The Effect of Intravenous S-Ketamine on the Minimum Alveolar Concentration of Sevoflurane

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Background

S-Ketamine is commonly used to reduce opioid consumption during general anaesthesia. Ketamine also reduces the minimum alveolar concentration (MAC) of volatile anaesthetics in animals. However, it is not yet determined if this is also the case in humans. Alterations of MAC are of major importance and must be considered by clinicians providing inhalational anaesthesia. Therefore, we investigated the effect of different doses of S-ketamine on the MAC of sevoflurane.

Methods

We included 30 adult ASA 1-3 patients aged 30-65 years who received general anaesthesia for elective surgery with a skin incision of at least 3 cm at the trunk. Anaesthesia was induced using multiple deep breath inhalational technique with 8% sevoflurane in oxygen. We inserted a laryngeal mask airway, decreased the sevoflurane concentration to a predefined level and held it constant for at least 15 minutes. At the same time, we administered a bolus dose of either S-ketamine $1 \text{ mg} \cdot \text{kg}^{-1}$ (high dose ketamine group) or S-ketamine $0.5 \text{ mg} \cdot \text{kg}^{-1}$ (low dose ketamine group) or placebo (0.9% saline, placebo group), followed by a continuous infusion of the same amount per hour.

An independent examiner observed patient's reaction to skin incision (movement vs. no-movement) and we calculated the MAC of sevoflurane in each group using a modified Up and Down titration method. In addition, we recorded the occurrence of adverse events such as hallucinations or signs of intraoperative awareness postoperatively in the recovery area.

Results

Based on our preliminary results, high and low dose S-ketamine reduces the MAC of sevoflurane significantly compared to placebo ($P < 0.01$). The MAC in the high dose ketamine group was $0.55 \pm 0.1 \%$ sevoflurane (95% CI 0.4-0.7 %), in the low dose ketamine group the MAC was $0.95 \pm 0.1 \%$ sevoflurane (95% CI 0.8-1.1 %) and in the placebo group it was $2.1 \pm 0.13 \%$ sevoflurane (95% CI 2.0-2.2 %). No adverse events were recorded.

Conclusion

Our study demonstrates that S-ketamine, given in clinically used doses, decreases the MAC of sevoflurane without an increase in adverse events.