

Comparison of Sevoflurane and Propofol for Laryngeal Mask Airway in Children

Saravanan Ravi^{1,*}, Karthik Krishnamoorthy², Ilango Ganesan³

^{1,2}Assistant professor, Department of Anaesthesiology, SRM Medical College Hospital and Research Centre, SRM University

³Associate professor, Department of Anaesthesiology, ESI Postgraduate Institute of Medical Science And Research, Chennai

***Corresponding Author:**

Email: drcrsaravanan@gmail.com

ABSTRACT

Background: Laryngeal mask airway(LMA) is a supraglottic airway device extensively used in children for day care surgeries. Propofol is the gold standard drug for LMA insertion, but Sevoflurane is a recent volatile agent emerging as an effective alternative.

Objective: The objective of this study is to compare Sevoflurane and Propofol for insertion of Laryngeal mask airway in children.

Methods: We conducted a prospective randomized study involving 60 paediatric patients posted for below umbilicus surgeries aged between 4 and 12 years of ASA physical status 1&2. 30 patients in group S were induced with sevoflurane 7% and 30 patients in group P were induced with propofol 3mg/kg i.v. The time to induction, time to jaw relaxation, time to LMA insertion were recorded. The hemodynamic parameters and any complications associated during the procedure were recorded.

Results: Patients in group S had shorter induction time(39.1±6.30 s Vs 41.4±4.17 s in group P) whereas time to jaw relaxation(107.3±17.51 s in group S Vs 49.4±5.69 s in group P) and time to LMA insertion(117.9±19.2 s in group S Vs 59.3±6.8 s in group P) were shorter in group P. Both the groups were comparable in successful insertion in the first attempt as well as hemodynamic stability.

Conclusion: Propofol and Sevoflurane are equally effective for LMA insertion in children.

Keywords: Propofol, Sevoflurane, Laryngeal mask airway, paediatric LMA, day care surgeries

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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 the airway in an anaesthetized or unconscious patient, we have supraglottic devices like anatomical face mask, laryngeal mask airway, cuffed oropharyngeal airway and combitube.

The LMA is an 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 of positive pressure. In controlled ventilation peak inflation pressure should not exceed 25cm H₂O. An outstanding feature of LMA is that it provides a rapid clear airway in a vast majority of patients and it is both faster and easier to

insert than a tracheal tube. LMA can be used for paediatric and adult patients undergoing daycare surgeries[1]. LMA may be particularly helpful in children in whom unusual anatomy makes tracheal intubation difficult. The LMA provides a useful alternative to tracheal tube when it is necessary to administer anaesthesia to children with an upper respiratory infection. The LMA has been used for children who need anaesthesia outside operation theatres like MRI examinations, extra shock wave lithotripsy.

Successful insertion of LMA requires sufficient depth of anaesthesia and depression of airway reflexes to avoid gagging, coughing and laryngeal spasm. Propofol is the induction agent most commonly used for insertion of LMA for decades because of its effectiveness in depressing airway reflexes. However, it has got side effects like pain on injection, hypotension, bradycardia and apnea. Sevoflurane is a recently introduced volatile anaesthetic agent which has low blood solubility that allows rapid smooth inhalational induction with excellent recovery. Moreover, sevoflurane offers better hemodynamic stability[2,3]. This study was being conducted to compare Sevoflurane and Propofol for insertion of laryngeal mask airway in children. The time taken for induction, time taken for jaw relaxation, time to LMA insertion, hemodynamic

parameters, complications during induction and LMA insertion are compared.

MATERIALS AND METHODS

This study was performed in a tertiary care centre in Chennai. 60 paediatric patients of ASA physical status 1 & 2 undergoing elective minor surgical procedures below umbilicus lasting less than 60 min were included in the study. Patients with recent respiratory tract infection, bronchial asthma, family history of malignant hyperthermia were excluded from the study. Patients belonged to the age group of 4 – 12 years of both sexes. It was a prospective randomised controlled study. The study was approved by the institutional ethical committee and written informed consent from parents obtained.

All patients were fasted as per NPO guidelines. Premedication was done with Syp. Triclofos 60 mg/kg po given 45 min before shifting the child to operating room[4]. Basal heart rate, blood pressure and oxygen saturation were recorded. Intravenous access established. Inj. Glycopyrrolate 10µg/kg and Inj. Fentanyl citrate 2 µg/kg i.v. given on table[5]. Pre-oxygenation with 100% O₂ done for 3 min.

