal blades (reference) group (M) and 2 plastic blades group (V (Vital View®) and H (Heine XP®)). Difficult tracheal intubation was evaluated by the quantitative Intubation Difficulty Scale (IDS) on the basis of seven criteria associated with difficult intubation (IDS = 0: intubation without difficulty and IDS > 5: procedure involving moderate to major difficulty).

Results: 684 patients were studied, 228 in group M, 231 in group V and 225 in group H. Demographic data were comparable in the 3 groups. All groups are comparable regarding predictive factors of intubation difficulty. The incidence of difficult laryngoscopy (Cormack grade 3 and 4) did not differ significantly between the 3 groups. The percentage of intubation difficulty was 3.9% in group M, 4.4% in group V and 10.4% in group H, with a significant difference between M and H ($p = 0.01$) but not between groups M and V. The percentage of intubation without difficulty (IDS = 0) represented 63.2% in group M, 52.3% in group V and 51.1% in group H with a significant difference between groups M and H ($p = 0.01$) and a trend toward a difference between groups M and V ($p = 0.05$) without reach significance.

Conclusion: This study showed that intubation could be more difficult when plastic blades were used.

A-1002

Cuff pressure estimation study

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Background and Goals: The cuff pressure of both endotracheal tubes (ETT) and the laryngeal mask airway (LMA) during anaesthesia is conventionally

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estimated by finger palpation of the valve pilot balloon. Failure to maintain cuff pressure below 35 or 60 cmH_2O for ETT and LMA use respectively is associated with pharyngeal (1), laryngeal (2) and tracheal (3) morbidity. We tested the hypothesis that the conventional clinical practice of manual estimation of cuff pressure is inaccurate.

Material and Methods: 22 anaesthetists (all grades) and 12 Operating department practitioners were asked to estimate, by pilot balloon palpation, the cuff pressure of 5 *Marshall*® disposable LMAs and 5 *Mallinckrodt*® ETTs concealed from view. The cuffs were inflated and pressure measured using a *Mallinckrodt*® handheld manometer.

Results: For the ETT, out of 128 cuff estimations that were observed to be acceptably low, 68(53%) were unacceptably high. Furthermore, for the LMA out of 114 cuff estimations that were observed to be low 49(43%) were unacceptably high. The sensitivity of manual palpation of the pilot balloon to estimate cuff pressure was 34% and 52% for the ETT and LMA respectively.

Conclusions: This study has demonstrated the use of finger palpation of the valve pilot balloon to estimate cuff pressure to be inaccurate, even in experienced hands. Prediction of a low acceptable pressure when the cuff pressures were excessively high was commonly found in both ETT and LMA devices. Reproduced in clinical practice, unrecognised high cuff pressure is associated with pharyngeal and laryngo-tracheal morbidity. Based on the findings of this study, we recommend cuff pressure be assessed more formally using a handheld manometer device where both ETTs and LMA devices are in use.

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A-1003

Comparison between manoeuvres facilitating endotracheal tube advancement during orotracheal fiberoptic intubation

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Background and Goal of Study: Endotracheal tube (ETT) advancement over a fibrescope already inserted in the trachea may be hampered by several anatomical hang-ups [1]. Our study compares the efficacy between two of the most frequently recommended manoeuvres, namely the ETT 90° anticlockwise rotation (ACR) [2] or the application of cricoid pressure (CP) [3], for reducing difficulty in advancing an ETT during fibreoptic orotracheal intubation (FOI).

Materials and Methods: After institutional approval and informed consent we studied 40 ASA I–II adult patients, without anticipated difficult airway, requiring tracheal intubation for elective surgery. Moreover in them first attempt to railroad an ETT (reinforced, beveled, 6.5/7.0 mm in women/men respectively) over an orally inserted fibreoptic unit (4.1 mm distal end outer diameter), under general anesthesia and muscle paralysis, was failed. These patients were randomized to undergo a second attempt using the ACR (ACR group, $n = 20$) or the CP (CP group, $n = 20$) manoeuvre. In case of persisting difficulty FOI was performed through the intubating laryngeal mask airway (ILMA). Patient's demographics, airway characteristics and success rates of tracheal intubation between groups were analyzed by student's t-test and chi-squared test as appropriate. Statistical significance was accepted for $p < 0.05$.

Results and Discussions: Intergroup demographics and airway characteristics were comparable. ETT insertion was facilitated in 14 of 20 patients (70%) using the ACR manoeuvre compared to 12 of 20 patients (60%) when the CP manoeuvre was applied (OR = 1.55, 95% CI from 0.42 to 5.76, $p = 0.07$). Overall success rate for both manoeuvres was 65% (26 of 40 patients). ILMA aided FOI was always accomplished in the cases of manoeuvre failure in both groups.

Conclusion(s): Either ACR or CP is equally effective to overcome resistance in advancing an ETT during FOI. These manoeuvres appear to be useful alternatives in resolving the problem of tube hanging-up in almost two thirds of cases.

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A-1004

The effect of laryngotracheal lidocaine on coughing after general anesthesia for carotid endarterectomy

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Background and Goal of Study: Hematoma formation following carotid endarterectomy is a serious complication requiring evacuation under general anaesthesia. It may be caused by coughing which causes hypertension and tachycardia. This is reduced if endotracheal lidocaine is used at intubation. Procedures performed under local anesthesia obviate the need for a endotracheal tube though not all patients are suitable. In a randomized controlled double-blinded study we investigated the efficacy of endotracheal lidocaine administered at induction in reducing the incidence of post–operative coughing and haematoma formation.

Materials and Methods: 50 patients presenting for elective carotid endarterectomy under general anaesthesia were randomized to receive either endotracheal lidocaine 4% (4 ml) or normal saline (4 ml) just prior to intubation.

Results and Discussions: 50 patients were enrolled into the study. None were excluded. There were no significant differences between the two groups in terms of age, gender, ASA and case duration. Fewer patients coughed on emergence in the lidocaine group (13 out of 25, 52%) compared to the placebo group (21 out of 25, 84%; $p = 0.002$). There was no significant difference between the groups in recovery (lidocaine 9 out of 25, 36% and placebo 15 out of 25, 60%; $p = 0.230$). Though only 11 patients were judged to have a slight hematoma (all < 4 cm), none required re-exploration. There was no significant difference between the lidocaine group (7 out of 25, 28%) and placebo group (4 out of 25, 16%; $p = 0.306$). Subgroup analysis of all the patients who coughed, irrespective of which group, showed no difference in hematoma formation (cough group 4 out of 29, 14%; did not cough group 7 out of 21, 33%; $p = 0.1$).

Conclusion(s): This study supports the use of endotracheal lidocaine to reduce the incidence of coughing on emergence from general anesthesia but use of lidocaine or coughing itself may not affect post-op hematoma formation in patients undergoing carotid endarterectomy.

A-1005

Method of proper position of endotracheal tubes in patients receiving laparoscopic gynecologic surgery

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Background and Goal of Study: Endobronchial intubations have been frequently reported during pelviscopic surgery. This study was performed to suggest a guideline for proper placement of endotracheal tube (ETT) during pelviscopic surgery.

Materials and Methods: A prospective, randomized study. Female patients scheduled for elective pelviscopic surgery were enrolled. (Exclusion: malformation in chest radiography, height < 158 cm, or BMI > 30 kg/m^2). Patients were randomly allocated into one of the three groups. ETT was secured: by palpating the cuff at suprasternal notch (Cuff palpation group: G-cuff) or by placing 21 cm – mark on upper incisors (21 cm – Fix group: G-21FIX). In marking group (G-mark), an indicating-mark was made on the surface of ETT at a point 1 cm above the proximal end of cuff. The ETT was secured when the mark was placed at the level of vocal cord. Using fiberoptic bronchoscope, the distance between the tip of ETT and carina (D) was measured at following times; when the patients were 1) in supine position (D1), 2) in Trendelenberg position (D2), and 3) after creation of pneumoperitoenum (D3). The incidence of endobronchial intubation was also compared.

Results and Discussions: Sixty patients were enrolled (age: 45 ± 11 yr, height: 160 ± 4 cm, weight 60 ± 6 kg). Table 1 shows the change in D in each period. One-way ANOVA or Fisher-Irwin test.

	G-cuff	G-21FIX	G-mark
D1 (mm)†	31 ± 13	25 ± 8	36 ± 9
D2 (mm)†	27 ± 13	22 ± 9	33 ± 8
D3 (mm)†	16 ± 11*	11 ± 8*	23 ± 8*
EndoB (%)†	10 (0–21)	26 (11–31)	4 (0–11)

EndoB = endobrocnchial intubation rate. Mean (95% CI)
*$P < 0.05$ vs. D1, in each group; †$P < 0.05$ between groups.

Conclusion: An indicating mark made at 1 cm above the proximal end of cuff provided higher incidence of proper placement of ETT. However, this

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method was not able to eliminate the possibility of endobronchial intubation during pelviscopic surgery.

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A-1006

Tracheal cuff pressure in relation to anaesthesiologists experience – is there any improvement 3 years after similar study?

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Background and Goal of Study: Excessive tracheal tube cuff pressure (CP) may cause ischaemic changes in the tracheal mucosa and the most dramatic complication – rupture of a trachea. Too low cuff pressure increases the risk of aspiration of the gastric contents to the respiratory tract and accidental extubation. The aim of the study was to assess if the obtaining of the proper CP differs in three groups of anaesthesiologists with different experience and whether it have been changed in 3 years time span.

Materials and Methods: In year 2005, like in 2002, we measured the CP of the low-pressure high-volume Kendall tracheal tubes in 160 patients undergoing elective general anaesthesia. The CP was measured during first 30 minutes of the anaesthesia. Cuffs were filled with air by a nurse under surveillance of an anaesthesiologist. We used the PORTEX manometer designed for low-pressure high-volume tracheal tubes. The recommended range of CP was 1,56–2,54 kPa. Measurements were performed several times and the teams were unaware that the audit would be taking place. If the CP was out of range, it was corrected to proper values. The results were analyzed with reference to the seniority of anaesthesiologists, divided into 3 groups I:doctors with <2 years of practice (YOP); II:doctors with 2–10 YOP; III:doctors with >10 YOP and were compared with results obtained 3 years ago.

Results and Discussions:

Group:	mean CP/kPa/ (STD) in 2002	mean CP/kPa/ (STD) in 2005
I	3.07 (2.23)	4.04 (3.49)
II	3.95 (2.94)	5.04 (3.35)*/#
III	2.97 (2.31)	5.48 (2.57)**/##

*p = 0.0016 compared with I/2005; **p = 0.002 compared with I/2005; #p = 0.01 compared with II/2002, ##p = 0.0006 compared with III/2002. Analysis with ANOVA test with post-hoc HSD Tukey's test revealed differences among average CP values among groups in year 2005 and difference in CP obtained in group II and III between analyzed years.

Conclusion(s): 1) The professional experience does not influence on obtaining of proper CP. 2) Over-inflation is still observed in all groups and this phenomenon is more expressed despite presentation of the previous study results.

A-1007

Right supine rotation of the head for intubation

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Background and Goal of Study: The best way to predict airway difficulties remains unknown. We performed a prospective clinical trial to investigate the effects of the supine and right lateral position, on airway management.

Materials and Methods: Grade's Cormack and Lehane were notified at the first vision and after the supine right rotation of the neck by an anaesthesiologist with experience >5 years experience, in 190 patients under general anaesthesia and randomized in 4 groups. Exclusion criteria were known on 2 items: non cervical rotation or spine cervical disease, and non opening mouth under than 2.5 cm. The Macintosh blade is introduced along the right cheek to the pillar of right amygdale, the handle is then in a vertical position and the neck in a supine right rotation with the right ear against the operative table. The blade lifts the mouth in a horizontal axe, parallel at the teeth arcade, pushing the tongue on the left. With this neck rotation, glottis is down. Intubation was realized without cricoid pressure or an other helping manner.

