

No explicit memory after skin incision without anesthetic except for remifentanil infusion

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To the Editor:

Awareness and memory during general anesthesia is a serious problem. We experienced no explicit memory in a patient who was accidentally not administered anesthetic during skin incision before abdominal surgery. During that time, remifentanil alone was infused continuously. A 76-year-old woman, height 156.8 cm, weight 52 kg, was scheduled for peritoneal metastatic tumor resection. She had no complications or past history, except for lower anterior resection of the rectum with laparoscopic surgery 24 months prior. No premedication was administered. Anesthesia was induced with 200 mg thiopental and continuous infusion of remifentanil at the rate of 0.5 $\mu\text{g}/\text{kg}/\text{min}$. She underwent tracheal intubation with the aid of 7 mg of vecuronium. The ventilation was controlled with 35% oxygen in air. After the induction of anesthesia, we planned to provide inhaled 3% sevoflurane during mask ventilation and 1% after tracheal intubation. We used the sevoflurane vaporizer 953 for servo 900C ventilator (MAQUET Critical Care AB, Solna, Sweden). This vaporizer requires activation of another switch in addition to adjusting the concentration dial to initiate sevoflurane inhalation (Fig. 1). We inadvertently forgot to activate the vaporizer switch to the “on” position. Accordingly, no sevoflurane was inhaled. After intubation, we decreased the rate of remifentanil infusion to 0.25 $\mu\text{g}/\text{kg}/\text{min}$ during surgical-site sterilization and draping. Just before skin incision, we increased the rate of remifentanil infusion to 0.5 $\mu\text{g}/\text{kg}/\text{min}$. Twenty-four minutes after the administration

of thiopental, skin incision was performed as usual. There was no apparent change of blood pressure or heart rate. The laparotomy was then continued, and there were no apparent changes in her vital signs. About 6 min after the skin incision, we noticed that the end-tidal concentration of sevoflurane on the monitor (S5, GE Healthcare Japan, Tokyo) was zero, and activated the vaporizer switch. We initially administered 3% sevoflurane, followed by 1–1.5% sevoflurane with 0.1–0.5 $\mu\text{g}/\text{kg}/\text{min}$ of remifentanil. No other sedatives were administered. The operation was completed uneventfully with a total operation time of 1 h 39 min. The emergence from anesthesia was uneventful, with a total duration of anesthesia of 2 h 29 min. We asked the patient about her memories of the operation later on that same day and the next day. She had no explicit memory during the operation and expressed her thanks for a good anesthetic experience. The hypnotic that we administered to this patient was 200 mg of thiopental alone. Clinically, patients awaken from a single dose of thiopental about 5–10 min after administration because the drug levels in the brain decrease as a result of redistribution [1]. Accordingly, about 15 min after the end of the hypnotic action of thiopental, the patient was sedated only with remifentanil of 0.25–0.5 $\mu\text{g}/\text{kg}/\text{min}$. During the procedure, we had closed the eyelids of the patient using a sticking tape. The ears of the patient were free, but the sound in the operating room was minimal. Accordingly, it is possible that the patient was not aware of any stimuli except for the surgical procedure.

Remifentanil has some sedative action and has been used for analgesia-based sedation [2, 3]. No implicit or explicit memory was found when a high concentration of remifentanil combined with low hypnotic concentration of propofol was maintained with high bispectral index (BIS) values [4]. Remifentanil 0.5 $\mu\text{g}/\text{kg}/\text{min}$ might have been

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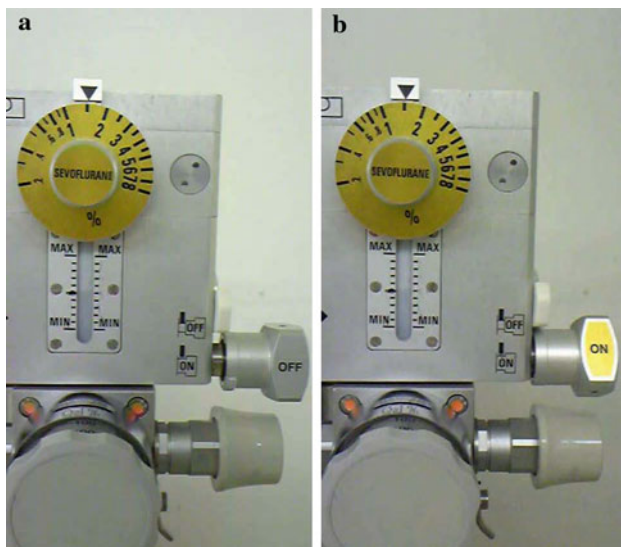


Fig. 1 Photograph of the vaporizers 953 for the servo 900C ventilator showing the dial for controlling the concentration of sevoflurane and the switch for turning on the vaporizer. **a** Inactivated switch. **b** Activated switch

sufficient to suppress the sympathetic response to the surgical stimuli as well as provide deep sedation and induce an unconscious state in this patient. Another possibility is that the cognitive dysfunction caused by surgery and anesthesia [5] might have induced retrograde amnesia. We found no harmful sequelae in this patient up to the time of discharge, although it is likely that this patient had implicit memory during operation. Needless to say, we must avoid errors of

anesthetic administration and cautiously monitor the end-tidal concentration of inhaled anesthetics. After this accident, we reinforced orientation of our anesthesiologists regarding the use of the vaporizer and made it a rule to check and record the end-tidal concentration of inhaled anesthetics at least every 30 min. However, in this case, the potent analgesic action of remifentanyl might have been able to prevent the memory and awareness during surgery for a short period.

References

1. Reves JG, Glass PSA, Lubarsky DA, McEvoy MD, Martinez-Ruiz R. Intravenous anesthetics. In: Miller RD, editor. *Miller's anesthesia*. Philadelphia: Churchill Livingstone; 2010. p. 719–68.
2. Dahaba AA, Grabner T, Rehak PH, List WF, Metzler H. Remifentanyl versus morphine analgesia and sedation for mechanical ventilated critically ill patients: a randomized double blind study. *Anesthesiology*. 2004;101:640–6.
3. Breen D, Karabinis A, Malbrain M, Morais R, Albrecht S, Jarnvig IL, Parkinson P, Kirkham AJ. Decreased duration of mechanical ventilation when comparing analgesia-based sedation using remifentanyl with standard hypnotic-based sedation for up to 10 days in intensive care unit patients. *Critical Care*. 2005;9:R200–10.
4. Lequeux PY, Velghe-Lenelle CE, Cantraine F, Sosnowski M, Barvais L. Absence of implicit and explicit memory during propofol/remifentanyl anaesthesia. *Eur J Anaesthesiol*. 2005;22:333–6.
5. Rasmussen L, Stygall J, Newman SP. Cognitive dysfunction and other long-term complications of surgery and anesthesia. In: Miller RD, editor. *Miller's anesthesia*. Philadelphia: Churchill Livingstone; 2010. p. 2805–19.