Group P- Propofol group. Patients were induced with Inj. Propofol 3 mg/kg i.v. bolus. Group S- Sevoflurane group. Patients were induced with Sevoflurane 7% inhalation in N₂O/O₂ mixture 2:1. The time to loss of consciousness and eyelash reflex was noted. Mask ventilation was continued until jaw relaxation was attained. After jaw relaxation was attained, LMA insertion done with the standard technique by a single person in both groups. The standard technique involves a completely deflated LMA, held like a pen guided into the pharynx with the index finger of the operator at the junction of the tube and the bowl, with the operator at the head of the patient and the LMA aperture facing caudally. With the head extended and the neck flexed by using the hand under occiput, under direct vision, the tip of the cuff is pressed upwards against the hard palate. The LMA is advanced into the hypopharynx till a resistance is felt. The cuff is then inflated with air according to the specifications of LMA. The size of the LMA selected according to the weight of the patient and cuff volume as per manufacturer's instructions. The sizes used in this study were 2 & 2.5.

The time taken for the loss of eyelash reflex, time to jaw relaxation were noted. The time to LMA insertion and number of attempts required for successful insertion were noted. Heart rate, Blood pressure and Oxygen saturation were recorded after induction and LMA insertion. Any complications during induction or LMA insertion like coughing, gagging, regurgitation, vomiting, patient movements,

laryngospasm, apnea, traumatic insertion or gastric distension were noted.

Time To Induction – time taken from the administration of induction agent to loss of consciousness and loss of eyelash reflex.

Time To Jaw Relaxation – time taken from the administration of induction agent to relaxation of jaw required to open the mouth.

Time To LMA Insertion – time taken from the administration of induction agent to successful insertion of laryngeal mask airway.

Once LMA was inserted, position and adequacy of the seal was checked. Spontaneous ventilation with N₂O/O₂ mixture 2:1 ratio + Sevoflurane 2% with modified Jackson Rees circuit. Regional blocks were given after fixation of LMA. Sevoflurane and N₂O were tapered and discontinued at the end of surgery and LMA removed in an awake state and then shifted to the recovery room.

RESULTS

There were no significant differences between the two groups in demographic data and type of surgeries. The mean age in group S is 7.3 y and in group P is 7.73 y. The mean weight in group S is 20.03 kg and in group P is 19.8 kg. (Table 1)

The time to induction was shorter in GroupS(39.1±6.30 s) compared to GroupP(41.4±4.17 s) with no statistical significance. Patients in GroupP had earlier jaw relaxation (49.4±5.69s) compared to GroupS(107.3±17.51 s) which is statistically significant. Also, the time to LMA insertion was shorter in Group P(59.3±6.8 s) compared to Group S(117.9±19.2 s) which is statistically significant. (Table 2)

The insertion was more successful by the 1st attempt in the propofol group. LMA was successfully inserted at the first attempt in 25 out of 30 cases in groups S. In remaining 5 cases, insertion was successful in the second attempt. Whereas in group S, LMA insertion at first attempt was successful in 29 cases, the remaining 1 in the second attempt. But this is not statistically significant.

There were 4 patients who had movements during induction in the propofol group and 4 patients had transient apnea during induction in the sevoflurane group. There was no incidence of coughing, gagging and laryngospasm in both the groups.

There was a significant difference in pulse rate in both groups. The pulse rates in propofol group decreased from baseline (mean pulse rate baseline-118.4, post induction- 106.8, post insertion-109.8) but within acceptable limits. In Sevoflurane group pulse rate increased from baseline during induction and LMA insertion (baseline mean pulse rate-118.1,

post induction- 120.4, post insertion-120.3) but within acceptable limits.

The decrease in mean arterial pressure (MAP) was observed in both groups and is not statistically significant. The MAP in group P were baseline-80.1 mmHg, postinduction-69.9 mmHg and post insertion-71.8 mmHg. The MAP in group S was baseline-78.6 mmHg, postinduction-69.2 mmHg and postinsertion-70.4 mmHg.

Table 1: Types of Surgeries

SURGERY	GROUP P	GROUP S	TOTAL
Herniotomy	11	14	25
PV sac ligation	8	6	14
Circumcision	9	9	18
Others	2	1	3

Table indicating types of surgeries done in both groups which are comparable.