Results and Discussions: Laryngoscopic intubation was successful in all patients. A second attempt was necessary in 1 patient (G 4). A tooth trauma was observed in 1 patient (G 4).

Cormack & Lehane	to G 4	to G 3	to G 2	to G 1
Grade 4 n = 5	0	1	1	3
Grade 3 n = 13	0	0	1	12
Grade 2 n = 62	0	0	5	57
Grade 1 n = 110	0	0	0	110

Conclusion: The right supine rotation provides a good improvement of the Cormack and Lehane gradation and laryngoscopic view.

Reference:

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A-1008

A comparison of the incidence and sites of the laryngeal impingement with *Mallinckrodt* reinforced tube and *LMA Fastrach* tube during nasal fibreoptic intubation

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Background and Goal of Study: The influence of endotracheal tube characteristics on impingement during fibreoptic intubation has been reported before. However existing reports with visualisation of impingement have only studied a single tube type[1,2], whereas studies comparing different tubes have not visualised the site of arrest[3]. We conducted a prospective randomised study using two-scope technique to compare two types of flexometallic tubes with respect to incidence and site of impingement during nasal fibreoptic intubation.

Materials and Methods: With ethical approval, we studied 60 ASA I–II adult patients undergoing dental procedures. Patients were randomised to receive either a *Mallinckrodt reinforced* (group A) or a *LMA Fastrach* (group B) 6.0 or 6.5 mm tube. The relevant tube was preloaded onto the intubating fibrescope (FS). With the patients anaesthetised and paralysed in the supine position, the intubating FS was inserted into the trachea, followed by the contralateral passage of an observational FS to provide a view of the supraglottic region. During railroading of the tube, if impingement occurred, the site was noted with the observational scope prior to disempaction and rotation of the tube.

Results and Discussions: The incidence of impingement was significantly higher in group A: 10/30 vs. 2/30 in group B ($p < 0.025$). Only in two instances the right aryepiglottic fold was the site of impingement; in all other cases it was posterior to the right arytenoid. No case of impingement on the epiglottis or vocal cord was observed in either group. Only in one case more than one rotational manoeuvre required to pass the tube (group A).

Conclusions: This study demonstrated significantly higher incidence of impingement with the *Mallinckrodt* reinforced tube as compared to the *LMA Fastrach* tube. With respect to the site of impingement it is notable that with both tubes more posterior impingement occurred, rather than lateral.

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A-1009

The role of the anaesthetists experience in endotracheal tube cuff pressure

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Background and Goal of Study: Cuff pressure, after taking into account the patients age, gender and weight, should be in the range of 20–30 cm H_2O (1). In routine practice, the cuff is inflated until no air leak is detected on positive pressure ventilation or by manual check. The aim of this study was to find out if an anaesthetist's degree of experience influences the endotracheal tube cuff pressure.

Materials and Methods: With ethics committee approval and patient consents, 154 adult patients, ASA I–III, scheduled for elective surgery under general anaesthesia. Tracheal tubes (Saviour®) of low pressure high volume cuffs were used in all patients. The cuffs were inflated by a nurse anaesthetist trainee (Group I), a nurse anaesthetist (Group II), a junior anaesthetist (Group III, <4 years' experience) or a senior anaesthetist (Group IV, $\geqslant 4$ years'experience). Volume was recorded as mL. A blinded anaesthetist measured cuff pressure

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with a manometer (Endotest, Rüsch; Germany) during first five minutes after tracheal intubation. The recommended pressure range was 20–30 cmH_2O (normal). If the cuff pressure was out of range, it was adjusted to the right values. Pressures <20 cmH_2O classified as low and >30 cmH_2O as high. Differences were assessed with ANOVA and chi-square tests ($p < 0.05$).

Results and Discussions: Demographics were similar for all patients. Data are presented in the table (mean ± SD).

Group	n	Cuff pressure (mean ± SD)	Low pressure (n)	%	High pressure (n)	%	Normal pressure (n)	%
I	41	48.27 ± 24.43*	2	4.88	31	75.61	8	19.51
II	35	35.54 ± 17.34	2	5.71	17	48.58	16	45.71
III	43	38.95 ± 23.12	5	11.63	22	51.16	16	37.21
IV	35	33.66 ± 21.39	4	11.43	12	34.29	19	54.28

*$P < 0.05$ between Group I and IV.

Contrary to the findings of Sanchez Viialobos et al (2), who found that senior anaesthetists were prone to over inflate the cuffs, we observed a higher number of normal values in the senior anaesthetists' group (Group IV).

Conclusions: Although experience matters in inflating cuffs to normal pressures, the most reliable method is the use of a pressure manometer.

References:

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A-1010

1st Danish difficult airway registry update. Prevalence of complications associated with unexpected vs. expected difficult airway

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Background and Goals: Management of difficult airway, both expected and especially unexpected, can lead to complication such as aspiration of gastric content, dental, soft tissue and vocal cords trauma, as well as a postponed anaesthesia.

Based on incident reports to the Danish Difficult Airway Registry (DDAR), we report number of complications associated with expected (EDA) and unexpected difficult airway (UDA) management.

DDAR has been a nationwide quality database since January 1st 2003.

Materials and Methods: Records of 776 difficult airway events in 767 patients, who are registered in DDAR's Access based database, of both difficult mask ventilation, difficult intubation and CV-CI were reviewed retrospectively. Number of EDA and UDA events as well as the number of the registered complications in each group of events was notified.

Results: There have been registered 503 UDA and 256 EDA events. 17 events were unidentified. The anaesthesia was postponed because of a failed intubation in 48 (6%) out of 776 cases. Dental trauma was reported in 30 (3.8%) cases, soft tissue and vocal cords trauma in 118 (15%) cases, cardiac events, such as a bradycardia, tachycardia and hypotension, in 11 (1.4%) cases and aspiration in 5 (0.64%) cases.

Number of complications is shown in the table.

Difficult airway	Postponed anesthesia	Dental trauma	Soft tissue and vocal cords trauma	Cardiac events	Aspiration
Unexpected	37 (7.3%)	23 (2.9%)	94 (18%)	7 (0.9%)	5 (0.64%)
Expected	9 (3.5%)	6 (2.3%)	23 (9%)	3 (1.17%)	0
Undefined	2	1	1	1	0
Total number	48 (6%)	30 (3.8%)	118 (15%)	11 (1.4%)	5 (0.64%)

Conclusions: The prevalence of complications associated with difficult airway is high in our material, compared with other reportings (1). This may be due to the fact that our cases were selected based on an airway problem. The numbers of most complications were higher in the group of an unexpected difficult airway. It seems likely, that complications could be avoided by anticipation of a difficult airway.

Reference:

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A-1011

Qualitative analysis of unanticipated difficult airway management

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Background and Goal of Study: Unanticipated difficult airway management (DAM) is a major challenge for the anaesthesiologist and associated with a risk of severe patient damage. We analysed 24 cases of unanticipated DAM for actual case management and anaesthesiologists knowledge, technical and non-technical skills. Anaesthesiologists' opinions as well as environmental factors of importance for DAM proficiency were also assessed.

Materials and Methods: Departments of Anaesthesiology in three Copenhagen University Hospitals participated in a prospective study of unanticipated DAM. Anaesthesiologists recorded the details of the cases on a datasheet. Qualitative data were collected in a semi-structured interview if the value of the Intubation Difficulty Score (IDS) was >5, if the value of the VAS >5 for mask ventilation or in case of a registered complication. Transcripts were theme analysed independently by two analysts. Data sheets and interviews were used in the final evaluation.

Results and Discussions: All 24 cases concerned difficult tracheal intubation and it was associated with difficult mask ventilation on four occasions. Management in three cases demonstrated strict adherence to a DAM practice guideline. Anaesthesiologists lacked standards for DAM. Inadequate knowledge, training and training facilities were documented. Sudden re-allocation of personnel and change of anaesthetic technique were potential risk factors for DAM. Insufficient airway assessment, insufficient patient information and registration of difficulties were demonstrated. Ethical issues were raised concerning using patients for skills practice.

Conclusion(s): Both personal and system failures resulted in insufficient DAM. We demonstrated insufficient knowledge of DAM and anaesthesiologists lacked DAM training. Standards for DAM and curricula for continuing education in DAM are needed.

Reference:

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A-1012

Systematically teaching assessment in prediction of difficult airway

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Background and Goal: Airway risks can be averted if predictive tests are correctly applied (1). Test validation is better accepted for difficult intubation (DI), rather than for difficult bag mask ventilation (DMV) (2). Learning assessment is subjective, and the sort of people who have to manage difficulties is wide. We should device a framework permitting to everyone to predict ability in providing oxygenation before embarking on a course of action (i.e. RSI) (3). Teaching is essential for a good test performance, but specificity for tests is poor in literature (4). How to ensure psychomotor skills acquisition in airway assessment?

Materials and Methods: 965 elective surgical pts (56.2 ± 17.3 years, BMI 26.4 ± 5.1) were examined according to an Airway Form nationally recognized (5). Data were collected by trainees (1st yr 49.6, 2nd yr 30.4, 3rd yr 10.7, 4th yr 9.3% respectively) and confirmed by tutors. After induction, subjective judgment on DMV and DI were recorded, according to national guidelines.

Results and Discussions: DMV was predicted in 191 pts (19.80%) and found really difficult in 185 pts (19.18%). Anticipation of this risk by the trainees was accurate in almost all the pts. Only 9 pts (0.93%) were wrongly evaluated and in 5 an extraglottic device has had adopted as rescue technique. The errors were all made by 1–2nd years trainees and were discussed in post-audit.

Conclusion(s): Airway assessment tests and correct appliance of national guidelines have to be systematically taught. The most important benefit for encouraging in assessment ritual is that it forces us in decision making. We must continue to train airway managers (our trainees and ourselves) to think about airway difficulties before trying to solve real ones (6). Furthermore an Airway Form may strive in large prospective studies, predictors of difficulties and we need it first of all for DMV. These are assumption for guidelines implementation too.

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A-1013

The use of a flexible laryngeal mask airway (FLMA) for cleft palate surgery in children

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Background and Goal of Study: Airway protective reflex activation is less frequent with a flexible laryngeal mask airway (FLMA) than with a tracheal tube (TT). (1,2). We decided to switch from the usual practice of tracheal intubation to the use of an FLMA.
Materials and Methods: We studied 41 (23 F, 18 M) children with cleft palate undergoing primary cleft palate suture. Ages ranged from 8–12 months and weights from 6580–9990 g, average 8323 g. After induction of anesthesia with sevorane, a size 2 FLMA was inserted with midline approach. A Dingmann mouth gag was then inserted by the surgeon. Maintenance anesthesia: minimal flow anaesthesia, sufentanil, PCV, PEEP, no muscle relaxants.
Results and Discussions: The FLMA was successfully used in 38 out of 41 children (92.7% success rate). Two operations (4.9%) were cancelled because of bronchospasm in the placement phase. In one case (2.4%), that of a very small child, tracheal intubation was needed because of interference from the FLMA tube within the field of operation. No major complications occurred during the operations. Removal of the FLMA took place when the patient awoke in PACU – in 15 cases removed by the anesthesiologist, in 23 cases by a trained PACU nurse. In all cases the interior side of the FLMA was clean.
Conclusion(s): This method is simple and safer than TT for patients with coexisting upper airway disease. Use of the FLMA increases operation theatre case turnover and enables smooth postoperative recovery.
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A-1015

Laryngeal morbidity after single lung ventilation: a comparison of two different techniques

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Background and Goal of Study: One-lung-ventilation (OLV) can be achieved by either using a double-lumen-tube (DLT) or a bronchial blocker (BB) alternatively (1). It remains unclear whether the chosen technique of OLV may influence larnygeal and bronchial morbidity. Aim of the study was the evaluation of vocal cord injuries (VCI), postoperative hoarseness (PH), and bronchial injuries (BI) after using a DLT vs. a Magill tube with BB in patients undergoing thoracic surgery.
Materials and Methods: IRB-approved, randomised, double-blinded study in 60 patients undergoing thoracic surgery with necessity of OLV. After induction with fentanyl, propofol and atracurium patients were intubated according to randomisation either with DLT (Group A) or Magill tube (Group B). DLT-size was chosen in accordance to Brodsky (2). For OLV in group B-patients a bronchial blocker (Arndt-Blocker, Cook Europe, Bjaeverskov, Denmark) was inserted. BI and VCI were evaluated by endoscopy before and after extubation at the end of surgery. PH was evaluated by an independent investigator immediately, 24 h, 48 h, and 72 h after surgery. Statistics: Chi-square-test.
Results and Discussions: Demographic data, duration of anaesthesia and surgery were comparable between the two groups. Exclusion of four patients because of re-intubation. Incidence of BI, VCI, number of patients with PH, and count of episodes of PH are shown in table 1.

