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## Work stress in medical anaesthesiology trainees

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### EDITOR:

Recent reports of human errors indicate the importance of assessing work stress and improving the working environment in order to reduce errors. It is natural to assume that medical trainees have a large burden of stress during their training period. It has recently been reported that the concentration of salivary amylase may reflect the degree of working stress [1], and a kit that enables simple measurement of amylase concentration has been developed [2]. We therefore tried to measure salivary amylase concentrations in medical trainees of the Department of Anaesthesiology in order to determine stress factors.

Twelve medical trainees who had initially received training in Sapporo Medical University Hospital after graduation from medical school were enrolled in this study. None of the medical trainees had a history of neurological or psychiatric disorders; none of them were taking any medication that affects autonomic nervous and endocrine systems, and none of them had any tendency towards gingival bleeding. Two studies were conducted: Study 1 was carried out to find how individual stress changes within 1 day (07:00, 12:00, 15:00, 19:00), and Study 2 was carried out to determine whether stress reaction differed depending on the type of surgery (abdominal or neck/face surgery at 30 min before the operation, 60 min after the operation and just after the end of operation).

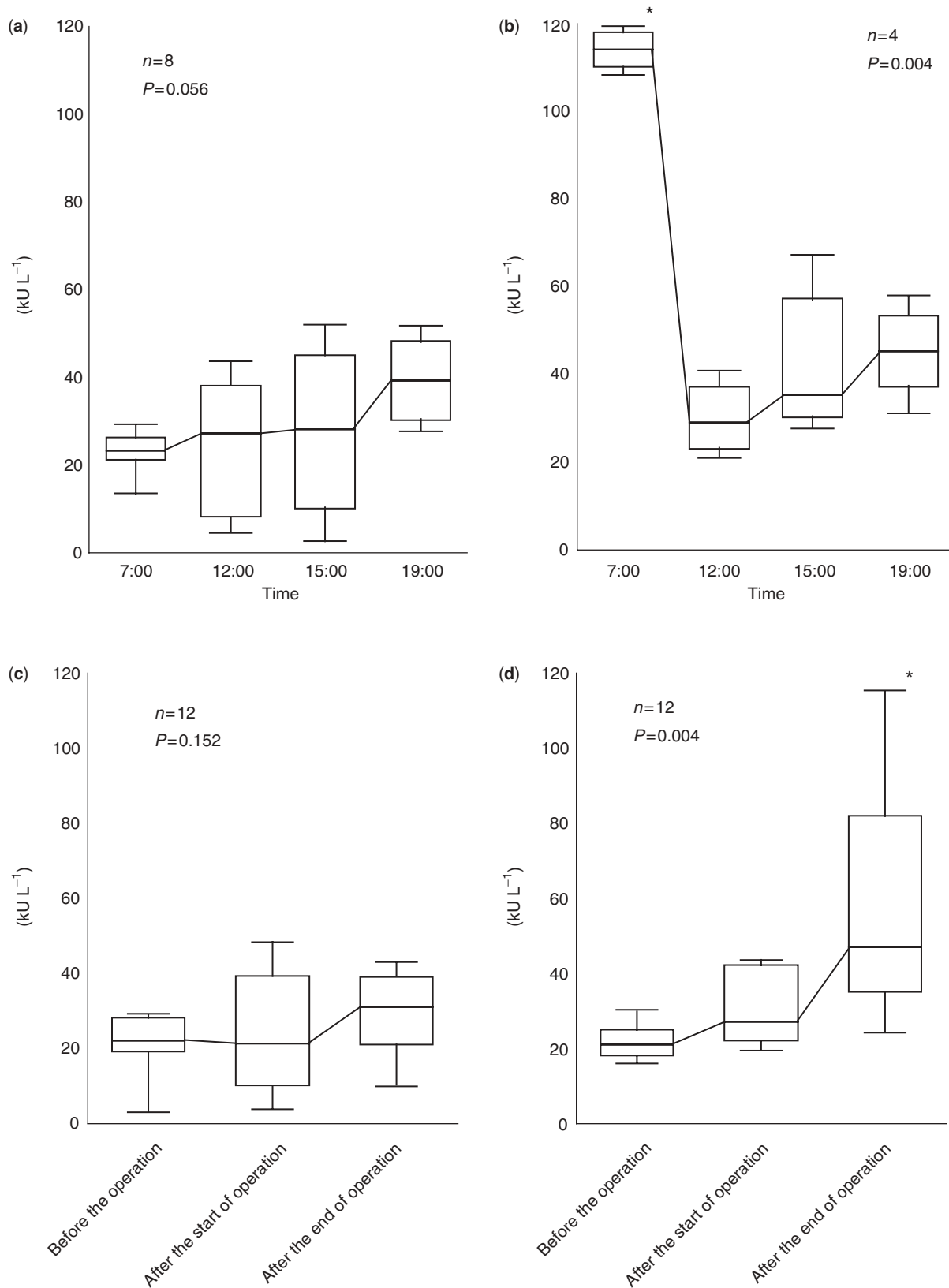
The timing of salivary sampling was blinded and randomized, and the surgical cases of which the medical trainees took charge were also randomized. The concentrations of salivary amylase were measured by the use of a kit for simplified measurement, COCORO Meter™ (Nipro Co., Osaka, Japan) [3]. A disposable probe was inserted into the sublingual region for 20 s, and the concentration of amylase was then measured in the kit, measurement time taking approximately 10 s. This automated system for analysing salivary amylase activity using a dry-chemistry system was made by the fabrication of a disposable teststrip equipped with built-in collecting and reagent papers and an automatic saliva transfer device [3]. Differences in measured concentrations in each group and between groups were compared using the Kruskal–Wallis test with Fisher's *post hoc* test.  $P < 0.05$  was considered significant.

