3. Covarrubias DJ, Luetmer PH, Campeau NG. Posterior reversible encephalopathy syndrome: prognostic utility of quantitative diffusion-weighted MR images. *AJNR Am J Neuroradiol* 2002; **23**: 1038–1048.
4. Hsieh CT, Chiang YH, Tang CT, Sun JM, Ju DT. Delayed traumatic thoracic spinal epidural hematoma: a case report and literature review. *Am J Emerg Med* 2007; **25**: 69–71.
5. Chang FC, Lirng JF, Luo CB *et al*. Evaluation of clinical and MR findings for the prognosis of spinal epidural haematomas. *Clin Radiol* 2005; **60**: 762–770.
6. Shin JJ, Kuh SU, Cho YE. Surgical management of spontaneous spinal epidural hematoma. *Eur Spine J* 2006; **15**: 998–1004.

Complete atrioventricular block following etomidate

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EDITOR:

Etomidate is an induction agent known for its cardiac stability; however, it has been reported to cause cardiac arrhythmias. A case of complete atrioventricular block caused by etomidate, a side-effect not previously reported in human subjects, is reported.

A 71-yr-old female was admitted to the psychiatric unit for a course of electro-convulsive therapy (ECT). She had well-controlled hypertension and had undergone an uneventful course of ECT the previous year. Her medications included nifedipine, doxasosin, dipyridamole, atorvastatin, indapamide, olanzapine, venlafaxine and lithium carbonate. She was not allergic to any medications. Examination of her cardiovascular and respiratory systems was unremarkable and assessment of her airway did not suggest any possible problems. Her blood biochemistry was within normal limits.

During her previous course of ECT, etomidate and suxamethonium had been used for induction of anaesthesia on each occasion. Her first treatment in this course of ECT had proceeded uneventfully when 18 mg etomidate and 50 mg suxamethonium were used. Induction was the same for the next two treatments; however, on both occasions after the suxamethonium was administered she developed what was reported to be a marked sinus bradycardia of 20 beats min^{-1} responding to intravenous (i.v.) atropine 600 μg within about 30 s. The treatments were otherwise uneventful and she made a full recovery each time.

At the next treatment, after the institution of monitoring and siting of an i.v. cannula, a pre-emptive dose of 600 mcg of i.v. atropine was given. Her heart rate (HR) increased from 100 to 110 beats min^{-1}. She was preoxygenated and induction of anaesthesia commenced with etomidate. After the administration of 17 mg of etomidate she developed complete heart block with the atrial rate remaining at about 100 per minute and intrinsic ventricular rate of 10 per minute with a good volume palpable carotid pulsation. The duration of this event was approximately 30 s when the rhythm reverted to normal sinus rhythm before any further treatment could be considered. The suxamethonium was not given and the treatment was abandoned. The patient made a full and uneventful recovery.

Subsequent echocardiogram and 24-h electrocardiography monitoring revealed no abnormalities and the cardiology team felt no further cardiac investigations were required. The decision was made that continuation of the course of ECT was warranted due to her ongoing psychiatric illness. She therefore continued her course of treatments with anaesthesia being administered by a consultant anaesthetist in the theatre recovery room, rather than the more isolated psychiatric unit, with external pacing pads applied as a precaution, prior to induction of anaesthesia. For the remainder of the course, anaesthesia was induced with propofol 1% with no problems.

Initially, it was thought that this patient's bradycardia was brought about as a side-effect of suxamethonium. However, it became clear that etomidate was the likely causative agent. Etomidate is presented as a colourless solution in an aqueous vehicle of water and 35% propylene glycol [1]. It is noted for its lack of cardiovascular side-effects, but rare known side-effects are transient bradycardia and cardiovascular instability. It is possibly not etomidate itself that causes the bradycardia, but its carrier propylene glycol [2]. It has, however, been shown to cause atrioventricular dissociation in isolated guinea pig heart studies [3].

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The Medicines and Healthcare Products Regulatory Agency, via their yellow card reporting scheme, have recorded a number of life-threatening or fatal complications involving etomidate, the earliest being reported in 1979. Among the other cardiovascular effects reported, there have been three cases of bradycardia and six cases of cardiac arrest, three of which were fatal [4].

There is very little reported about cardiovascular instability occurring with the use of etomidate. Al-Khudari and Whitwam [2] showed in 1986 that i.v. injection of propylene glycol in the canine model produced autonomic instability with stimulation of the cardiomotor vagus and inhibition of the sympathetic nervous system. In their experiments they concluded, however, that as the cardiovascular effects were observed within 3–5 s of injection, the autonomic effects must be from stimulation of intrathoracic structures as there would not be time for the propylene glycol to reach the central nervous system. In their experiment, the effects on HR were transient and the rate returned to normal within 1 min.

A case report from The Netherlands reported asystole in a patient lasting for 10–15 s followed by nodal rhythm spontaneously reverting to sinus rhythm on induction of anaesthesia with etomidate. In this case, no further problems were encountered and surgery went ahead uneventfully [5]. A more recent report demonstrated conversion of ventricular tachycardia to sinus rhythm during induction of anaesthesia, for DC cardioversion, with etomidate [6].

Etomidate has relatively few cardiovascular side-effects. However, it does have some rare effects which may be potentially life threatening. It is possible that its carrier, propylene glycol, might be the causative agent rather than the drug itself. The use of etomidate in lipid emulsion may be advantageous. It must also be remembered that patients in whom etomidate is used may be on a number of cardiovascular medications, and a drug interaction cannot be ruled out. These potential complications should be borne in mind when considering the use of etomidate as an induction agent.

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References

1. Hypnomidate (Janssen-Cilag Ltd, High Wycombe, UK) product information leaflet.
2. Al-Khudhairi D, Whitwam JG. Autonomic reflexes and the cardiovascular effects of propylene glycol. *Br J Anaesth* 1986; **58**(8): 897–902.
3. Stowe DF, Bosnjak ZJ, Kampine JP. Comparison of etomidate, ketamine, midazolam, propofol and thiopental on function and metabolism of isolated hearts. *Anesth Analg* 1992; **74**: 547–558.
4. Medicines and Healthcare products Regulatory Agency http://www.mhra.gov.uk/home/groups/public/documents/sentineldocuments/dap_1152181461751.pdf (accessed 2 May 2007).
5. van den Hurk AW, Teijen HJ. Cardiac complications during use of etomidate. *Anaesthesia* 1983; **38**(12): 1183–1184.
6. King S, Banker D. Etomidate as an antiarrhythmic. *Br J Anaesth* 2005; **95**(3): 425.

Potential danger hidden behind Vaporizers on Datex-Ohmeda Excel 210 SE

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EDITOR:
We report a problem hidden behind the vaporizers on a Datex-Ohmeda Excel 210 SE (Datex-Ohmeda Limited, Madison, WI, USA) anaesthetic machine that resulted in a vaporizer leak. A 70-yr-old ASA I male required a general anaesthetic for a Thompson's hemiarthroplasty. Before starting the case, the anaesthetic machines were checked and no faults were identified. There were two vaporizers on the Excel 210 SE anaesthetic machine in the operating theatre, an Isotec 4 isoflurane vaporizer (Datex-Ohmeda Limited) and a Datum (Blease Medical Equipment Limited, Buckinghamshire, UK) sevoflurane vaporizer. These were properly seated, locked into position and contained an anaesthetic agent. There was no evidence of a gas leak.

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