Table 1. Values are numbers (n).

Incidence	Group A (n = 27)	Group B (n = 29)
BI	8	6
VCI	12	5
PH	12	5*
Episodes	22	8*

*p < 0.05 Group B vs. A. Episodes: number of episodes with PH.

Conclusion(s): Using a BB for OLV instead of a DLT may reduce the incidence and count of episodes of PH significantly. Further studies should examine the effects of both techniques on larnygeal morbidity in a long-term follow-up.
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A-1016

A comparison of two types of new broncheal blockers and a single lumen tracheal tube for one-lung ventilation during thoracoscopy

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Background and Goal of Study: The purpose of this study was to compare the use of a wire-guided bronchial blocker (PBB: Phycon TCB bronchial blocker) to a spread type of bronchial blocker (CBB: Coopdech endobronchial blocker tube) for lung isolation during elective thoracic surgical cases.
Materials and Methods: Twenty ASA I–II patients who signed written informed consent before being enrolled into the study. We designed a prospective, randomized trial to compare the effectiveness of lung isolation among the 2 types of bronchial blockers: PBB group (n = 10), and CBB group (n = 10). Patients were randomized to intubation with a single-lumen tube with concomitant use of a PBB or a CBB. Both group were subdivided in two: bronchial blocker placed in the right mainstem bronchus (PBBR/CBBR), and in the left mainstem bronchus (PBBL/CBBL). Comparisons between groups included: (1) number of unsuccessful placement attempts with the blinded insertion technique, (2) number of malpositions of the devices, (3) surgical satisfaction with the lung deflation and (4) number of complications.
Results and Discussions: The number of unsuccessful placement attempt was none in the PBBR group (0/10) and one in the CBBR group (1/10), two in the PBBL group (2/10) and five in the CBBL group (5/10). Fiberoptic aided technique should be more appropriate for the left-sided blocked in both group. There was no statistical difference in BB malpositions, the lung to collapse and the number of complications among the two groups. Furthermore, for elective thoracic surgical cases, once the lung was isolated, the management seemed to be similar for both groups. This study demonstrates that the wire-guided bronchial blocker (Phycon) provides a high torque control and can be easily manipulated into the desired site of the lungs.
Conclusion: Our study shows that the Phycon TCB bronchial blocker is more useful than Coopdech endobronchial blocker tube.

A-1017

Incidence of unpredicted difficult intubation: retrospective study on 2500 patients

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Background and Goal: Aim of this retrospective study was to evaluate the incidence of unpredicted difficult intubation in patients undergoing elective surgery.
Materials and Methods: 2500 patients (mean age 52.4 ± 19.6 years, range 18–96, both sex) were enrolled in the study in a period of 3 years; all patients were scheduled for elective surgery in the specialities of General, Urologic, Orthopaedic, Gynecologic and ENT and were visited the day before surgery by the same anaesthetist performing anaesthesia (only at least more than two years experienced anaesthetists were considered for this study). According to classic parameters of difficulty prediction (1) all patients presenting predicted difficult ventilation and/or intubation were excluded from the study. After induction of general anaesthesia (propofol 2 $mg*kg^{-1}$, fentanil 1 $mcg*kg^{-1}$ and atracurium 0.5 $mg*kg^{-1}$) and three minutes preoxygenation, laryngoscopy with #3 Macintosh blade was performed, Cormack Lehane grading was assessed and intubation was attempted.
Results and Discussions: Intubation failed at first attempt in 151 patients (6.04%), and all of them but one were intubated during second attempt both with simple maneuvers (BURP, better head positioning, semirigid stylet and lower ID endotracheal tube in 131 = 5.24%) or with McCoy blade (2 cases = 0.08%), extraglottic devices (LMA classic in 5 cases = 0.2% or iLMA in 2 cases = 0.08%) or finally with Frova introducer (11 cases = 0.44%) to railroad the tube into the trachea. In the single case in which intubation failed after third attempt, surgery was performed with LMA classic (bilateral hernioplasty in a 72 years old patient).

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Conclusions: In our study the incidence of unpredicted difficult intubation occurred in 6.04% of patients scheduled for elective surgery, despite preoperative evaluation by an experienced anesthetist. These data confirm what described in literature (2) underlining the limits of traditional preoperative airways assessment.

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2 Toshiya Shiga et al. Predicting Difficult Intubation in Apparently Normal Patients. Anesthesiology 2005; 103: 429–37.

A-1018

Airway management in morbidly obese patients. Is there a place for laryngeal mask airway?

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Background and Goals of Study: Laryngeal mask airway (LMA) was designed to be used in healthy – weight subjects. Our goal is to show that LMA is an effective temporary airway device in morbidly obese patients.

Materials and Methods: We studied 112 morbidly obese patients (Body Mass Index $\geqslant 35\,kg/m^2$), scheduled for elective laparoscopic gastric band placement. Induction of anesthesia was with midazolam-propofol-fentanyl and paralysis with rocuronium. The LMA was then inserted and an effective airway established. Maintenance of anesthesia was with sevoflurane 1% in N_2O/O_2 4l–2l/min and continuous infusion of remifentanyl. We recorded number of LMA insertion attempts (max two each), time to establish an effective airway (positive pressure ventilation achieving a tidal volume of 8 ml/kg) and ease of gastric tube placement.

Results and Discussion: The LMA was successfully inserted in 110 patients. In two patients the LMA was placed with a second attempt. Adequate ventilation was possible in all 112 patients. Only 3 obese patients experienced transient oxygen desaturation ($SaO_2 < 90\%$) before adequate mask ventilation with the LMA was achieved. The time taken to provide an effective airway was 17 ± 7 sec, the first insertion of the LMA was successful in 110 patients (98%) while 3 patients (2%) needed a second attempt. Positive pressure ventilation was possible in all 112 patients (100%).

Conclusions: Although LMA was designed for healthy – weight subjects, it provides an effective temporary ventilating device in morbidly obese patients as well before attempting a laryngoscope-guided tracheal intubation and permanent establish of the airway.

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A-1019

Volatile induction with sevoflurane – the safe way for expected difficult intubation

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Background and Goal of Study: A patient with predicted difficult airways is a stress for anesthesiologist. This study was performed to compare Sevoflurane induction and classical intravenous induction and to assess the best choice in these cases even for doctors and patients.

Materials and Methods: After Hospital Ethics Committee approval 70 patients with Mallampati 3 and 4, thyromental distance <5 cm and mouth opening <3 cm were included in the study and randomized in 2 groups. In 35 patients induction was realized with 8% Sevoflurane in oxygen with spontaneous ventilation maintained and in 35 patients with Dormicum, Fentanyl, Propofol and Succinylcholine after 5 minutes preoxigenation. In cases of difficult intubation we assess arterial desaturation ($SpO_2 < 92\%$), various incidents occurred and an increase of heart rate with more than 20% preanesthetic value. Statistics used Student's t-test, χ^2 test and ANOVA ($p < 0.05$).

Results and Discussions: In Sevoflurane group 11 patients (31%) could not be intubated at first attempt but from these no one was postponed, in no patient SpO_2 fell below 92%, 1 patient had an increase heart rate by 25%, and nobody could remember anything about it. In intravenous induction group 9 patients (25%) could not be intubated at first attempt; from these one was postponed for fiberoptic intubation, in 6 patients SpO_2 fell below 92%, 5 patients had increase in heart rate and 2 of them could remember after surgery that "something was wrong with them" during anesthesia.

Conclusion(s): Volatile induction with Sevoflurane is safer for patients with difficult airways in terms of arterial oxygen desaturation ($p < 0.025$) and even if it can not be quantified it's far less stressful for the anesthesiologist having an spontaneous breathing patient with expected difficult airway than a paralysed one.

A-1020

Pressure support ventilation in airway obstruction

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Background and Goal of Study: An emergency tracheotomy may be necessary in case of airway obstruction. Performing it under pure local anaesthesia may increase surgical difficulties in agitated or anxious patients, especially if combined with local difficulties (previous radiotherapy, large tumour…). Conversely, sedation improves patient and surgeon comfort but often worsens airway obstruction, hypercarbia and sometimes agitation. Pressure support ventilation (PSV) improves alveolar ventilation of patients under anaesthesia (1). The aim of this study was to assess PSV in emergency tracheotomy performed under propofol sedation.

Materials and Methods: 7 consecutive, unpremedicated patients, scheduled for emergency tracheotomy for airway obstruction due to a cervical cancer were prospectively included. After explanations given to each patient, PSV was started via a face mask (Zeus ventilator) at 10 cm H_2O support level and adjusted to obtain an expired tidal volume >350 ml. Propofol TCI was then started with an initial target at 3 μg/ml and adjusted to maintain both loss of consciousness and spontaneous ventilation. The surgeon performed tracheotomy after subcutaneous and intratracheal lidocaine 2% infiltration.

Results and Discussions: Results are expressed in mean (range). Patients were 60 yr (50–74). One patient required sedation because of psychiatric disease and the others because of anticipated technical difficulties. The mean duration of the surgery was 20 min (10–37). During surgery, mean propofol target was 3 (range 1–5.5) μg/ml. Pressure support was 21 cm H_2O (15–30). No oxygen desaturation below 93% was recorded and $PetCO_2$ just after tracheotomy was 41 mmHg (35–50).

Conclusion: During difficult emergency tracheotomy, PSV may support spontaneous ventilation, avoids desaturation and hypoventilation and allows sedation, making surgery easier.

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A-1021

Difficult intubation scale applied to morbidly obese patients

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Background and Goal of Study: Airway management is a major factor underlying morbidity and mortality related to anaesthesia in the morbidly obese population. The purpose of this prospective study is to apply, The Intubation Difficult Scale (IDS); an objective scoring system proposed by Adnet et al (1), to the morbidly obese patients in our hospital.

Materials and Methods: After obtaining the approval from the Institutional Review Board and informed consent, we studied 49 morbidly obese patients scheduled for gastroplasty in our institution from 1/10/04 to 1/10/05. A morbidly obese is a patient with a Body Mass Index $>35\,kg/m^2$ when associated with weight related co-morbidity or $>40\,kg/m^2$ if there is not co-morbidity. The exclusion criteria consisted of ASA group III–IV and younger than 18 years old.

