



COMPARISON OF PROPOFOL AND SEVOFLURANE INDUCTION FOR EASE OF LARYNGEAL MASK AIRWAY INSERTION AND PRESSOR RESPONSE IN SHORT SURGICAL PROCEDURE: AN OBERVATIONAL STUDY

Anaesthesiology

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| Dr. Bhagyashree Kalunke | Junior Resident-3, Department of Anaesthesiology, Government Medical College and Hospital, Miraj |
| Dr. Sunita Shende | Associate Professor, Department of Anaesthesiology, Government Medical College and Hospital, Miraj |
| Dr. Ullhas Sudhakarrrao Misal | Professor & HOD, Department of Anaesthesiology, Government Medical College and Hospital, Miraj |
| Dr. Sarita Thanekar | Assistant Professor, Department of Anaesthesiology, Government Medical College and Hospital, Miraj |

ABSTRACT

Background: Sevoflurane, as compared with propofol, has the advantage of providing better hemodynamic stability and a smoother transition to the maintenance phase without a period of apnea. Hence, the present study was conducted to compare the induction characteristics, ease of LMA insertion, hemodynamic changes, and complications during LMA insertion following induction of anesthesia with inhalation of propofol and induction with sevoflurane. **Material:** The prospective observational study was conducted in the Department of Anaesthesia at Tertiary Care Centre in central India. Total 72 patients in the age between 18 to 60 years, of either sex, ASA grade I and II and who were scheduled for short surgical procedures lasting for 30 min in gynecology and orthopedic surgery were enrolled in the study. **Results:** Both the groups were comparable and found no significant difference in terms of demographic data of patients including age, sex, weight, and BMI with p value of >0.05. There was no significant difference in both the groups in terms of hemodynamic parameters (HR, SBP, DBP and MAP) in preoperative period and during induction. Occurrence of complications likes coughing, biting, jaw relaxation and laryngospasm during induction and LMA insertion were comparable between two groups. There were moderate movements in 2.77% of patients in groups P and 5.55% in group S. **Conclusion:** Induction with Propofol is better than induction with Sevoflurane for insertion of LMA in adults with respect to induction characteristics, ease of LMA insertion with less complications during LMA insertion

KEYWORDS

Hemodynamic changes, laryngeal mask airway, propofol, sevoflurane

INTRODUCTION

The major responsibility of an anaesthesiologist is to provide adequate ventilation for the patient by providing unobstructed airway. An anaesthetic technique is safe only when diligent efforts are devoted to maintaining an intact functional airway. To maintain airway in an anaesthetized or unconscious patient we have supraglottic devices like anatomical face mask, laryngeal mask airway (LMA), cuffed oropharyngeal airway and combitube^[1].

Laryngeal mask airway was conceived and designed by Archie Brain in United Kingdom in 1981^[2]. Following prolonged research, it was released in 1988. It has now got a role in the routine management and has established as an airway device in the elective setting where the procedure does not warrant tracheal intubation. The LMA is an airway device used frequently in Anesthesia and critical care for airway management during surgery^[3]. It is an alternate and appropriate airway device to the facemask when endo tracheal intubation is not mandatory.

However, the LMA is ingenious supraglottic airway device that is designed to provide and maintain a seal around the laryngeal inlet for spontaneous ventilation and allow controlled ventilation at modest levels (<15 cm of H₂O) of positive pressure^[4]. LMA has been used in millions of patients and is accepted as a safe technique, in variety of surgical procedures. It ensures a better control of airway than the facemask, leaving the anesthesiologists hands free and avoids the disadvantages of endotracheal tube-like pressure response during intubation and sore throat, croup, and hoarseness postoperatively. Laryngeal mask also provides an effective and simple solution to many problems of difficult intubation. With the use of LMA, muscle relaxation is unnecessary, laryngoscopy is avoided, and hemodynamic changes are minimized during insertion^[5].

The ideal induction agent for LMA insertion would provide loss of consciousness, jaw relaxation, and absence of upper airway reflexes rapidly without cardiorespiratory compromise. Most currently available induction agents have been used for LMA insertion, but propofol is probably the best intravenous agent and sevoflurane is the best volatile agent^[6]. Successful insertion of LMA requires sufficient depth of anaesthesia and depression of airway reflexes to avoid

gagging, coughing and laryngeal spasm.

