

ORIGINAL ARTICLE

Comparison of 4.5% Versus 8% Sevoflurane for Inhalational Induction in Adults

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ABSTRACT

Background: Inhalational induction is a frequently used anesthetic technique in pediatric patients. However, it is less frequently used in adult patients undergoing surgery. General anesthesia can be induced either by intravenous injection or inhalation of anesthetic drugs. There are no established guidelines about the usage of 4.5% vs 8% sevoflurane for inhalation induction in adults undergoing elective day care surgery.

Aim: To compare mean time to loss of eyelash reflex using 4.5% vs 8% sevoflurane for inhalational induction in adult patients undergoing elective day care surgery.

Methodology: This randomized controlled trial was conducted in the department of anesthesia, Mayo Hospital Lahore over a period of six months from June 2018 to December 2018. A total of 60 patients were enrolled in the study. We included adult patients aged 18-60 years of either gender and ASA status I & II undergoing elective day care surgery. While, patients having history of adverse reaction to inhalational agents and those who were on chronic sedatives, antipsychotic treatment were excluded. Demographic data of age and gender were obtained along with their body weight, height and BMI. They were randomly divided into two study groups using lottery method. After routine pre-op check and attaching standard anesthesia monitoring, patients in group-A and group-B were given 4.5% sevoflurane & 8% sevoflurane respectively at a fresh gas flow of 8 L/min of oxygen and they were instructed to take deep breaths while inhaling gas with help of face mask.

Results: The mean age in 4.5% sevoflurane group was 42.27±11.83 years while in 8% sevoflurane group it was 45.43±12.76 years. In 4.5% sevoflurane group there were 12(40%) male and 18(60%) female cases while in 8% sevoflurane group there were 11(36.67%) male and 19(63.33%) female cases. The mean time to loss of eyelash reflex in 4.5% sevoflurane group was 88.57±6.71 seconds and in 8% sevoflurane group the mean time to loss eyelashes reflex was 67.87±5.90 seconds. The mean time to loss eyelashes reflex was statistically less in 8% sevoflurane group, with p-value 0.001.

Conclusion: We concluded that mean time to loss eyelashes reflex was considerably lesser with 8% sevoflurane when compared with 4.5% sevoflurane for inhalational induction in adult patients for elective day care surgery.

Keywords: Inhalational induction, sevoflurane, eyelash reflex, day care surgery.

INTRODUCTION

Safe delivery of general anesthesia is one of the hall mark of standard anesthetic practice. This requires induction of anesthesia, maintenance and recovery from anesthesia. Various anesthetic medications as well as techniques are in practice¹. Rapidly acting medications and with safe hemodynamic profile are definitely desirable for safe delivery of general anesthesia².

Various techniques include intravenous induction and inhalational induction. Regarding inhalational inductions, there are multiple drugs including halothane and sevoflurane³. However, certain properties are required to be one the ideal inhalational agent. That include, safe onset of anesthetic induction, non-pungent, low blood gas coefficient and poor solubility along with rapid recovery profile with no or minimal post anesthetic sedative effects during early post-op period⁴. That makes this kind of drug ideal for ambulatory anesthesia. Sevoflurane possess much of these properties and has been in practice for inhalational induction in pediatric patients as well as for maintenance during general anesthesia⁵. However, it has been less frequently used for inhalational induction in adult patients. Although propofol is very commonly used for ambulatory anesthesia and its recovery profile is quite comparable with sevoflurane regarding recovery from anesthesia⁶. There are no established guidelines about the usage of 4.5% versus 8% sevoflurane for inhalation induction in adult patients. Therefore, this study was designed to determine meantime to induction of anesthesia (measured by mean time to loss of eyelash reflex) in adult patients for day care surgery.

The objective of the study was to compare mean time to loss of eyelash reflex using 4.5% versus 8% sevoflurane for inhalation induction in adult patients undergoing elective day care surgery.