Results: 49 patients were studied. The value IDS = 0 (intubation without difficulty) represented a 34.7%, IDS < 5 the 59.2% and IDS > 5 the 6.1%, there were not impossible intubations in this series. N_1 (Number of attempts > 1): 1 on 6 cases (12.2%) and 2 on 3 or more attempts (4%). N_2 (Number of operators > 1): 1 operator (4.2%), 3 operators (2.1%). N_3 (Number of alternative techniques): 3 ILMA (6.1%), 4 stylet (8.1%). N_4 (Cormack Grade) (2): 26 grades I (53.1%), 17 grades II (34.7%), 6 grades III (12.2%). N_5 (Lifting force required): 39 normal (79.6%), 10 increased (20.4%). N_6 (Laryngeal pressure): not applied in 26 (53.1%), applied in 23 (46.9%). N_7 (Vocal cord mobility): all in abduction.

Conclusions: The IDS permits a qualitative and quantitative approach to the nature of the difficult intubation in morbid obese patients. This scale allow us to demonstrate that tracheal intubation is more difficult in obese than in lean

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patients (3). Airway managers need to have alternative plans to maintain oxygenation and ventilation.

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A-1022

Epidemiological survey of unexpected difficult airway management

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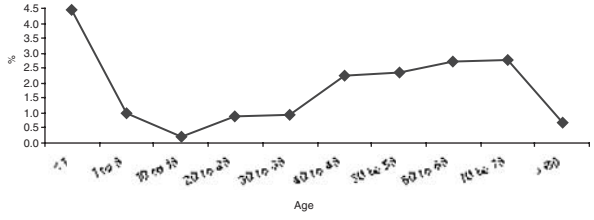
Goal of Study: Within an extensive survey of anesthetic activity in Catalonia in 2003 (ANESCAT), we characterized patients presenting unanticipated difficult airway management (UDAM).

Methods: We designed a prospective, cross-sectional survey to collect information from anesthesiologists by way of a questionnaire on every anesthetic procedure performed on 14 randomly selected days in 2003. All hospitals (131) in Catalonia (6,704,146 inhabitants) and around 850 anesthesiologists participated. UDAM was defined when there was an unexpected situation of more than 3 attempts to carry out laryngoscopy and/or impossible mask ventilation requiring the use of alternatives techniques for airway control. We performed bivariate comparison for age, sex, ASA status and whether the procedure was urgent or elective. In a multivariate analysis, a multiple logistic regression model was constructed.

Results: A total of 23,136 questionnaires were collected. In 37% of patients general or combined anesthesia was used. In 1.8% of the cases, a situation of UDAM was reported by the anesthesiologists. This extrapolates to 4,013 patients, an average of 4.7 cases per anesthesiologist yearly. The logistic regression model showed the following factors to be significantly associated with UDAM: ASA class (odds ratio [OR] 2.7 for each class); male gender (OR: 1.4) and age (OR: 1.03 for each yr). The figure shows the percentage of UDAM cases by age.



Conclusions: Our Catalan, multicentre survey showed an incidence of UDAM of 1.8%, similar to previous studies. Gender and ASA class were the associated risk factors. A significant increase in risk was related to age; but the risk was highest for patients less than 1 yr old and very low for patients over 80 yrs old, probably because of anatomical differences.

Reference:

1 Rose D, Cohen M. Can J Anaesth 1994; 41:372.

A-1023

Does body mass index influence tracheal tube cuff volume?

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Background and Goal of Study: Endotracheal tube (ETT) cuff pressure depends on cuff volume, cuff area touching tracheal mucosa, cuff compliance and intrathorasic pressure. ETTs chosen according to patient's age, gender and weight should have cuff pressures in the range of 20–30 cm H_2O (1). We tested the hypothesis that the tube cuff is inflated in the normal range using a manometer correlated with the body mass index (BMI).

Materials and Methods: With institutional ethics committee approval and the informed written consent, we studied 117 adult patients, ASA I-II-III, under general anaesthesia with an ETT. High volume, low pressure cuffed ETTs were used in tube sizes 7.0 to 8.5 mm. We inflated the cuff with a manometer connected to the cuff pilot balloon until pressure was 25 cm H_2O and measured the volume. BMI, cuff volume and ETT diameter were recorded. Data obtained were compared using chi-squared test and variance analysis. The relationship between BMI and cuff volume was observed with Pearson correlation test.

Results and Discussions: There were no statistical differences in patients' age, weight and height between groups.

ETT diameter (mm)	Number of patients (n)	BMI (mean ± SD)	Cuff Volume (mL) (mean ± SD)	r
7.0	15	25 ± 3.21	4.71 ± 0.77	0.023
7.5	15	25.43 ± 4.31	4.39 ± 1.03	−0.139
8.0	76	28.10 ± 4.86	5.31 ± 1.67	−0.043
8.5	11	28.82 ± 5.16	4.17 ± 1.44	0.581

Conclusion(s): ETT chosen according to patient's gender, age and weight has no correlation with BMI of patients.

Reference:

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A-1024

Predictors of difficult airway management in morbid obesity patients

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Background and Goal of Study: Difficult intubation is one of the most important factors of morbimortality associated to anaesthesia. The aim of our study was to evaluate the predictive value of certain parameters as difficult intubation or difficult ventilation indicators when they were evaluated during preoperative visit of morbid obesity patients scheduled for bariatric surgery.

Material and Methods: We have followed all patients scheduled for laparoscopic gastric bypass during a five-year period. During preoperative visit following parameters were evaluated and considered as possible difficult intubation and/or ventilation indicators when: 1. Body mass index >50 Kg/m^2 (BMI), 2. Mallampatti grade III–IV (M), 3. tiromentonian distance <6 cms (TMD), 4. cervical mobility <35° (CMD), 5. temporo-mandibular mobility decreased (TMM), 6. Obstructive sleep apnea syndrome (OSAS). During anaesthetic induction we recorded the grade of difficult airway management and we calculated Positive and Negative Predictive Value (PPV/NPV), sensibility (S) and specificity (E) of each indicator.

Results: One thousand four hundred and fifty patients were included.

	PVV (V/I)	NPV (V/I)	S (V/I)	E (V/I)
BMI	22.5/4.6	97.4/98.4	70.3/42.3	82.7/79.6
Mall	10.9/2.9	96/98.3	65.4/53.8	61.3/59.8
TMD	57.3/28	96.6/99.5	53/80.7	97.1/95.4
CMD	44.6/23.3	95.8/99.3	45.6/73	95.7/94.5
TMM	45/29.5	95.2/99.2	32/65.4	97.1/96.5
OSAS	22.2/5.2	96.7/97.4	60.5/42.3	84.7/81.3

V/I: difficult ventilation/difficult intubation.

Conclusions: BMI and Mall were good predictors of difficult ventilation whereas TMD, CMD and TMM were good predictors of difficult ventilation. Probably evaluation of different factors together it could result the better method to predict a difficult airway management in morbid obese patients.

A-1025

Comparison of the intubating laryngeal mask airway with the Bullard laryngoscope for endotracheal intubation in patients with simulated difficult airway using the Philadelphia cervical collar

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Background and Goal of Study: Intubation of a patient with cervical spine (C-spine) injury, especially in an emergency situation is a challenge even to the most experienced anaesthesiologist. Our goal was to compare the utility and safety of the intubating laryngeal mask airway (ILMA) (1) and the Bullard laryngoscope (BL) for orotracheal intubation in patients with simulated difficult airway (SDA) (2) using the philadelphia cervical collar.

Materials and Methods: 32 patients posted for elective surgeries requiring orotracheal intubation were randomized into 2 groups (16 in ILMA and 16 in BL). After induction and paralysis, intubation was attempted using either

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ILMA or BL with collar applied. Failure after 2 attempts resulted in the anterior collar being removed and intubation by direct laryngoscopy with manual inline stabilization. Time to intubate (TI), haemodynamics attempts, trauma and sore-throat were assessed.

Results and Discussions: The TI [Mean (SD)] was longer in the BL compared to ILMA group [107(58.88) vs 60.62 (36.68)], $P < 0.05$. Changes in haemodynamics were comparable. Other data (number) are shown in the table.

		ILMA	BL	P
Intubation	Successful	8	14	<0.05
	Unsuccessful	8	2	<0.05
Attempts	1	6	10	>0.05
	2	2	4	>0.05
Trauma	Yes	5	4	>0.05
	No	11	12	>0.05
Sorethroat	Yes	12	11	>0.05
	No	4	5	>0.05

Conclusion(s): The BL has a significantly higher success rate of intubation in patients with SDA. When successful, time taken to intubate is shorter with the ILMA.

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A-1026

Patient characteristics influencing the performance of the video laryngoscope (Glidescope)

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Background and Goal of Study: Anesthesiologists choose which airway device to use for difficult intubations, taking into account each patient's specific features. The video laryngoscope (VL) allows equal or superior glottic visualization compared with direct laryngoscopy (DL)[1], but predictive features for intubation success using the VL have not been identified. Our prospective observational study aimed to identify what patient characteristics, if any, predict intubation difficulty with the VL. Principal outcomes were time to intubate and number of attempts.

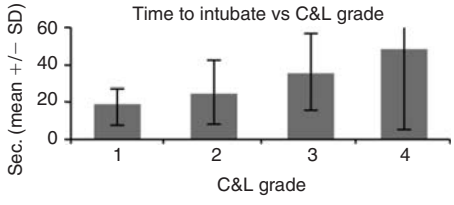
Materials and Methods: Following approval from the IRB and each participant, patients were prospectively enrolled before elective surgeries with endotracheal intubation. Demographic and morphometric factors known to be associated with difficult DL, or believed to influence the use of the VL, were recorded preoperatively. After muscle relaxation was confirmed, a regular DL was performed in all patients to assess the Cormack & Lehane (C&L) grade of glottic visualization. Then, intubation using the VL was accomplished. Number of attempts and time needed for intubation were recorded. Patient characteristics found to be correlated with longer intubation time or multiple attempts with univariate analysis were introduced into a stepwise regression model.

Results and Discussions: A total of 400 patients were studied. Intubation required 1/2/3 attempts in 342/48/9 patients respectively; 1 patient could not be intubated with the VL. Mean intubation time was 21 ± 14 seconds. After multiple regression, higher C&L grade at DL ($P < 0.0001$, figure) and shorter sternothyroid distance ($P = 0.007$) were associated to longer intubation time while only higher C&L grade predicted multiple attempts ($P < 0.0006$).

Conclusion(s): Although the current study found a very high success rate with the VL, it also showed that intubation with this device is likely to take longer and require more attempts in patients who exhibit a higher C&L grade during regular DL.

Reference:

1 Sun DA, et al. *Br J Anesth* 2005; 94:381–4.



A-1027

Glottic exposure using Glidescope® vs conventional Macintosh laryngoscopy with head in neutral position

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Background and Goal: Glidescope (GL) is a video-laryngoscope with a blade integrated CCD and a peculiarly shaped blade. Aim of this study was to assess CL grading with head in neutral position (HNP) comparing the view obtained with GL (medium blade) and with conventional #3 MacIntosh blade (MB).

Materials and Methods: 250 patients (mean age 48 ± 15 years), ASA I–III, showing no signs of predictable difficult intubation were enrolled. Anaesthesia was induced with propofol 2 mg*kg^{-1}, fentanil 2 mcg*kg^{-1} and atracurium 0.5 mg*kg^{-1} followed by oral airway placement and 4 minutes preoxygenation. Laryngoscopy was then performed with HNP: randomly 125 patients underwent laryngoscopy with MB first and one minute later with GL, while 125 patients underwent laryngoscopy with GL and one minute later with MB. CL grading was assessed during both laryngoscopies in the "best view" situation by a skilled anaesthetist, and then trachea was intubated during the second laryngoscopy. Statistic analysis was performed using t-test for paired samples, CI 99%.