Since the introduction of LMA, various induction agents namely thiopentone, propofol, halothane], sevoflurane^[7,8] have been used for induction of anaesthesia for LMA placement. Among which a famous method of anaesthesia for LMA placement is with use of intravenous propofol. Propofol is considered the drug of choice for the insertion of the LMA during induction of anaesthesia because of its quickly and depressant effect on airway reflexes. On the other hand, propofol is not ideal agent; it is associated with many side effects like apnea, pain on injection, hypotension and excitatory patient movement^[9].

In recent times, inhalational induction with sevoflurane using single VCB technique has been used^[10]. It is an alternate method to intravenous induction in adult patients. This method is rapid, with greater acceptancy, slight excitatory phenomena and better hemodynamic profiles. Laryngeal Mask Airway placement is more rapid after VCB induction using 8% of sevoflurane^[11]. This makes the sevoflurane a sole drug for both maintenance & induction of anaesthesia. Sevoflurane is a nonpungent inhaled anesthetic with a low blood gas solubility coefficient (0.69) and minimal respiratory irritant characteristics that make it suitable for inhaled induction of anaesthesia and insertion of the LMA^[12]. Furthermore, sevoflurane, as compared with propofol, has the advantage of providing better hemodynamic stability and a smoother transition to the maintenance phase without a period of apnea. Hence, the present study was conducted to compare the induction characteristics, ease of LMA insertion, hemodynamic changes, and complications during LMA insertion following induction of anaesthesia with inhalation of propofol and induction with sevoflurane.

MATERIAL AND METHODS

The prospective observational study was conducted in the Department of Anaesthesia at Tertiary Care Centre in central India during a period of 18 months from 1st March 2021 to August 2022 to compare the efficacy in terms of induction characteristics, ease of LMA insertion, hemodynamic changes, and complications during LMA insertion following induction of anaesthesia with propofol and induction with sevoflurane. Total 72 patients in the age between 18 to 60 years, of either sex, ASA grade I and II and who were scheduled for short

surgical procedures lasting for 30 min in gynecology and orthopedic surgery were enrolled in the study.

Total 72 patients were randomly divided into two groups of 36 patients in each group i.e., Group P (propofol induction) and Group S (sevoflurane induction). The decision to use either of the study drugs was taken by the senior anaesthetist.

Inclusion Criteria

- All the patients who were scheduled for elective short surgical procedures lasting for 30 min in gynecology and orthopedic surgery.
- Male and female patients
- Age above 18 years and below 60 years
- ASA physical status 1 and 2
- Patients willing to give informed written consent.

Exclusion Criteria

- Patients age <18 years and >60 years.
- Patients with cardiac disease
- Patients with allergic to inhaled anesthetics and propofol.
- Known case of malignant hyperthermia or suspected genetic propensity.
- Smokers (greater than or equal to twenty cigarettes per day).
- Patients who are unconscious or severely ill
- Morbidly obese
- Patients requiring endotracheal intubation.
- Major procedure requiring muscle relaxation.

METHODOLOGY

After obtaining approval from institutional ethics committee, all the patients were fully explained about the study procedure. Then written informed consent was obtained from patients. Patients were routinely taken by senior anaesthetist to OT after starting ringer lactate infusion using 18G I.V cannula. Monitors connect to all patients such as NIBP, ECG, and Pulse Oxymetry and baseline characteristics were recorded. Premedicated with Inj. Glycopyrrolate 0.2mg I.V., Inj. Fentanyl 2microgram per Kilogram, Inj. Ranitidine 50 mg I.V., Inj. Ondansetron 0.1mg/kg. Then preoxygenated for 3 minutes with 100% O2.

Propofol Group

Patients in the propofol group were preoxygenated with 100 percent oxygen for three minutes and anesthetized using propofol 2.5 mg/kg intravenously, given over a period of thirty seconds. 30seconds after the achievement of induction (i.e., sixty seconds after the start of propofol), jaw relaxation was assessed and, if achievable, Laryngeal Mask Airway (LMA) placement was attempted. If not possible, attempts were repeated every thirty seconds up to a maximum 4 attempts, every time preceded by intravenous boluses of propofol about 0.5 milligram per kilogram. At the end of the surgery, the existence of blood on the LMA was noted.