Table 2: Comparison of time to induction, jaw relaxation and LMA insertion

Parameters	Group S (mean±SD)	Group P (mean±SD)	Student t-test
Time to induction (seconds)	39.1±6.30	41.4±4.17	t-1.71, p-0.09, not significant
Time to jaw relaxation (seconds)	107.3±17.51	49.4±5.69	t-17.23, p-0.0001, significant
Time to LMA insertion (seconds)	117.9±19.2	59.3±6.8	t-15.76, p-0.0001, significant

Table comparing the time parameters between two groups in a sample size of 30 in each group.

DISCUSSION

Laryngeal mask airway insertion requires deep plane of anaesthesia and suppression of respiratory reflexes for which Propofol is the drug that provides ideal conditions. In our study, Sevoflurane is an effective alternative which produces smoother induction and successful LMA insertion, which correlates with most of the corresponding studies.

This study shows that the time to induction is less in sevoflurane group compared to propofol group (Group S- 39.1s vs Group P- 41.1s) which correlates with similar study on comparing propofol and sevoflurane in children by Kalpana et al[2]. In related studies in adults, Divatia et al[6], Siddik et al[7] and Ahmeduddin et al[8] achieved faster induction with propofol.

The time to jaw relaxation is shorter with propofol in this study (Group P- 107.3s vs Group S- 49.4s). This correlates well with the study of Siddik et al[7] who had rapid jaw relaxation with propofol compared to sevoflurane.

In this study, the time to LMA insertion is shorter with propofol (Group P-59.3s vs Group S- 117.9s). This result can be correlated with the studies of Divatia et al[6], Siddik et al[7], Ti et al[9] who had similar results. But this contradicts the study of Lopez Gil et al[3], who achieved faster LMA insertion with sevoflurane compared to propofol. The dosage of sevoflurane and propofol used are identical to this study. The explanation given in their study was that the dose of propofol used would be low. Also Kalpana et al[2] noted less LMA insertion time with sevoflurane than propofol.

The number of attempts required for LMA insertion was not statistically significant between the two groups (p- 0.19). The successful insertion at 1st attempt in group S is 83.3% compared to 96.7% in group P. Fewer attempts were required to insert LMA with propofol compared to sevoflurane was shown by Ti et al[9]. Divatia et al[6] found no difference between sevoflurane and propofol in regard to number of attempts. However successful LMA insertion at 1st attempt is 93% in sevoflurane group compared to 83% in the propofol group, as observed by Kalpana et al[2].

There is no significant difference between both groups in hemodynamic stability as demonstrated similarly by Kalpana et al[2] and Ahmeduddin et al[8]. Mori et al[10] also found an only slight decrease in blood pressure when sevoflurane is used for induction. Lopez Gil et al[3] also found no differences in blood pressure and oxygen saturation among patients in the study comparing sevoflurane and propofol for induction and maintenance of anaesthesia using laryngeal mask airway in children. Kalpana et al[2] noted more fall in MAP 2min post induction with propofol.

Four patients in sevoflurane group had transient apnea during induction. The patients recovered spontaneously on ventilation with bag and mask. Although it is a non-irritant, pleasant smelling volatile anaesthetic agent, children rarely have breath holding like episodes with induction dose. In Mori et al[10] study, the incidence of breathholding and coughing was less with sevoflurane compared to halothane. Ti et al[9] also showed more incidence of apnea with propofol compared to sevoflurane. In this study, apnea is not noted in any cases in the propofol group. The incidence of apnea during induction is 16.7% in propofol group compared to 6.7% in sevoflurane group as demonstrated by Kalpana et al[2], but is statistically insignificant.

Four patients in propofol group had movements during induction, which is common with the agent. This is correlating with the studies done by Ti et al[9] and Borgeat et al[11] who explained that the movements may be partially due to pain during injection of propofol. However, no cases had

movements during induction or LMA insertion in the sevoflurane group.

One patient in propofol group had mild gastric distension while ventilating after LMA insertion. LMA was removed and reinserted and the surgery proceeded after confirming adequate seal, but no regurgitation or vomiting occurred. In both groups, no patient had coughing, gagging, regurgitation, vomiting, laryngospasm or desaturation during induction or LMA insertion.

CONCLUSION

In conclusion, Propofol and Sevoflurane are equally effective for LMA insertion in children. However, Propofol has a faster insertion time due to early onset of jaw relaxation compared to sevoflurane and high success rate in 1st attempt for LMA insertion whereas Sevoflurane has better hemodynamic stability and less side effects compared to propofol.

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