Results and Discussions: CL grading with GL/MB was:

	CL I	CL IIa	CL IIb	CL III	CL IV
MB	124/49.6%	90/36%	32/12.8%	4/1.6%	0/0%
GL	198/79.2%*	47/18.8%*	5/2%*	0/0%*	0/0%

all patients are expressed as n/% – * $p < 0.01$ SS

Intubation success rate with HNP was 100% at first attempt during GL laryngoscopy (always performed with a precurved semi rigid stylet), while in the MB group 6 patients (5 CL IIb and 1 CL III) required head extension and a semi rigid stylet to be intubated, one of them requiring a second attempt. Neither desaturation nor other adverse events occurred during the procedures.

Conclusions: The use of GL compared with MB with HNP allowed a mean of 1 degree CL grading gain in our patients, with disappearance of CL III laryngoscopy, the difference being statistically significant. This may have useful implications for difficult laryngoscopy or for intubation with the head in fixed position. Further studies, conducted on a larger number of patients and including difficult to intubate patients are necessary to correctly assess the performance of Glidescope during normal and difficult conditions, the preliminary results being very promising.

A-1028

Cervical spine movement during endotracheal intubation with manual in-line stabilization: a comparison between direct laryngoscopy and the GlideScope® video laryngoscope

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Background and Goal of Study: The optimal technique to intubate the trachea of patients with a potential cervical spine (CS) injury remains controversial. A prospective study comparing CS movement during intubation with direct laryngoscopy (DL) and with video laryngoscopy (VL) using the GlideScope® was conducted using continuous cinefluoroscopy.

Materials and Methods: Twenty patients without CS pathology were studied. After induction of general anesthesia with neuromuscular blockade, both DL and VL were performed on every patient in an order determined by a randomization table. During the maneuvers, manual in-line stabilization of the CS was performed by a trained assistant. Cinefluoroscopic images were later analyzed by dividing each technique in four segments: a first segment preceding manipulations ("Baseline", see figure), a second segment corresponding to maneuvers made to visualize the glottis ("Visualization"), a third segment during which the endotracheal tube was advanced up to the glottic aperture ("ETT"), and a fourth segment corresponding to the insertion of the tube through the glottis and into the trachea ("Intubation"). For each step, the maximal movement of each section of the CS (from occiput to C5) was measured. CS movement during DL and VL was then compared using a two-way ANOVA.

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Results and Discussions: No significant difference was found between DL and VL regarding rotational movement of individual vertebrae and segmental movement of flexion or extension (P values between 0.08 and 0.88). For both techniques, maximal CS movement occurred at the atlanto-occipital joint (see figure).
Conclusion(s): During intubation under general anesthesia with neuromuscular blockade and manual in-line stabilization, the use of VL does not significantly decrease movement of the non-pathologic CS when compared with DL.

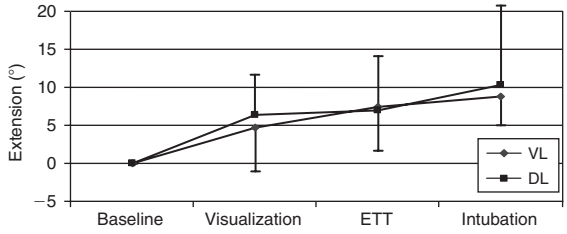

Figure. Movement of the atlanto-occipital joint: direct laryngoscopy (DL) vs. video laryngoscopy (VL): Mean ± SD.

A-1029

The CTrach LMA system: evaluation of the causes of poor views and corrective measures

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Background and Goal of Study: The LMA CTrach system (CTrach) consists of an airway with inbuilt fibreoptic channels and a LCD viewer. The CTrach enables viewing of the larynx and endotracheal intubation through the laryngeal mask, and is developed from the LMA Fastrach system. We evaluated the causes of poor views and possible corrective measures with the CTrach.
Materials and Methods: We obtained IRB approval and consent from 51 patients requiring general anaesthesia and endotracheal intubation for elective surgery. The CTrach airway was inserted with minimal neck movement and adjusted to optimize ventilation. The viewer was then attached and the view used to guide intubation through the CTrach. We used a fibreoptic bronchoscope to diagnose the causes of failed or poor CTrach views.
Results and Discussions: It was easy to ventilate all patients with the CTrach. The CTrach view was good in 28 patients and intubation was successful in all 28.

In 7 patients, <50% of the vocal cords could be seen and in 13 patients, the vocal cords could not be seen at all. This was due to the epiglottis blocking the view in 17 patients, and pushing the airway deeper in or partial withdrawal and reinsertion improved the view in 11 patients. The arytenoids obstructed the view in 3 patients and this was corrected with forward lifting of the airway in all 3. In 18 of the 20 patients who initially had partial or obstructed views, intubation was successful, all at the first attempt.

In 3 patients, no features could be distinguished with the CTrach, due to secretions. This recurred despite removal, cleaning and reinsertion of the CTrach airway. Blind intubation was successful in 2 patients, and failed due to epiglottic obstruction in 1 patient.
Conclusion(s): Despite seemingly optimal ventilation via the CTrach, the epiglottis frequently obstructed viewing of the larynx. In some patients, this could not be corrected with simple maneuvers, causing failed intubation. We should moderate our expectations of the CTrach system.

A-1030

Evaluation of the LMA C Trach™ Preliminary data

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Background and Aim of the Study: The LMA C Trach™ mask enables ventilation during intubation attempts. Built-in fibreoptics provide a real time view of the larynx and of the tracheal tube passing the vocal cords. We report our preliminary data on the use of LMA C Trach in anaesthetised patients
Patients and Methods: Fifty consecutive patients ASA I–II, M/F: 22/28, aged 25–65 yr, weight 71–96 kg were included. Anaesthesia was induced with propofol, fentanyl and cis-atracurium. The LMA C Trach™ was inserted exactly the same as the LMA Fastrach™. In all cases we were seeking for the optimum ventilation position with the ILMA (Chandy manoeuvre) and at this position the viewer was attached. Once the airway was secured and patient was being ventilated, the viewer was switched on, and a clear image of the larynx was displayed in real time. The tracheal tube was viewed entering the trachea. Successful ILM placement was confirmed with bag ventilation 8–10 ml/kg and capnography. In case of failure with the C Trach the light-guided technique was applied.
Results: A straight silicone tracheal tube (Intavent) size 7.5–8.0 mm ID was placed easily and successfully in 45/50 (90%) of patients. Tracheal intubation failed in the first 5/50(10%) patients, due to technical reasons (not able to achieve a clear image on the viewer). These cases were managed successfully with the light-guided technique. After viewer placement in 10/45 (22%) patients adjusting manoeuvres performed to have a view of the vocal cords. In 8/45 (18%) patients the LMA C Trach was removed and replaced to clean the fiberoptics. The time required after viewer placement to successful intubation ranged between 15–105 seconds. Trauma due to LMA was not serious in 2/50 (4%) of patients.
Conclusion: The LMA C Trach was safe and effective for tracheal intubation in anaesthetised patients.

A-1031

Tracheal intubation with Bonfils fiberscope in difficult airway

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Background and Goals: Failed intubation is relatively common in anesthesia and the discovery usually occurs after attempts of laryngoscopy have failed, with the patient anesthetized and paralysed (1). Several devices have been proposed in these circumstances with controversial results depending on the operators skill (2). The Bonfils fiberscope has been successfully used in anticipated or unpredicted difficult airways (3). The aim was to investigate the success rate of intubation with Bonfils fiberscope in difficult airway patients undergoing ENT or maxillo-facial surgery.
Material and Methods: A prospective observational study on fifty patients scheduled for elective ENT or maxillo-facial surgery with borderline anticipated (i.e.Mallampati class III–IV) or unexpected difficult airway. After anesthesia induction and oxygenation, the first intubation attempt was with direct laryngoscopy. If laryngoscope-assisted tracheal intubation was impossible, the patient was enrolled in the Bonfils fiberscope study. The first approach was with the head in the sniffing position, and if the epiglottis and the vocal cords could be seen the tube was inserted. If the soft palate, tongue and epiglottis approximate to the posterior pharyngeal wall and the view obscured by the tissues, the Macintosh laryngoscope was used to enlarge the retropharyngeal space.
Results: The success rate of tracheal intubation at the first attempt using Bonfils fiberscope was 88% (44 of 50 patients). Five patients were intubated on the second attempt. Difficult ventilation was encountered in one patient: he was wakened for a flexible fiberoptic awake intubation. The median time of intubation was 46 s (range 15 s–155 s).
Conclusions: Bonfils fiberscope enables quick and safe intubation when the conventional laryngoscope failed, and could be the first choice with borderline and unpredicted difficult airway. After adequate training, this device needs little preparation time and consent prompt recognition of tracheal placement of the tube.
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A-1032

The ProSeal laryngeal mask airway is an effective alternative to laryngoscope-guided tracheal intubation for laparoscopic adjustable gastric band surgery

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Background: The ProSeal™ laryngeal mask airway (PLMA) is a new laryngeal mask device with a modified cuff to improve the seal and a drain tube to prevent aspiration and gastric insufflation. In the following randomized noncrossover prospective trial, we test the hypothesis that the PLMA is a similarly effective airway device to conventional laryngoscope-guided tracheal intubation in anesthetized paralyzed patients undergoing gastric banding.
Methods: Fifty patients (American Society of Anesthesiologists grade 1–2, aged 18–65 yr) were divided into two equal-sized groups for airway management with the PLMA or tracheal tube (TT). Induction was with fentanyl/propofol, maintenance with sevoflurane, and muscle relaxation with

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atracurium. The following data were collected: number of insertion attempts (maximum of 3 allowed), time to achieve an effective airway, ventilatory capability, gastric size, peak airway pressure before/after pneumoperitoneum, duration of surgery/pneumoperitoneum, hemodynamic responses to insertion and removal, airway trauma and sore throat. In addition, oropharyngeal leak pressures and ease of gastric tube placement were recorded for the PLMA group.

Results: The number of attempts for successful insertion were similar, but effective airway time was shorter for the PLMA. There were no episodes of failed ventilation or hypoxia. The hemodynamic stress responses to insertion and removal were greater for the TT than the PLMA.

We compared the rate of successful intubation with Chi square test. Wilcoxon Rank Sum tests to compare the time to successful intubation and ease of intubation. P values of less than 0.05 were regarded as statistically significant.

Conclusions: The ProSeal LMA is a similarly effective airway device to conventional laryngoscope-guided tracheal intubation for gastric banding, but is more rapidly inserted and associated with an attenuated hemodynamic response to insertion and removal.

A-1033

Economic considerations on reusable and single-use laryngeal mask airways: sample calculation based on clinical data of LMA-classic and ambu laryngeal mask

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Background and Goal of Study: Besides reduction of infection risk, economic concerns are of increasing interest in the debate on single-use versus reusable products. In a clinical trial, LMA-Classic and single-use Ambu laryngeal mask (ALM) are compared and costs are analyzed.

Materials and Methods: After approval of the local ethics committee and written consent, 60 patients scheduled for elective ambulatory interventions were randomized to be ventilated with either LMA or ALM. General anaesthesia was standardized, and airway devices were placed according to manufacturer's instructions. Number of attempts, anaesthesia time, and time in the recovery unit were recorded. Costs were calculated based on data obtained from buying department (device costs) and controlling (process costs: sterilization, personnel, storage, disposal).

Results and Discussions: Demographic data was comparable for both groups, as were number of attempts, anaesthesia and recovery unit time, resulting in no economic differences. With a prize per unit of € 120,00 for the reusable LMA (up to 40 uses), one would expect a cost advantage as long as the price per unit for the single-use ALM exceeds € 3,00. When costs for autoclaving (€ 1,09) and personnel (€ 2,37) for each resterilization of LMA are added (total € 6,46), the costs per use calculated as 1/40 of the device cost account for only 46% of actual costs per use (±20 € LMA price results in a change of only ±4%). After deduction of 10% of the costs for storing and disposal, the maximum price for the single-use product to be competitive is € 5,81 (90% of € 6,46). Costs caused by wrong size selection, which are applicable for both devices, leading to resterilization in the LMA and disposal in the ALM, are not noted. Also not included are considerations on reusable devices kept ready as backup for airway management but not frequently used, and devices that are broken or lost, never reaching the maximum of recommended uses (up to 25% of the total stock),[1,2] leading to higher costs per actual use of LMA.