In Study 1, the concentrations of salivary amylase at 07:00 varied: eight medical trainees showed very low concentrations of amylase (less than  $30 \text{ kUL}^{-1}$ ) while four trainees showed concentrations over  $100 \text{ kUL}^{-1}$ . The time course of the amylase activity was therefore divided into two groups depending on the morning concentrations (Fig. 1). The amylase concentrations in the trainees who showed low concentrations in the morning tended to increase during the day, but there was no statistical significance (Fig. 1a,  $n = 8$ ;  $P = 0.056$ ). The amylase concentrations in the trainees who showed high concentrations (over  $100 \text{ kUL}^{-1}$ ) in the morning significantly decreased at 12:00 (Fig. 1b,  $n = 4$ ;  $P = 0.038$ ), but there was no change in the amylase concentrations after that time. There were no significant differences in the amylase concentrations between these groups after 12:00. Interestingly, all of the trainees who showed amylase concentrations

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**Figure 1.**

Time courses of changes in amylase concentrations in medical trainees. (a) Those trainees who showed low concentrations (less than 30 kU L<sup>-1</sup>) of amylase in the morning. (b) Those trainees who showed high concentrations (over 100 kU L<sup>-1</sup>) of amylase in the morning. (c) Changes in amylase concentrations during abdominal surgery. (d) Changes in amylase concentrations during head and neck surgery. Data are median (thick line)  $\pm$  25/75th percentile (boxes)  $\pm$  10/90th percentile (bars). \*P < 0.05 vs. amylase values at all other different sampling times.

over  $100 \text{ kUL}^{-1}$  in the morning regarded themselves as being 'night persons'. Anaesthesiology is a stressful occupation due to long working hours, fatigue, demanding interpersonal relations, the need for sustained vigilance, unpredictability of work, fear of litigation, competence pressure and production pressure [4]. Chronic exposure to these factors can lead to stress disorders (burnout, drug addiction and suicide) and/or human error. Furthermore, it is natural to assume that medical trainees have a large burden of stress during their training period. We found in this pilot study that the medical trainees did not have much working hours-dependent stress. Rather, it was found that amylase concentration in the morning differed greatly depending on the lifestyle.

For Study 2, all of the trainees engaged in two kinds of surgery (neck/face and abdominal surgery) during the study period. The type of surgery was randomized, and the durations of surgery were similar ( $4.2 \pm 1.2 \text{ h}$  for neck/face surgery and  $3.8 \pm 1.4 \text{ h}$  for abdominal surgery;  $P = 0.309$ ). Although amylase concentrations did not change in trainees engaged in abdominal surgery ( $P = 0.152$ ), those in trainees engaged in neck/face surgery significantly increased ( $P = 0.004$ ). Interviews with the trainees after the study revealed that they felt severe stress when they had to move away from where they could immediately manage the airway.

Although it is still not clear whether measurement of salivary amylase accurately reflects the degree of stress felt by medical staff in the operating room, it is interesting that no relationship was found between work stress of medical trainees and daily work or duration of surgery. It is also inter-

esting that the medical trainees felt stress when they had to move away from the place where they could immediately manage the airway. Further investigation is needed to clarify the relationship between the degree of work stress and medical incidence due to human errors.

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## Opioid-induced hyperalgesia or opioid-withdrawal hyperalgesia?

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### EDITOR:

We read with interest the letter by Dumont and colleagues [1]. They present a case of a 62-yr-old male undergoing revascularization of the right femoral artery who, due to chronic pain from his vascular

disease, received daily fentanyl-patch ( $75 \mu\text{g h}^{-1}$ ), tramadol 150 mg, paracetamol 3 g and amitriptyline 50 mg preoperatively. During anaesthesia, he received in total 6.3 mg remifentanyl over 5 h of surgery followed by 2 g paracetamol and 10 mg piritramide for postoperative analgesia. He complained of intense pain upon arrival in the ICU, and 2 mg of morphine intravenously increased the pain. Another 2 mg of morphine induced a similar result. The pain was managed with ketamine, and the authors concluded that this case was a good example of opioid-induced

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