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METHODOLOGY

This randomized controlled trial was conducted in the department of anesthesia, Mayo Hospital Lahore over a period of six months from June 2018 to December 2018. After approval from hospital ethical committee and informed written consent, a total of 60 patients were enrolled in the study. Non-probability, consecutive sampling technique was used with 80% power of study, 95% confidence level and 5% margin of error.

We included adult patients aged 18-60 years of either gender and ASA status I & II undergoing elective day care surgery (excision of fibroadenoma, lipoma, tonsillectomy, squint surgery) under general anesthesia. While, patients having history of adverse reaction to inhalational agents and those who were on chronic sedatives, antipsychotic treatment were excluded.

Demographic data of age and gender were obtained along with their body weight, height and BMI. They were randomly divided into two study groups using lottery method. After routine pre-op check and standard anesthesia monitoring, patients in group-A and group-B were given 4.5% sevoflurane & 8% sevoflurane respectively at a fresh gas flow of 8 L/min of oxygen and they were instructed to take deep breaths while inhaling gas with help of face mask.

Loss of eyelash reflex was considered as the desired end point for induction in both groups. Time to loss of eyelash reflex was defined subjectively as time in seconds from induction of anesthesia to drop of eyelashes. All cases were conducted by a single anesthesiologist and recorded on predesigned proforma.

Data analysis: Data were entered and analyzed using SPSS version 22. Quantitative data like age, weight, height and BMI and time to loss eyelash reflex were presented as mean±S.D while qualitative data like gender and type of surgery were presented as

frequency and percentages. Independent sample t-test was applied to compare mean time to loss eyelash reflex. P-value ≤ 0.05 was taken as significant. Data were also stratified for age, gender, BMI and ASA status to address effect modifiers.

RESULTS

The mean time to loss of eye lashes reflex in 4.5% sevoflurane group was 88.57 ± 6.71 sec and in 8% Sevoflurane group it was 67.87 ± 5.90 sec. The mean time to loss eye lashes reflex was statistically less in 8% sevoflurane group, p-value < 0.001 (Table 1).

Regarding age, the mean age in 4.5% sevoflurane group was 42.27 ± 11.83 years while in 8% sevoflurane group it was 45.43 ± 12.76 years. Regarding gender, in 4.5% sevoflurane group there were 12(40%) male and 18(60%) female while in 8% sevoflurane group there were 11(36.67%) male and 19(63.33%) female. Considering ASA status, in 4.5% sevoflurane group, 14(46.7%) cases had ASA classification I and 16(53.3%) cases had ASA II while in 8% sevoflurane group, 16(53.3%) cases had ASA I and 14(46.7%) cases had ASA II.

While doing data stratification of age groups and mean time to loss of eyelashes reflex, in 18-39 years age group, the mean time to loss eyelashes reflex in 4.5% sevoflurane group was 87.75 ± 7.57 sec and in 8% sevoflurane group it was 67.11 ± 6.47 sec. In 40-60 years age group, the mean time to loss eyelashes reflex in 4.5% sevoflurane group was 88.86 ± 6.54 sec and in 8% sevoflurane group it was 68.19 ± 5.78 sec. The mean time to loss of eyelashes reflex was less in 8% sevoflurane group regardless of age group, with p-value < 0.001 .

Considering gender in data stratification, in male cases, the mean time to loss of eyelashes reflex in 4.5% sevoflurane group was 89.42 ± 6.50 sec and in 8% sevoflurane group it was 69.36 ± 6.22 sec. In female cases, the mean time to loss eyelashes reflex in 4.5% sevoflurane group was 88 ± 6.98 sec and in 8% sevoflurane group it was 67.00 ± 5.70 sec. The mean time to loss eyelashes reflex was statistically less in 8% sevoflurane group in both male and female cases, p-value < 0.001 .

