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Two minutes of sevoflurane does not improve intubating conditions under vecuronium priming

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Introduction

Sevoflurane has a low blood/gas partition coefficient which shortens anesthesia induction and recovery times because of its rapid uptake and elimination [1,2]. Sevoflurane also exerts a strong potentiating effect on neuromuscular block by vecuronium, in approximate proportion to its inhaled concentration [3]. However, there are no published evaluations of intubating conditions after priming with vecuronium under sevoflurane anesthesia. The present study examined whether sevoflurane administration for 2 min prior to intubation facilitates intubating conditions with vecuronium priming, as reported by Taboada et al. [4].

Materials and methods

One hundred ASA I or II patients scheduled for elective otorhinolaryngological surgery were included in this study. The nature of this study was explained, and informed consent was obtained from each patient. All patients were free from neuromuscular diseases and had not received any medication known to alter neuromuscular transmission. Atropine sulfate 0.5 mg and midazolam 2.5–5.0 mg were intramuscularly administered 60 min before surgery. An electrocardiogram and blood pressure were taken continuously. The mean blood pressure (MBP) and heart rate (HR) were measured every minute during the study. Lactated Ringer's solution was infused via an 18-gauge intravenous cannula inserted into the cephalic vein. The inspired O_2 and end-tidal CO_2, N_2O, and sevoflurane concentrations were measured continuously with an anesthetic gas monitor (Ohmeda RGM 5250, Madison, WI, USA). The priming dose of 0.01 mg·kg^{-1} of vecuronium was injected intravenously before injection of thiamylal. At 3 min 30 s, 4–6 mg·kg^{-1} of thiamylal was administered intravenously. At 4 min, 0.1 mg·kg^{-1} of vecuronium was administered as an intubation dose. After injection of the intubation dose, 6 l·min^{-1} of oxygen was given to group I ($n = 50$), and 4 l·min^{-1} of nitrous oxide, 2 l·min^{-1} of oxygen and 4% of sevoflurane were given to group II ($n = 50$) under a mask. At 6 min, laryngoscopy and endotracheal intubation were performed. An additional dose of thiamylal was administered if needed.

Intubating conditions were evaluated by a modification of the method of Lund et al., which reflects the difficulty of intubation [5] (Table 1). The scores of the following three factors were summed for a final score: degree of mouth opening; visibility of vocal cord; and body movement. Each factor was divided into three grades; the total scores of 0–1, 2–3, and 4–6 corresponded to excellent, good, and fair, respectively. Ideal conditions were defined as a minimum response to intubation and were given a score of 1 or less on our scale.

The data, expressed as the mean ± SD, were analyzed for statistical significance using Wilcoxon's test. P values of less than 0.01 were regarded as statistically significant.

Results

There were no statistically significant differences between group I and group II in terms of patient background characteristics. The age distributions were 51 ± 15 and 48 ± 16 years, height 156 ± 9 and 155 ±

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Table 1. Intubating scoring system

Component		Score
Degree of mouth opening	more than 3.5 cm	0
	2.5–3.5 cm	1
	less than 2.5 cm	2
Visibility of vocal cord	whole	0
	part	1
	none	2
Body movement	none	0
	bucking	1
	gross movement	2

Table 2. Intubating conditions

Score	Group I	Group II
Excellent (0–1)	37	38
Good (2–3)	11	8
Fair (4–6)	2	4
Total	50	50 (cases)

Table 3. Details of intubation score

	Group I (n = 50)	Group II (n = 50)
Narrow mouth opening	11	11
Poor visibility of vocal cord	16	13
Body movement	19	20 (cases)

8 cm, and weight 57 ± 9 and 55 ± 11 kg in group I and group II, respectively. We achieved excellent intubating conditions in 37 group I cases and 38 group II cases (Table 2); the intubation score was 1.0 ± 1.2 and 1.1 ± 1.2 in the two groups, respectively. As the components of the intubation score, either coughing or body movement occurred in 19 group I cases and 20 group II cases (Table 3). Additional thiamylal was given prior to intubation in 29 group I cases and 23 group II cases; the additional dose was 2.6 ± 1.2 mg·kg^{-1} and 2.1 ± 0.9 mg·kg^{-1} in each group, respectively. In group II, the end-tidal sevoflurane concentration prior to intubation was 1.9% ± 0.3%.

There were no statistically significant differences between group I and group II in the increases of MBP and HR during intubation (Table 4). MBP and HR after intubation increased compared with the preinduction value in both groups ($P < 0.01$).

Discussion

Intubating conditions depend on the depth of anesthesia and the degree of muscle relaxation. Thiamylal anesthesia under vecuronium priming does not provide sufficient depth of anesthesia for endotracheal intubation; symptoms of insufficient anesthesia are coughing and body movement during and immediately after intubation [6]. It is recommended to temporarily increase anesthesia by priming in patients who are physically fit [7]. In this study, we added 2-min administration of sevoflurane to the usual course of vecuronium and thiamylal. Sevoflurane was chosen because that drug takes effect quickly and augments the neuromuscular blocking effect by vecuronium.

In this study, although end-tidal sevoflurane concentration reached 1.9% after 2 min of administration, intubating conditions did not improve. We performed an additional examination for temporal change of end-tidal sevoflurane concentration in ten ASA I patients who had been administrated 4 l·min^{-1} of nitrous oxide, 2 l·min^{-1} of oxygen, and 4% sevoflurane under a mask. It took over 9 min for the end-tidal sevoflurane concentration to attain a constant value; a constant condition indicates equilibration of anesthetic partition pressure in the brain. Therefore, 2 min of sevoflurane prior to intubation did not establish sufficient depth of anesthesia. There was no significant decrease in blood pressure during the first 2 min of induction of sevoflurane anesthesia.

In conclusion, we achieved good intubating conditions using vecuronium priming with and without sevoflurane anesthesia. Two minutes of sevoflurane prior to intubation under vecuronium priming did not improve the intubating conditions. Also, it appears to take more than 9 min for the end-tidal sevoflurane concentration to reach a constant value.

Table 4. Change in mean blood pressure (MBP) and heart rate (HR)

	Group I (n = 50)		Group II (n = 50)	
	Preinduction	After intubation	Preinduction	After intubation
MBP (mmHg)	89 ± 16	104 ± 24*	96 ± 20	104± 25*
HR (bpm)	80 ± 16	97 ± 14*	78 ± 22	95 ± 18*

Values are expressed as mean ± SD.
*$P < 0.01$ compared with preinduction value.

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