Title: MAC-awake of Sevoflurane in Children

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ABSTRACT BODY:

Introduction: Several studies have indicated that children have a higher incidence of awareness compared to adults. A possible explanation for this could be differences in the relative potencies of anaesthetic agents in children. While the minimum alveolar concentration (MAC) of agents usually decreases with increasing age, the MAC of sevoflurane remains constant at about 2.4% over the age range from 2-12 years of age (1). However at one MAC the effect of sevoflurane on the EEG does change within this age range (2). MAC-awake is the concentration of volatile anaesthesia where half the population awakens from anaesthesia. For prevention of awareness MAC-awake is the most relevant measure of anaesthesia potency. In adults MAC-awake for the isoflurane and sevoflurane is roughly one third of MAC. In a sample of children aged 2-12 years MAC-awake for sevoflurane has been reported as 0.78% (3,4) (also about one third of MAC) but there are no reports of how MAC-awake changes within that age range. If MAC-awake is higher in younger children compared to MAC then the margin between movement and awakening is less and this could explain the increased incidence of awareness in this age group. The aim of this study was to determine if MAC-awake of sevoflurane changes with age within the age range of 2-12 years.

Methods: After institutional ethics approval and informed parental consent 60 children were enrolled in this study; 20 in each of three age groups (2 to <5, 5 to <8 and 8 to <13 years). Children were excluded if they had opioids, sedative premedication, regional nerve blockade or a procedure likely to cause any residual discomfort. All children had sevoflurane anaesthesia. At the end of the procedure the sevoflurane was decreased to the target concentration. Once the target end tidal concentration was achieved it was maintained for 10 minutes before a standard auditory stimulus was applied and an observer (blinded to the target concentration) determined if the child was awake. The Dixon up-down method was used to determine MAC-awake starting at 1.2% with 0.2% incremental steps up or down.

Results: This study demonstrated that MAC-awake was highest in the youngest group but did not change between the two older groups. Using Lerman's data for the MAC, MAC-awake was less than one third MAC.

Age Group	MAC-awake (95% CI)	Ratio MAC-awake/MAC
2-<5	0.66 (0.53-0.79)	0.3
5-<8	0.45 (0.31-0.59)	0.2
8-12	0.43 (0.27-0.59)	0.2

Discussion: Consistent with EEG data, MAC-awake was higher in the youngest age group. However, in the age groups where awareness has been reported (5-12years) MAC-awake was lower than reported in previous studies and did not change with age. Therefore it seems unlikely that age specific changes to MAC-awake with respect to MAC are a cause for awareness in children. The overall values are lower than previously reported. This may be due to subtle differences between studies in the definition of wakefulness.

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