Sevoflurane Group

In group S, patients were asked to take vital capacity breaths with Sevoflurane 8%. Then the patients asked to take a deep breath and then expire to residual volume. The face mask with primed closed circuit was positioned confidently over the face of the patient. The patients were taught to inspire a vital capacity breath and asked to hold it as long as possible. Loss of conscious ness was established by testing the eyelash reflex. Duration of vital capacity breath-hold was noted and 90s after the induction, the jaw relaxation was assessed. Scoring system was used to grade the conditions for the LMA insertion.

If LMA was inserted easily it classified as full (Grade 3); placement was associated with coughing, gagging, or patient movement, it classified as partial (Grade 2); when LMA placement was not possible, it classified as poor/difficult (Grade 1). Three or four sizes of LMA were used according to weight of the patient.

Demographic data, the time taken for LMA insertion, induction characteristics (Loss of verbal contact, Loss of eyelash reflex, Jaw relaxation, LMA insertion), number of attempts for insertion, ease of LMA insertion, hemodynamic variables, and complications during LMA insertion among the groups were recorded and compared between two groups.

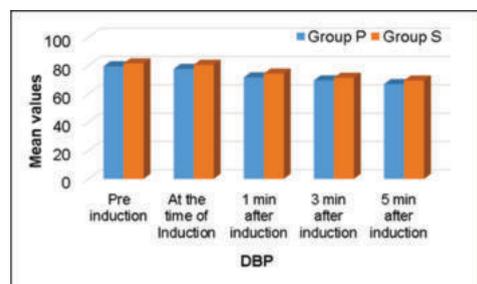
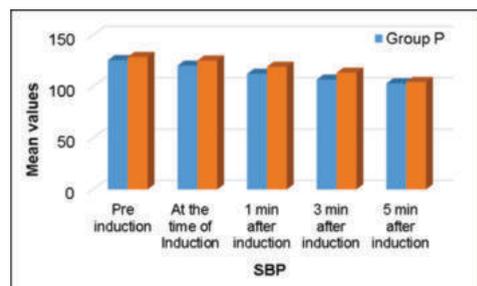
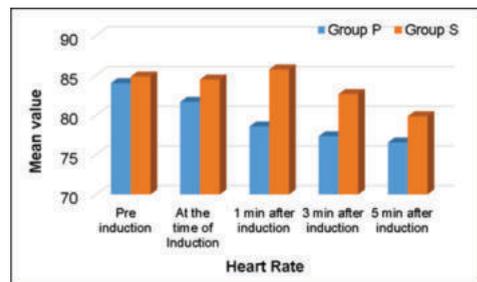
Statistical Analysis

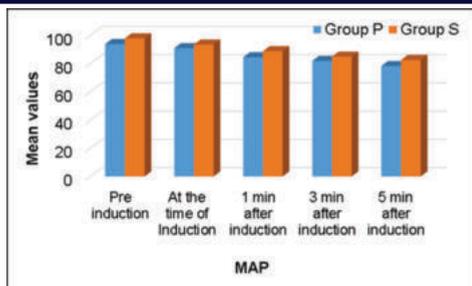
Data was entered in Microsoft office excel and analyzed using SPSS version 21.0 for windows. P values less than 0.05 were considered

statistically significant. Demographic data, the time taken for LMA insertion and hemodynamic variables among the groups were analyzed with unpaired student t test. Chi-square analysis was used for comparing gender and number of attempts for insertion.

