

The Minimum Alveolar Concentration of Sevoflurane in Cats

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Eight adult cats of either sex were studied. The minimal alveolar concentration (MAC) for sevoflurane in the cats was found to be $2.58 \pm 0.30\%$ (mean \pm SD). The ratios of MAC values between sevoflurane and halothane, enflurane and isoflurane in cats were very similar to those ratios found in humans and dogs. This observation suggests that the results of this study are correct and allows us to estimate unknown MAC values for sevoflurane in other species using known MAC values for other anesthetic agents. (Key words: sevoflurane, minimum alveolar concentration, cat)

(Doi M, Yunoki H, Ikeda K: The minimum alveolar concentration of sevoflurane in cats. *J Anesth* 2: 113-114, 1988)

Minimum alveolar concentration (MAC) is essential to comparing pharmacological effects of a inhalational anesthetic agent with others. For sevoflurane, a new halogenated ether anesthetic agent, MAC values have been studied in humans¹ and dogs². Though cats are most suitable for studies for central nervous system, the MAC value for sevoflurane in cats has not been known. We therefore determined MAC for sevoflurane in cats.

Eight adult cats (two female, six male), with a mean weight of 3.38 ± 0.81 kg (SD) were studied. All animals were allowed ad libitum access to food and water until the time of study. Induction of anesthesia was accomplished in a box, using sevoflurane in balanced oxygen. The trachea was intubated with a cuffed endotracheal tube without the use of muscle relaxants or other agents. The animals were ventilated mechanically (tidal volume, 20 ml/kg; respiratory rate, 15 breaths/min), and carbon dioxide was added to the inspired gas mixture

to maintain arterial carbon dioxide tension between 30 and 40 mmHg. Esophageal temperature was maintained at $38 \pm 1^\circ\text{C}$ using infrared heat lamps. The sample for end-tidal sevoflurane concentration analysis was drawn from the tip of the endotracheal tube via a polyethylene catheter, and was measured using a gas chromatograph (GC-9A, Shimadzu CO., LTD.).

The technique for the ensuing MAC determination was similar to that described by Eger et al³. Each animal was maintained initially for 15 min at an end-tidal sevoflurane concentration of $2.70 \pm 0.05\%$. A 10 inch hemostat then was applied (first ratchet) to the cat's shaved tail for 60 seconds. Any purposeful movement constituted a positive response. Stiffening, shivering, swallowing, or changes in respiratory pattern were disregarded. The end-tidal sevoflurane concentration was then adjusted by $0.30 \pm 0.05\%$ (upward after a positive response, downward after a negative) and maintained for 15 min at the new end-tidal concentration before repeat application of the hemostat. When the no-response concentration had been bracketed in this fashion, an intermediate end-tidal level (i.e. 0.15% adjustment) was achieved and a final clamping was performed. MAC for each

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Table 1. MAC values (\pm SD) for human, cat and dog

	Sevoflurane	Halothane	Enflurane	Isoflurane	Sevoflurane	Sevoflurane	Sevoflurane
					Halothane	Enflurane	Isoflurane
Human	1.71a	0.77b	1.68c	1.15d	2.22	1.02	1.49
Cat	2.58 \pm 0.30	1.19 \pm 0.15e	2.37 \pm 0.16e	1.61 \pm 0.10e	2.19	1.09	1.60
Dog	2.36 \pm 0.46f	0.87 \pm 0.04g	2.06 \pm 0.13h	1.28 \pm 0.25i	2.71	1.14	1.84

The value for sevoflurane in cat is from this study.

References: a=1), b=5), c=6), d=7), e=8), f=2), g=9), h=10), i=11)

animal was defined as the average of the highest end-tidal concentration at which a positive response occurred and the lowest concentration at which a negative response was observed. The MAC value thus obtained allowed a maximum error of \pm 0.08%. MAC for the cats was calculated as the mean of the eight individual values thus obtained.

MAC value in cats was found to be 2.58 \pm 0.30% (mean \pm SD). The range of the values was between 2.07 and 2.86.

The ratio of MAC values for any pairing of halothane, enflurane and isoflurane is constant in human, cat, dog and other four species⁴. The MAC values for sevoflurane in cats from this study and in humans¹ and dogs² from the studies in our department are shown in table 1 with available MAC values for halothane, enflurane and isoflurane in humans, cats and dogs⁵⁻¹¹. It is apparent for the three species that the within-species ratios of MAC values between sevoflurane and other three anesthetic agents are also very similar (table 1). This observation suggests that the results of this study are correct and allows us to estimate unknown MAC values for sevoflurane in other species using known MAC values for other anesthetic agents.

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