Conclusion(s): Calculations on device economy should not be based on wholesale prices alone but should take into account process costs and other important variables.

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A-1034

Randomized prospective comparison of LMA-ProSeal and laryngeal tube LTS II

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Background and Goal of Study: Comparative studies of the LMA-ProSeal (PS, LMA Company) and the Laryngeal Tube Suction (LTS, VBM Medizintechnik) showed comparable results for both devices [1–3] with marked differences in only one trial [4]. The new LTS II [5] is compared to LMA-ProSeal to assess device performance.

Materials and Methods: After approval of the local ethics committee and written consent, 100 elective surgical patients were randomized to be ventilated with either PS or LTS II. Following preoxygenation and standardized induction of general anaesthesia with fentanyl and propofol, airway devices were placed according to manufacturer's instructions. Attempt number (max. 2, than other device) and time until first tidal volume were recorded. Ventilation was standardized (tidal volume 7 ml kg^{-1}, respiratory rate 12 min^{-1}) and resulting $PetCO_2$ was recorded. Airway leak pressure (maximum 40 cmH_2O) was measured with cuff pressures adjusted to 60 cmH_2O. Ease of gastric tube insertion was evaluated. Devices were inspected for traces of blood after removal. Patients were questioned for postoperative complaints. Mann-Whitney-U-test was used to compare groups.

Results and Discussions: 50 patients were ventilated with each device. Demographic data as well as ASA-group, Mallampati score, hemodynamic and respiratory variables were comparable for both groups. Insertion was successful in a high percentage of patients (first/second attempt PS 43/6, LTS II 44/4). After two failed attempts, the other device was successfully used in 1 PS and 2 LTS II patients. Time until first tidal volume for PS and LTS II was 25.5 ± 11.5 and 25.0 ± 10.1 seconds. Airway leak pressures were comparable: 32.0 (18–40) for PS and 33.1 (15–40) cmH_2O for LTS II, peak airway pressures 17.6 ± 4.1 and 17.2 ± 4.1 cmH_2O. Gastric tube insertion failed in 2 patients of each group. Traces of blood were found in 3 PS patients and in 2 LTS II patients. In both groups postoperative complaints were mild and infrequent.

Conclusion(s): In this prospective randomized trial, LMA-ProSeal and LTS II were comparable in all respects

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A-1035

A comparison of the ProSeal laryngeal mask and the laryngeal tube suction – II in spontaneously breathing anaesthetized patients

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Background and Goals: We compared ease of insertion, quality of ventilation and postoperative discomfort after short surgical interventions in spontaneously breathing patients between two new devices for airway management: the ProSeal® Laryngeal Mask Airway (PLMA) and the Laryngeal Tube Suction II (LTS-II).

Materials and Methods: Following induction with fentanyl and propofol, 108 fasted patients of both sexes, classified as ASA physical status I or II, aged 18–70, and scheduled for elective surgery of expected short duration were randomly allocated to the PLMA (n = 54) or LTS-II (n = 54). If the anaesthetist could not effectively establish an airway using the initial randomized device after three insertion attempts, the alternative device was used. The anaesthetist assessed the overall ease of PLMA or LTS-II insertion as easy, moderate, difficult or impossible.

The presence of gas leaks was detected by auscultation at neck and mouth. Then, the maximal expired tidal volume was measured.

The incidence of laryngopharyngeal discomfort (sore throat, dysphagia and/or dysphonia) was checked 24 hours after the intervention.

Results: First-attempt insertion success rates were more frequent for the PLMA (85.2% vs. 70.4%), but success rates were similar (98.2% vs. 90.7%) after three attempts. The anaesthetist considered that insertion of the PLMA was easy in 46 of the 54 cases whilst the insertion of the LTS-II was easy in 33 of the 54 cases. ($P < 0.01$)

The insertion of the MLPS took place without difficulty in the five patients in whom the insertion of the LTS-II proved impossible. On the other hand, the insertion of the LTS-II was possible in the patient in whom the insertion of the MLPS was not possible.

Expired tidal volume was similar with both devices (457 vs. 429 mL; MLPS, LTS-II respectively). The PLMA formed a more effective seal than the LTS-II ($P < 0.05$).

There were no differences in the incidence of intolerance, sore throat, dysphagia and/or dysphonia between both devices.

Conclusion: We conclude that the PLMA showed greater ease of insertion and reliability than the LTS-II. The quality of ventilation and the incidence of

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postoperative complications in non-paralyzed anesthetized patients were similar between both devices.

A-1036

Evaluation of single use vs multiple use intubating laryngeal mask for tracheal intubation using the flexible lightwand

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Aim of the Study: To evaluate the single use intubating laryngeal mask (ILM) vs multiple use ILM for tracheal intubation using the flexible lightwand (FLW). The FLW consists of a completely flexible thin plastic catheter, a bulb attached to its distal end, a 15-mm concentric adaptor at its proximal end and an extension ending in a battery with a power switch. The device is placed into a straight silicone tracheal tube (TT) in such a way that the bulb is adjusted to the distal end of the TT.

Material and Methods: After IRB approval and informed consent 70 patients were included, ASA 1–3, aged 23–70 yr, weight 52–105 kg, scheduled to undergo propofol/Fentanyl/cisatracurium anaesthesia for elective surgery. Patients were randomly allocated to a double comparative trial and were intubated using the flexible lightwand through either the single use (SU) ILM (n = 30, group A) or the multiple use (MU) ILM (n = 40, group B). The TT preloaded with the FLW was inserted through the ILM and by observing the glow on the neck was advanced into the trachea. Whenever resistance was felt during insertion, appropriate adjusting manouevres were performed. The number of manouevres performed, the total duration of the procedure and the final outcome were recorded. Failure to intubate was defined as inability to place the TT successfully after four manouevres have been attempted.

Results: The ILM was placed successfully in all patients. The results are shown in the table. Values are expressed as mean (±SD) or numbers of patients.

		Manouevres per patient			
ILM	Duration (s)	0	1	2–4	Fail
SU	30 ± 7	15/30 (50%)	12/30 (40%)	3/30 (10%)	0
MU	28 ± 7	25/40 (62.5%)	12/40 (30%)	3/40 (7.5%)	0
p	NSS[a]	NSS[b]			

[a] Unpaired t-test, [b] Chi square test, NSS: Non statistical significant.

Conclusion: The single use ILM is equally effective with the multiple use ILM for tracheal intubation using the FLW.

A-1037

The use of small-dose vecronium and midazolam facilitate laryngeal mask airway ProSeal, during target-controlled infusion of propofol

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Background and Goal of Study: To assess the laryngeal mask airway ProSeal (PLMA) insertion conditions produced by using small-dose vecronium during the induction of anesthesia with midazolam, fentanyl and target controlled infusion (TCI) of propofol.

Materials and Methods: Patients were randomaly divided into two groups of 20 to compare the effects of with or without vecronium. Three minutes after intravenous injection of midazolam 0.08 mg/kg, the patients receive 2.0 microg/kg fentanyl and tci of propofol with 2 microg/ml of target plasma concentrations (Cpt), PLMA was inserted when the bispectral index (BIS) values reached below 45. The PLMA insertion conditions (mouth opening, coughing, gagging, head or limb movement, overall ease of insertion) were assessed, and hemodynamic responses were evaluated after PLMA insertion.

Results and Discussions: There was no significant difference between the two groups with regard to the physical or clinical characteristics of the patients. Insertion of the LMA was graded as easy in 85% of patients who received vecronium, compared with 55% of patients without vecronium. The total dose of propofol needed to place an PLMA in the vecronium group was lower than without vecronium group (1.1 vs 3.2 mg/kg).

Insertion of the PLMA in the anesthetized patient can sometimes be difficult, because of inadequate jaw opening, gagging or coughing. Propofol has been recommended because of its depressant effect on laryngeal reflexes, but relatively large doses of propofol are required to achieve successful PLMA insertion and it causes unwanted cardiorespiratory depression. Vecronium has a rapid onset and a short duration. It facilitates PLMA insertion probably by relaxing the laryngeal muscles. And there was a significant reduction in total dose of propofol needed to insert the PLMA when small-dose vecronium was used and this was associated with less hypotension.

Conclusion: The use of small-dose vecronium 0.06 mg/kg with midazolam 0.08 mg/kg, 2.0 microg/kg fentanyl and TCI of propofol with 2.0 microg/ml of Cpt facilitated PLMA insertion, reducing the total dose of propofol needed, reduce the incidences of hypotension and improved the chance of correct positioning of PLMA.

A-1038

Comparison between the laryngeal tube sonda II and the endotracheal tube

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Background and Goal of Study: The newly introduced Laryngeal Tube Sonda II. LTS II (VBM Medizintechnik, Susltz, Germany) is a further development of the Laryngeal Tube Suction (LTS)[1]. The LTS II is latex-free, double lumen silicon tube wherein one lumen is used for ventilation and the other for gastric tube placement.

To own knowledge, no study has yet compared the LTS II with the endotracheal tube (ETT).

We hypothesized that the LTS II and the ETT perform similarly as measured by oxygenation and ventilation at the prefixed peak ventilatory pressure of 19 cc H_2O.

Materials and Methods: The study was approved by the Hospital Ethics Committee and informed consent was obtained. ASA I adult patients undergoing general anesthesia were randomly allocated to receive either LTS II or ETT (n = 40 each group).

The patients were ventilated using pressure control mode ventilation with 19 cc H_2O peak inspiratory pressure. Oxygen saturation (SO_2) and end tidal CO_2 ($EtCO_2$) were measured and recorded. Breath by breath spirometry data was obtained using a side-stream spirometry device.

Results and Discussions: Successful insertion was achieved in 98% for the LTS II and 100% for the ETT. SO_2 and $EtCO_2$ for LTS II and for ETT respectively were 97.2% (±2); 38.1 mmHg (±6) and 98.7% (±2); 38.5 mmHg. Inspiratory Tidal Volume and Expiratory Tidal Volume for LTS II and for ETT respectively were 633 cc (±38); 545 cc (±47) and 570 cc (±33); 536 cc (±35).

Conclusion(s): This study suggests that clinical performance of the LTS II and the ETT is similar with regard to oxygenation and ventilation using pressure control ventilation with 19 cc H_2O of peak pressure.

Reference:

1 Gaitini L, et al. Randomized Controlled Trial Comparing the Proseal Laryngeal Mask Airway with the Laryngeal Tube Suction in mechanically ventilated patients. Anesthesiology 2004 Aug; 101(2):316–20.

A-1039

Randomized comparison of laryngeal tube with laryngeal mask airway during general anaesthesia with controlled ventilation

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Background and Goal of Study: The laryngeal mask airway (LMA; Laryngeal Mask Company, Henley-on-Thames, UK) is an established airway device, whereas the laryngeal tube (LT) is relatively new supraglottic ventilatory device for airway management (1,2). The aim of this study was to compare the LMA and the LT in terms of ease of insertion, ventilation quality during anesthesia with controlled ventilation, and to evaluate their impact on postoperative laryngopharyngeal discomfort.