In data stratification considering BMI, the mean time to loss eyelashes reflex in 4.5% sevoflurane group was 90.38 ± 5.01 sec and in 8% sevoflurane group it was 66.50 ± 6.77 sec. In non-obese cases, the mean time to loss eyelashes reflex in 4.5% sevoflurane group was 87.91 ± 7.22 sec and in 8% sevoflurane group it was 68.21 ± 5.77 sec. The mean time to loss eyelashes reflex was statistically less in 8% sevoflurane group in obese and non-obese cases, p-value < 0.001 .

In cases with ASA I status, the mean time to loss eyelashes reflex in 4.5% sevoflurane group was 92.07 ± 6.37 sec and in 8% sevoflurane group it was 66.75 ± 6.06 sec. In cases with ASA II, the mean time to loss eyelashes reflex in 4.5% sevoflurane group was 85.50 ± 6.91 sec and in 8% sevoflurane group it was 69.14 ± 5.65 sec. The mean time to loss eyelashes reflex was statistically less in 8% sevoflurane group regardless of ASA status, p-value < 0.001 .

Table 1: Comparison of Time to loss eyelashes reflex in both study groups

Study variable	Study groups	Mean time (seconds)	S.D
Time to loss eyelashes reflex	4.5% Sevoflurane	88.57	6.71
	8% Sevoflurane	67.87	5.90
	Total	78.22	12.17

P value 0.001

DISCUSSION

Different anesthetic techniques has been devised for safe delivery of anesthesia including intravenous induction as well as inhalational induction. Inhalational induction with mask is preferred in pediatric patients considering fear of needles and intravenous cannulation before induction of general anesthesia. However, these techniques need to be catered depending upon clinical conditions of the patients. Sevoflurane has been commonly used for inhalational induction considering its rapid onset, low blood gas co-efficient, sweet smell, poor solubility and rapid recovery profile as well. It provides adequate depth of anesthesia and may allow insertion of laryngeal mask airway in selected patients. Inhalational induction can be done with initial high

concentration or gradually escalating from initial low concentration of sevoflurane and this can be done either with full vital capacity breath and normal tidal breathing⁷.

A number of other interventions can be carried out to improve the quality of inhalational induction, including, applying positive end expiratory pressure, adding another other anesthetic gas like nitrous oxide, use of remifentanyl or premedication with clonidine. All these interventions help to increase depth of anesthesia and lessen the onset of sleep time⁸. But we must be careful that fresh gas flow of oxygen is mandatory while doing inhalational induction. High inspired concentration of volatile anesthetic agents has been reported to be having shorted induction time, however, they are also associated with certain complications including bradycardia, breath holding, hypotension, salivation and laryngospasm⁹. Therefore, there is standard protocol of anesthetic monitoring during any kind of conduct of anesthesia.

Various studies are available with different anesthetic techniques and modalities, as for example, a multicenter study compared sevoflurane induction in three groups including conventional stepwise inhalation induction, vital capacity rapid inhalation induction at 4.5% & 8% sevoflurane. The time to loss of eyelash reflex was significantly less in 8% sevoflurane versus 4.5% sevoflurane¹⁰. Similar results were found in our study, the mean time to loss eyelashes reflex in 4.5% sevoflurane group was 88.5 ± 6.71 sec and in 8% sevoflurane group the mean time to loss eyelashes reflex was 67.87 ± 5.90 sec with p-value < 0.001 . Addition of another inhalational anesthetic agent speeds up the time of induction as reported by El-Radaideh KM et al¹¹ who used 8% sevoflurane in 66% nitrous oxide and oxygen at 9 L/min the induction time was 51 ± 4 s. Similar results were reported by Yurino and Kimura¹² who used 7.5% sevoflurane and 66% nitrous oxide in oxygen with induction time of 41 ± 16 s.

CONCLUSION

We concluded that mean time to loss eyelashes reflex was considerably lesser with 8% sevoflurane when compared with 4.5% sevoflurane for inhalational induction in adult patients for elective day care surgery.

Conflict of interest: Nil

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