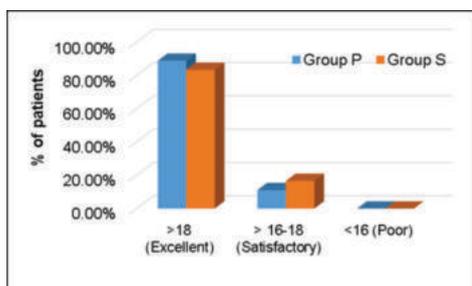
RESULTS

- During the study period, a total 72 patients of either sex, ASA status 1 and 2, age between 18 to 60 years and scheduled for elective short surgical procedures lasting for 30 min in general surgical, gynecological and orthopedic surgery were enrolled in the study. All the patients were randomly divided into two groups of 36 patients in each group i.e., Group P (propofol induction) and Group S (sevoflurane induction). The various data and test results of all these study populations are presented in the form of tables and figures.
- Both the groups were comparable and found no significant difference in terms of demographic data of patients including age, sex, weight, and BMI with p value of >0.05.
- Loss of verbal contact was earlier with propofol (57.41±15.03 sec) as compared to sevoflurane (64.89±9.67 sec) which was statistically significant with p value of 0.032.
- The mean time for loss of eyelash reflex was 73.03 secs in propofol group and 81.22 secs in sevoflurane group which was statistically significant (p=0.0181).
- Jaw relaxation has taken a longer time in sevoflurane group (103.27 ± 12.11 sec) as compared to propofol group (89.25 ± 15.55 sec) with p value of 0.001.
- Sevoflurane took a longer time for LMA insertion (114.66 ± 10.97 sec) as compared to propofol (83.5 ± 14.72 sec). This was statistically significant (P<0.05).
- Thus, sevoflurane has taken longer time for induction and LMA insertion. Verbal contact, eyelash reflex, jaw relaxation and LMA insertion was earlier with propofol and was statistically significant with p value <0.05.
- The ease of insertion or successful LMA insertion was easier in group P but without any statistically significant difference.
- The insertion was more successful by 1st attempt in the propofol group. But this was not statistically significant.
- There was no significant difference in both the groups in terms of hemodynamic parameters (HR, SBP, DBP and MAP) in preoperative period and during induction.





- A fall in the HR, DBP and MAP in group P was noted when compared to group S at one minute which was statistically significant ($p < 0.05$) while there was no statistically significant difference between two groups in terms of HR, DBP and MAP at 3 minutes and 5 minutes after induction.
- Jaw relaxation was present in all the patients (100%) in groups P and in group S it was present in 34 cases. However, the ease of insertion was difficult in three patients in group S.
- Occurrence of complications like coughing, biting, jaw relaxation and laryngospasm during induction and LMA insertion were comparable between two groups. There were moderate movements in 2.77% of patients in groups P and 5.55% in group S.
- The overall insertion was excellent with propofol in 32 (88.88%) patients scoring 18 and 04 (11.11%) had satisfactory condition for LMA insertion. Whereas with sevoflurane, 30 (83.33%) patients had excellent conditions for LMA insertion and 06 (16.66%) had satisfactory condition for LMA insertion when grading was done using 18-point score. There was no statistically significant difference in the overall score for LMA insertion characteristics.



DISCUSSION

LMA was originally discovered by Dr. Brain A.J. It is now very popular in airway management and is used extensively in different types of surgeries. Satisfactory insertion of LMA after induction of anesthesia requires sufficient depth of anesthesia and adequate blunting of airway reflexes^[13]. Insertion of LMA is said to be associated with less hemodynamic changes than endotracheal intubation^[14]. One of the most common intravenous induction agents used for LMA insertion is propofol due to its greater depressant effect on airway reflexes^[15] and excellent jaw relaxation. It is however associated with adverse effects such as pain on injection, hypotension, hypersensitivity, and apnea. Among the inhalational induction agents, sevoflurane is more suitable even in high concentrations because of its low blood gas solubility, due to its pleasant smell, smooth and rapid induction, and minimal respiratory irritant effect. The vital capacity induction technique with sevoflurane was used to make the technique similar to that of intravenous bolus injection of propofol^[15]. This is associated with good hemodynamic stability and high patient acceptance. Administration of fentanyl before LMA insertion gives synergistic effect with propofol and sevoflurane^[16].

Propofol is a known induction agent for insertion of LMA with excellent jaw relaxation and allows easy insertion of LMA. But it is not means ideal as it has been associated with several adverse effects including hypotension, apnoea and pain on injection. Recently single breath vital capacity breath inhaled induction of anesthesia with sevoflurane has been used as an alternative to IV induction in adults. This is associated with high patient acceptance and good hemodynamic stability. So, in present study, we compared the induction and LMA insertion characteristics, hemodynamic response and complications associated with sevoflurane inhaled induction and propofol intravenous induction in adult patients. Patients were randomly divided into two groups of 36 patients in each group i.e., Group P (propofol induction) and Group S (sevoflurane induction).