Materials and Methods: In 100 patients undergoing general anesthesia for urological surgery, anesthesia was induced with propofol and fentanyl and maintained with isoflurane and nitrous oxide. Patients were randomized to controlled ventilation with the LT (n = 50) or the LMA (n = 50). After 1, 15, 30, 45, 60, 75, 90, and 120 min of ventilation with the LT or LMA, oxygen saturation, end-expiratory carbon dioxide, expiratory tidal volume, peak airway pressure, plato pressure, and dynamic compliance were recorded. The incidence of postoperative laryngopharyngeal discomfort was also evaluated.

Results and Discussion: No differences in patients characteristics were detected between groups. First attempt insertion success rates were more frequent for the LT (84.8% versus 56.1%; p = 0.001). Ventilation variables

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revealed sufficient ventilation and oxygenation with either device. Dynamic compliance was significantly higher when using the LT compared with the LMA. The number of patients in whom blood on the removed device during emergence was significantly higher with LMA than LT ($p < 0.05$).

Conclusions: We have demonstrated that successful insertion is more likely with the LT than with the LMA. Insertion of the LMA requires more attempts and causes a greater number of complication. Using the LT and LMA resulted in comparable ventilation variables in this model of ASA physical status I and II patients undergoing routine surgical procedures. The newly developed LT may be a simple alternative device to secure the airway.

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A-1040

Clinical evaluation of four disposable laryngeal masks

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Background and Goal of Study: Disposable laryngeal masks (DLM) prevent infectious disease transmission, but new designs and materials may imply differences in clinical performance and learning curve of insertion. We compared the clinical use of four DLM: Ambu LM (Ambu), Soft Seal (Portex), Solus (Intersurgical) and LMA Unique (LMA) in terms of ease of insertion, airway seal efficacy, and complications derived of its use.

Materials and Methods: 205 patients were randomly allocated in four groups, Ambu, Intersurgical, LMA or Portex. Time and number of attempts needed for insertion, quality of ventilation, airway seal pressure at 60 cmH_2O of intracuff pressure, and complications were evaluated.

Results and Discussions: Main results are shown in the following table:

	Ambu	Intrsurg	LMA	Portex
First attempt (%)	76	57*	78	67
Failure at third attempt (%)	3	6	2	8
Time needed (s)	21.1 ± 10	36.9 ± 43	31.9 ± 45	34.5 ± 24
Optimal ventilation (%)	95	94	100	92
Airway seal pres. (cmH_2O)	23.7 ± 5	20.9 ± 4	22.1 ± 6	27.3 ± 5*
Blood on mask (%)	12.3	16.9	10.2	38.5*
Sore throat (%)	6.3	9.4	8.2	10.3

*$p < 0.05$.

Conclusion(s): Our results suggest different clinical performance and learning curve of use for disposable laryngeal masks. Ambú LM and LMA Unique appear to be easier to insert and less traumatic. Portex LM achieves a slightly more effective airway seal.

A-1041

The ProSeal laryngeal mask airway is an effective alternative to laryngoscope-guided tracheal intubation for gynaecological laparoscopy

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Background and Goal of Study: The ProSeal™ laryngeal mask airway (PLMA) is a supraglottic airway device with a modified cuff to improve the seal and a drain tube to prevent aspiration and gastric insufflation(1). We compare ProSeal™ Laryngeal Mask Airway (PLMA) with endotracheal tube (TT) in a randomised non-crossover prospective trial as an effective alternative in gynaecological laparoscopy.

Materials and Methods: After hospital ethics committee approval and informed consent, we recruited 180 patients undergoing elective gynaecological laparoscopy. They were randomised to PLMA (n = 90) or TT (n = 90). After induction of general anaesthesia, respective devices were inserted. The following data were collected: Ventilatory capability, number of insertion attempts (Maximum 3 attempts), time to achieve effective airway, hemodynamic responses to insertion and removal. Oropharyngeal leak pressures and ease of gastric tube placement were recorded for PLMA group. Sample size was powered to detect a difference of 5% for successful ventilation (α:0.05, β:0.2).

Results and Discussions: The number of attempts was similar but effective airway time was shorter for PLMA (21 ± 14 s vs. 33 ± 17 s, $p < 0.001$). Both devices were successfully inserted within three attempts. There were no episodes of failed ventilation or hypoxia. Hemodynamic stress responses were greater for TT. Duration of surgery, pneumoperitoneum, intra-abdominal pressures and gastric size were similar for both groups. There were no differences in frequency of complications or sore throat. Oropharyngeal leak pressure for PLMA was 27 ± 4 cmH_20. Orogastric tube insertion was easy in 80 patients and difficult in 10 patients.

Conclusion: The ProSeal™ LMA is an effective alternative to endotracheal intubation for gynecological laparoscopy. It is quicker to establish and associated with an attenuated hemodynamic response to insertion and removal.

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A-1042

Propofol induced less pharyngeal discomfort than thiopentone in patients receiving laryngeal mask airway (LMA) insertion

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Background and Goal of Study: LMA related postoperative pharyngeal discomfort such as sore throat, dysphasia, and dysphonia were not infrequent, even comparable with tracheal intubation (1), which often resulted in dissatisfaction of the patients (2). Previous studies demonstrated that propofol induced less gagging, coughing or laryngospasm, and provided intense suppression on airway reflex during tracheal intubation when compared with thiopentone (3). Whether the choice of induction agents of anaesthesia plays a role in the improvement of the minor complications with the insertion of LMA is still unclear. The prospective, double blind, randomised study was conducted to compare the incidence of postoperative pharyngeal discomfort after LMA with induction agent propofol or thiopentone.

Materials and Methods: 406 patients were randomly assigned into two groups; Propofol and Thiopentone group. Anaesthesia and monitor were standardized. All patients received fentanyl 1 ug/kg. Then, the patients in Propofol group were induced with 2.5 mg/kg propofol and the patients in Thiopentone group received 1.5 mg/kg thiopentone. Succinylcholine 0.5 mg/kg was administered to facilitate LMA insertion. Sevoflurane 1–2 MAC in 50% oxygen was adjusted to maintain depth of anaesthesia. Postoperatively, we evaluated and recorded the incidence of pharyngeal discomfort at postoperative 2, 12, and 24 hours.

Results and Discussions: The incidence of sore throat in Thiopentone group was significantly higher than the Propofol group at postoperative 2 and 12 hours ($P < 0.05$); while the incidence of dysphonia and dysphasia in Thiopentone group was significantly higher than the Propofol group at postoperative 2 hours ($P < 0.05$). The incidence of postoperative nausea and vomiting (PONV) in Thiopentone group was also significantly higher than those of Propofol group at postoperative 2 hours ($P < 0.05$).

Conclusion(s): At the dose of propofol administered provided more protection against LMA induced immediate pharyngeal discomfort and PONV than a regular induction dose of thiopentone.

References:

1 Anesthesiology 2002;96:289–95.
2 Br J Anaesth 2004;92:541–3.
3 Anesthesiology 2001;94:760–6.

A-1043

Airway sealing and waste gas exposure during mechanical ventilation using CobraPLA compared with LMA classic

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Background and Goal of Study: Recent data clearly demonstrate that chronic exposure to trace concentrations of volatile anesthetics and nitrous oxide may be hazardous. Compared with tracheal intubation waste gas exposure is higher during the use of supraglottic airway devices. The CobraPLA™ (Engineered Medical Systems, IN, USA) is a recently introduced supraglottic airway, intended to provide easier insertion and improved airway sealing (1). The aim of this randomized study was to compare performance and sealing capacities of the CobraPLA with the LMA classic.

Materials and Methods: After approval by the IRB, 40 ASA I and II patients undergoing minor surgery were grouped as CobraPLA (n = 20) or LMA group (n = 20). Leak pressures were assessed at airway pressures up to 30 cmH_2O or until audible gas leakage occurred. Environmental waste gas pollution was measured at two different sites (patient's mouth and anesthetist's breathing zone) with a spectrometer detecting sevoflurane and nitrous oxide.

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Results and Discussions: Correct CobraPLA positioning was possible in 19/20 patients (95%). The 1st insertion attempt was successful in 15 (75%), a 2nd attempt was necessary in 4 (20%) and in 1 patient insertion failed after 3 attempts. Correct positioning of the LMA classic was possible in all patients, a 2nd attempt was necessary in 2 patients and a 3rd attempt in 1 patient. Average leak pressure of the CobraPLA was 25 ± 5 cmH_2O, compared to 21 ± 4 cmH_2O of the LMA classic ($p < 0.05$). Sealing up to 30 cmH_2O was observed in 6 patients within the CobraPLA-group and one LMA classic patient. Spectrometric assessment of wasted Sevoflurane and N_2O showed a trend to higher OR pollution during LMA classic ventilation at both sites.

Conclusions: Both airways performed well and sufficient ventilatory support was possible in all but one CobraPLA patient. Sealing capacity of the CobraPLA was significantly better and OR air contamination with waste anesthetic gases might be reduced using the new CobraPLA.

Reference:

1 Akca O, Wadhwa A, Sengupta P, et al. *Anesth Analg.* 2004;99:272–8.

A-1044

A clinical comparison of the disposable ambu laryngeal mask and LMA unique

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Background and Goal of Study: The Ambu™ Laryngeal Mask (ALM) is a disposable supraglottic airway device. The goal of this randomised, single-blinded, multi-centre study is to compare its performance with the LMA Unique™ (LMA-U) in non-paralysed adult patients.

Materials and Methods: After ethics committee approval and written informed consent, 65 adult patients ASA grade 1–2, scheduled for short-lasting anaesthesia were included. Patients with BMI > 30·kg·m^{-2} or predicted difficult airway were not included. After induction of anaesthesia, size 3 to 5 ALM (group 1) or LMA-U (group 2) was inserted in strict accordance with the manufacturer's recommendations. Success and insertion time, oropharyngeal leak pressure (OLP), peak airway pressure (PAP) and fiberoptic view were recorded. Per and postoperative (sore throat, dysphonia or dysphagia) side effects were recorded. Differences were assessed with χ^2 or Fischer Exact test, Student t-test and Mann-Whitney test.

Results and Discussions: Five patients were excluded. There was no difference regarding demographic data and haemodynamic preoperative parameter values. First insertion success rates (76.7% vs. 86.7%), and insertion time in first attempt (32.9 ± 9.4 s vs. 34.1 ± 11.7 s respectively) were comparable in the two groups. Mean PAP was similar (15 ± 2.7 cmH_2O vs. 14.5 ± 3.4 cmH_2O) but mean OLP (21.8 ± 4.3 cmH_2O vs. 18.7 ± 4.7 cmH_2O; $p = 0.011$) and the difference between OLP and PAP (6.8 ± 5.3 cmH_2O vs. 4.2 ± 3.8 cmH_2O. $p = 0.036$) was higher with the Ambu™ Laryngeal Mask. There was no difference regarding the pre and postoperative side effects.

	ALM		LMA-U	
Fiberoptic view	n	%	n	%
VC not seen	1	3.3	2	6.7
VC and anterior part of E	16	53.3	12	40
VC and posterior part of E	9	30	12	40
Only VC	4	13.3	4	13.3

With VC: Vocal cords and E: Epiglottis ($p = 0.643$).

Conclusion(s): The Ambu™ Laryngeal Mask and LMA Unique™ are equal in performance regarding handling and side effects. A higher OLP in the Ambu™ Laryngeal Mask suggests a better airway sealing.

A-1045

Easytube: comparison between two insertion techniques

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Background and Goal of Study: The EasyTube (EzT) (Teleflex, Ruesch, Stuttgart, Germany) is a new disposable, polyvinyl-chloride, double-lumen, supraglottic airway device. It allows ventilation in either esophageal or tracheal position, however it is expected to enter the esophagus in most cases. While it is similar to the Combitube, its advantages are that the distal end is much thinner, the balloon is latexfree, a bronchoscope may be passed and a pediatric size is available. (1) The EzT may be positioned in the esophagus blindly or using a laryngoscope. The aim of the study was to compare the blind vs laryngoscopy – guided technique for the esophageal insertion of the EzT.

