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Target-controlled propofol infusion using STELPUMP with epidural analgesia or intravenous fentanyl

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To the editor: Target-controlled infusion (TCI) is a novel technique of administration of intravenous anesthetics to rapidly obtain and thereafter maintain a set target concentration. A commercial device for TCI is not yet available in Japan. However, several freewares for TCI can be obtained via the Internet. Most of these programs are based on a three-compartment model, in which pharmacokinetic parameters are derived from studies in Western people. Due to a possible significant ethnic difference in pharmacokinetics, some may argue that these programs should not be used in Japanese patients until scientifically validated. Plasma drug concentration must be measured to assess the accuracy of a TCI program. However, it is currently impossible to obtain real-time drug concentrations. Furthermore, it should be noted that due to wide interindividual pharmacodynamic variability [1], the absolute value of drug concentration per se does not give us information on the adequacy of anesthesia.

We describe our experience with TCI of propofol using STELPUMP (available at http://pkpd.icon.palo-alto.med.va.gov/) in Japanese patients. Thirty-nine patients aged 18–89 years, weighing 36–75 kg, undergoing elective general surgical or orthopedic procedures received TCI of propofol. A Graseby 3500 Anaesthesia Pump (Graseby Medical, Watford, UK) connected to a PC via RS232C serial interface was used to infuse propofol. Sixteen patients having laparotomy received epidural anesthesia with bupivacaine. In the remaining 23 patients, most of whom were undergoing major spinal surgery, fentanyl was manually infused intravenously to obtain sufficient analgesia (total intravenous anesthesia; TIVA). The trachea was intubated in all patients and the lungs were ventilated with oxygen/air (FiO_2 0.4) to maintain normocapnea. The target effect-site concentration (C_T) of propofol for induction was set between 2.5 and 5.0 $\mu g \cdot ml^{-1}$ [2]. Intraoperatively, C_T was adjusted between 2.0 and 6.0 $\mu g \cdot ml^{-1}$ to maintain systemic arterial pressure and heart rate within ±20% of baseline values.

Except for an 89-year-old man, who was induced with a C_T of 2.5 $\mu g \cdot ml^{-1}$, all patients were induced within 3 min with a set C_T of 3.0–5.0 $\mu g \cdot ml^{-1}$. The patient characteristics and data of TCI are summarized in Table 1. In the propofol/epidural group, the mean C_T during maintenance was 2.8 $\mu g \cdot ml^{-1}$. In the TIVA group, the mean C_T during maintenance was 3.8 $\mu g \cdot ml^{-1}$. The mean infusion rate of fentanyl was 2.4 (SD, 0.8; range, 1.5–3.6) $\mu g \cdot kg^{-1} \cdot h^{-1}$.

The trachea was extubated when the spontaneous respiratory rate exceeded 10 breaths·min^{-1}, tidal volume exceeded 6 $ml \cdot kg^{-1}$, and the patients opened their eyes to simple verbal commands. The mean effect-site concentrations at extubation in the epidural and TIVA groups were 1.56 and 1.97 $\mu g \cdot ml^{-1}$, respectively. No patients required naloxone to restore adequate spontaneous ventilation. None of them had intraoperative recall. In these patients, no specific central nervous system monitoring was used. Monitoring of the bispectral index, in addition to standard clinical monitoring, might have improved titration of TCI [3].

We have found that TCI using STELPUMP is an easy, practical method of administration of propofol. However, we emphasize that close observation of the routinely monitored vital signs is crucial to titrate a set target concentration. Fur-

Table 1. Patient characteristics

Characteristic	Propofol/epidural (n = 16)	TIVA (n = 23)
Age–yr	69.1 (12.0) [42–89]	47.4 (16.3) [18–72]
Sex–F/M	5/11	10/13
Weight–kg	53.2 (7.9) [36–65]	59.1 (9.1) [45–75]
Duration of infusion–min	193 (73) [50–350]	138 (60) [32–214]
Mean infusion rate–mg·kg^{-1}·h^{-1}	5.4 (0.9) [4.0–6.7]	8.5 (1.6) [6.1–12.1]
From end of TCI to end of surgery–min	7.4 (4.1) [0–14]	7.0 (5.4) [0–18]
From end of TCI to extubation–min	9.2 (3.6) [4–16]	13.5 (5.4) [4–26]

TCI, Target-controlled infusion; TIVA, total intravenous anesthesia. Data are mean (SD) [range].

ther study assessing the accuracy of this program in Japanese patients is warranted.

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