Patient's response to LMA insertion was noted and graded. Gagging, coughing, biting, laryngospasm, jaw relaxation and ease of LMA insertion were graded. For assessing hemodynamic status – pulse rate, systolic and diastolic blood pressures, mean arterial blood pressures were recorded before induction (baseline), at induction, 1 minute, 2 minute and 5 minutes after LMA insertion.

In a study conducted by Paneerselvam S et al study, there was a statistically significant faster induction with propofol than with sevoflurane. The mean insertion time was significantly lower in group P (60.84±13.74s) than in group S (76.84±13.74s). Adequate jaw opening was present in all the patients (100%) in both the groups. However, the ease of insertion was difficult in two patients in both the group, but the LMA was inserted in the first attempt itself in those two patients in both the groups^[17]. Similar results were observed in present study

In Prabhudev K et al study mean time taken from induction to successful laryngeal mask insertion was significantly shorter with propofol compared with sevoflurane. With sevoflurane group the LMA insertion has taken 122±15.6 seconds while propofol has taken 100.8±14.48 seconds. Jaw relaxation has taken a longer time in sevoflurane group with $p < 0.001$ which was highly significant^[18]. Similar results were observed in present study

Priya et al in their study noted that propofol is known to depress laryngeal reflexes facilitating LMA insertion. They concluded that propofol is better than sevoflurane for LMA insertion using the loss of eyelash reflex as the end point of induction probably due to better jaw relaxation^[19]. Similar results were observed in present study.

In the study done by Prabhudev K et al where the heart rate at baseline and at the time of induction did not show much difference. Heart rate at one minute after induction showed a fall in propofol group which was statistically significant with p value of 0.006. No statistically significant difference was noted at 2 minutes and 5 minutes after induction. There was no statistically significant difference in SBP in preoperative period and during induction between the two groups but was statistically significant fall at one and two minutes. A significant fall in the systolic blood pressure in group P was noted when compared to group S. There was no statistically significant difference between the two groups at 5 minutes. At 5 minutes fall in blood pressure was noted in both group as halothane was added by that time for maintenance of anesthesia. However, there was no statistically significant difference in mean arterial blood pressure in preoperative period and during induction between the two groups but was statistically significant at one minute. There was no statistically significant difference between the two groups at 2 and 5 minutes^[18]. Similar results were observed in present study.

A conducted by Prabhudev K et al inadequate jaw relaxation was found in 2 patients in sevoflurane group. In the same patients ease of LMA insertion was difficult requiring second attempt. The statistical analysis using Chi square test revealed no significant difference between the 2 groups. Gagging, coughing and biting was found in 2 patients in sevoflurane group but was statistically not significant. In the patient in sevoflurane group both coughing and biting was noted. All patients in propofol group had LMA inserted in first attempt. In sevoflurane group 2 patients had LMA inserted in second attempt, probably due to inadequate jaw relaxation. The overall conditions of LMA insertion were graded as excellent in all 25 patients belonging to propofol group. 23 patients in sevoflurane group had excellent conditions with score of 18. 1 patient in sevoflurane group had score of 17 and other score of 16 with LMA insertion grading as satisfactory^[18]. In another similar study conducted by Priya et al, features like coughing, gagging and patient movements could not reach statistical significance. They noted that jaw relaxation with propofol was much better. With sevoflurane they noted that induction took longer time because sevoflurane has less relaxation properties when compared to propofol^[19]. Similar results were observed in present study.

CONCLUSION

In the present study even though sevoflurane is associated with good hemodynamic stability, but quality of anesthesia provided with propofol is superior. Delayed jaw relaxation with sevoflurane as compared to propofol may prolong time required for laryngeal mask airway insertion. None of the patients had trauma during insertion as noticed by absence of blood in LMA after removal in both groups. Occurrence of complications like coughing, biting, jaw relaxation

and laryngospasm during induction and LMA insertion were comparable between two groups. The overall score for LMA insertion characteristics were comparable in propofol and sevoflurane groups.

From the results of present study, it can be concluded that induction with Propofol is better than induction with Sevoflurane for insertion of LMA in adults with respect to induction characteristics, ease of LMA insertion with less complications during LMA insertion.

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