Materials and Methods: Thirty ASA I–II patients, Mallampati I and II adult patients, between 50–80 kg, undergoing minor surgery, were randomly allocated for esophageal EzT insertion using the blind or laryngoscopy-guided technique. Both insertion techniques were performed according to the manufacturer's instructions. Data were collected for number of attempts and time taken to provide an effective airway, for blood straining and postoperative airway morbidity. The time to obtain an effective airway was noted from the removal of the face mask to confirmation of normal ventilation, expressed by bilateral chest movement and normal capnography curve.

Results and Discussions: There were no failures on inserting the device with both techniques. First attempt/second attempt insertion rates were 86%/14% for the blind insertion technique and 93%/7% for the laryngoscopic-guided technique. Time to achieve an effective airway was 31 ± 4 seconds for the blind technique and 33 ± 6 seconds for the laryngoscopic-guided technique. After removal of the device blood stains were observed in eight patients, 4 patients in each group. Sore throat in Post Anesthesia Care Unit was 20% for both groups, and no patient required treatment.

Conclusion: We conclude that insertion of the EzT is equally successful with or without using a laryngoscope.

Reference:

1 Thierbach AR, Piepho T, Maybauer MO. A new device for emergency airway management: the EasyTube. Resuscitation 2004; 60:347.

A-1046

LMA classic versus lma ambu in patients undergoing orthopedic surgery

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Background and Goals: The Laryngeal Mask Airway (LMA) does not require the use of a laryngoscope, it is easy to introduce and reduces the risks of laryngeal trauma and it is suitable to the anatomical structures. We compared the standard LMA to a new sovraglottis device, the AMBU® mask, in term of safety, easiness of introduction and property of ventilation. (1, 2)

Materials and Methods: 22 patients undergoing orthopedical surgery were enrolled in the study and divided into 2 groups: group LMA and group Ambu (ASA I–II, age ranged of 18 to 80 years). General anesthesia (propofol 2.5 mg/kg, remifentanyl c.i. 0.05–0.5 mcg/kg/min, sevoflurane or desflurane, without muscle relaxant) was associated with peripherical nerve or epidural block. The correct position of the devices was checked with a flexible fibrescope (Karl Storz® Endoskope mod.113011, Tuttlingen, Germany) using the Brimacombe and Berry score (B-B score) (3). T-Student test was used to analyze mean time of insertion and air pressure leak, Mann Withney test for side effects.

Results and Discussion: Mean insertion time and maximum pressure air leak are reported in the table

	LMA	AMBU	p
Insertion (sec.)	20.7 ± 5.2	14.4 ± 7.4	0.032
Air leak (cm H_2O)	26.1 ± 4.0	24.0 ± 5.3	0.33
B-B score	2.5 ± 1.2	3.0 ± 1.1	0.53

Conclusion: The Ambu® mask is a valid alternative to the LMA classic because of its structure (unflexible grip and smaller thickness) without side effects.

References:

1 Verghese C. Anest Analg 1996; 82:129–33.
2 Brimacombe J. Anaesthesia 1996; 51:76–80.
3 Brimacombe J, Berry A. Anesth Analg 1993; 76:457.

A-1047

A cross-over trial comparing Ambu Laryngeal mask with Classic Laryngeal Mask Airway under anaesthesia

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Background: Transmission of prior related diseases like variant CJD associated with the use of reusable airway equipment has been of concern in recent years[1]. This has lead to an increase in disposable airway equipment available in the market. We compared the disposable Ambu Laryngeal mask™ with the reusable Classic Laryngeal Mask Airway™.

Materials and Methods: After ethics committee approval and written informed consent, we recruited 37 patients (ASA 1–3) in this randomized cross over study. Patients received a standard anesthetic using a total intravenous anesthesia technique. A standard depth of anesthesia was achieved after which each patient received both supraglottic airway devices one after the

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other in random order. We compared first attempt success rate and ease of insertion of the two devices. Ease of insertion was scored on a visual analogue scale (0–100: impossible to very easy). $P < 0.05$ was considered significant

Results: First attempt insertion success: (n = 37)

		Ambu LM	
		Success	Failure
Classic LMA	Success	28	1
	Failure	5	3

Ambu LM: 89.2%; Classic LMA: 78.4%; *p = 0.22 (McNemar test).*
Ease of insertion: median [IQR]; Ambu LM: 86 [76–94.5]; Classic LMA: 85 [59–89]; *p = 0.046 (Wilcoxon signed rank test).*

Conclusions: First attempt success rate for Ambu laryngeal mask was identical to Classic LMA. Ease of insertion was significantly easier with Ambu laryngeal mask.

Reference:

1 Hirsch N. *Anaesthesia* 2005; **60**:664–67.

A-1048

Clinical comparison between PAXpress™ and the laryngeal mask™ during general anesthesia

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Background and Goal of Study: A prospective study was performed to compare the efficacy of the Paxpress™[1] with that of the LMA™ in elective surgical procedures under general anesthesia.

Materials and Methods: 60 ASA I–III patients (pt), 37 men and 23 women were randomized to receive either the LMA (30) or Paxpress (30). Propofol 2–3 mg/kg, cisatracurium 0.03 mg/kg and remifentanil 0.10–0.20 μg/kg/min were used for anesthesia induction. Positive pressure ventilation (PPV) with Sevoflurane 0.6–1 MAC in 80% O_2/air, was used for maintenance. Ventilation and hemodynamic data were recorded every 5 min. The insertion time and the number of insertion attempts, required to obtain adequate ventilation were noted. It was determinated airway selling pressure with a manometer.

Results and Discussions: Both groups were comparable to demographic characteristics.

	Group LMA (n = 30)	Group PAxpress (n = 30)	P value
Insertion time (sec.)	29.78 ± 4.79	28.21 ± 4.87	0.185 (NS)
Insertion attempts(1/2)	29/1	27/3	0.30 (NS)
Inspiratory airway pressures (cmH_2O)	16.6 ± 3.37	17.5 ± 3.50	0.315 (NS)
Cuff air volume (ml)	20.3 ± 6.05	42.43 ± 8.37	<0.001
Airway sealing pressures (cmH_2O)	34.56 ± 5.74	39.5 ± 4.56	<0.001

Gastric insuflation was positive in 1 pt in each group, without major adverse reactions. After device removal, blood was found on 4 PAxpress devices (13%) and on 3 LMA (10%). In the PAxpress group 4 pt (13%) complained of pharyngeal soreness versus 2 pt (6%) in LMA. Data were analyzed using Chi-square and Student's t-tests. $P < 0.05$ was considered statistically significant.

Conclusion(s): PAxpress is an alternative to LMA during surgery, due to its similar insertion time and its higher airway sealing pressures with similar side effects.

Reference:

1 Vasilios Dimitrou. Can J Anaesth 2003; 50: 495–50.

A-1049

Streamlined liner of the pharinx airway (SLIPA™) in lateral decubitus

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Background and Goal of Study: SLIPA is a low-cost, single use, supraglottic device for airway control. Its safety has been demonstrated in supine patients under general anesthesia[1]. We tested this device in patients undergoing orthopedic surgery in lateral position.

Materials and Methods: Consecutive consentient patients undergoing hip surgery were enrolled. Patients at risk for inhalation, ASA 4, and oropharyngeal malformations were excluded. General anesthesia was induced with propofol, midazolam and fentanyl, and maintained with Sevoflurane. SLIPA was placed in patients operated in lateral decubitus. Laryngeal mask or endotracheal tube was placed in patients operated in supine position, as a control group. All patients received lumbar plexus block (ropivacaine 0.7% 30 ml). During surgery, volume-controlled ventilation was maintained with tidal volume set at 8 ml/kg (TVs), FiO_2 0.6 and 0 peep (Datex Ohmeda Advance S/5). Vital and ventilatory parameters were recorded every 5 minutes. The difference between TVs and expiratory volumes (TVe) was computed in order to quantify air leakage. Data (mean, range) were compared using student's T-test.

Results and Discussions: 10 patients were studied in each group. All SLIPA patients maintained a clinically adequate ventilation with minimal air leak throughout surgery in lateral position:

	SpO_2 mean (range)	Et-CO_2 mean (range) (mmHg)	TVs-Tve mean (range) (ml)
SLIPA	98 (97–100)	36.6 (30–43)	−20.7 (25–50)
Control	98 (97–100)	34.4 (29–40)	−20.4 (−8–69)

No postoperative respiratory complications occurred. There was no difference between SLIPA and controls.

Conclusion(s): SLIPA was safe and effective during mechanical ventilation in lateral decubitus. Environmental anesthetic gas pollution should be assessed in further study on SLIPA.

Reference:

1 Miller DM, Lavelle M. Anesthesia Analgesia 2002; 94:759–761.

A-1050

The newly developed easy tube: a comparison with the esophageal-tracheal combitube in non paralyzed anaesthetized adult patients

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Background and Goal of Study: The esophageal-tracheal combitube (CT) is an established airway device for emergency use (1). The Easy Tube (ET) is a relatively new disposable, polyvinyl-chloride, double-lumen, supraglottic airway device. The purpose of this study was to assess both the Easy Tube and the combitube in apneic patients during routine surgical procedures.

Materials and Methods: After IRB approval and written informed consent 44 patients (ASA 1–3), undergoing minor routine surgery were randomly allocated to controlled ventilation (FiO_2, 0.4; VT, 7 ml/kg; respiratory rate, 10 min^{-1}) with the ET (n = 22) or CT (n = 22). Both devices were inserted by a single experienced anesthesiologist; cuff inflation was performed with 75 ml of air (ET) and 70 ml (CT). After five and 10 minutes of ventilation SpO_2, $etCO_2$, VT_{ex} and P_{aw} were recorded. Time of insertion, failure rate and airway leak pressure (2) were measured. Occurrence of gastric inflation was assessed with a stethoscope placed on the epigastrium. Patients were asked about sore-throat, dysphonia, and dysphagia 24 hours after surgery (post-operative airway morbidity).

Results and Discussions: There were no differences in demographic data between groups at baseline. Time of insertion was comparable with the ET and CT (median: 58 sec; range, 27–150 sec vs. 76 sec; 35–183 sec; *P* = ns; Failures; ET 9/22 vs. CT 3/22). Ventilation variables revealed sufficient ventilation and oxygenation with either device. Paw (ET: median 16 cm H_2O; range 8–32 cm H_2O; CT:22; 16–32) and airway leak pressure (ET: 20 ± 6 cm H_2O; vs. CT: 30 ± 8) were higher (*P* = s) with the CT compared to the ET. Post-operative airway morbidity was significantly higher with the CT (CT-60% and ET-25%). No gastric inflation occurred with either device. Subjective assessment of handling was inferior with both devices.

Conclusion(s): The complex handling, resulting in some failures and post-operative patients discomfort suggest that the Easy Tube is not superior to the esophageal-tracheal combitube.

References:

1 Eur J. Anaesthesiol 2005; 22: ± 341–346.
2 Br J. Anaesth 1999; 82: 286–7.

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SUBJECT INDEX

https://doi.org/10.1017/S0265021506000809 Published online by Cambridge University Press

https://doi.org/10.1017/S0265021506000809 Published online by Cambridge University Press

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https://doi.org/10.1017/S0265021506000809 Published online by Cambridge University Press

https://doi.org/10.1017/S0265021506000809 Published online by Cambridge University Press

AUTHOR INDEX

https://doi.org/10.1017/S0265021506000809 Published online by Cambridge University Press

https://doi.org/10.1017/S0265021506000809 Published online by Cambridge University Press

https://doi.org/10.1017/S0265021506000809 Published online by Cambridge University Press

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