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ORIGINAL RESEARCH

Comparison of Sevoflurane and Propofol for laryngeal mask airway insertion and Press or response in patients undergoing surgery: A Randomized double blinded comparative study

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ABSTRACT

Background: The advent and widespread adoption of the Laryngeal Mask Airway (LMA) represent a significant turning point in the domain of anesthesiology, particularly in the context of airway management during surgical procedures.Propofol is particularly valued for its efficacy and has emerged as the induction agent of choice for LMA insertion.**Objectives:**this study was done with the aim to compare the easiness of Laryngeal Mask Airway insertion using Sevoflurane inhalational technique and Propofol intravenous induction technique in patients undergoing elective minor surgical procedures. **Materials and Methods**: After approval of Ethical committee of our institute, we conducted a prospective study in 80 patients selected for study & randomly divided into two groups. Group-P (N=40) - Propofol 2mg/kg IV.Group-S (N=40) - 8% Sevoflurane.Easiness of LMA insertion,time taken to LMA insertion (s),number of Attempts (n), Successful initial mouth opening were observed. **Results:** The time taken for induction and LMA insertion in Sevoflurane group was significantly longer than Propofol. Propofol provides good mouth opening and easy LMA insertion as compared to Sevoflurane while Sevoflurane provides better haemodynamic profile and less chances of apnea, Gagging, coughing during LMA insertion as compared to Propofol. **Conclusion:** Sevoflurane is associated with good hemodynamic stability, but the quality of anesthesia provided with Propofol is superior. Thus Sevoflurane is an acceptable alternative to a protocol for LMA insertion in adults.

Keywords: Laryngeal Mask Airway, Sevoflurane, Propofol.

INTRODUCTION

The advent and widespread adoption of the Laryngeal Mask Airway (LMA) represent a significant turning point in the domain of anesthesiology, particularly in the context of airway management during surgical procedures.[1] For the LMA to be inserted successfully following anesthesia induction, it is imperative that anesthesia is deep enough to sufficiently suppress the airway reflexes. Inadequate depth of anesthesia elevates the risk of complications, ranging from minor irritations to more severe airway obstructions or aspiration.[2]The LMA has significantly altered the landscape of airway management in anesthesia, offering a safer, less invasive, and efficient alternative to endotracheal intubation. Its adoption reflects broader trends towards improving patient safety, comfort, and outcomes in surgical care.[3]

Propofol is particularly valued for its efficacy and has emerged as the induction agent of choice for LMA insertion.[4] On the other hand, Sevoflurane is notable for its airway-friendly properties, significantly reducing the likelihood of adverse respiratory events such as breath-holding, coughing, or laryngospasm during mask induction. The strategy of rapid LMA insertion following a vital capacity breath induction with Sevoflurane posits a single-agent approach for both the induction and maintenance phases of anesthesia. This approach not only simplifies the anesthetic process but also offers potential cost-saving benefits by minimizing the need for additional pharmacological agents.[5]

Our study is designed to undertake a thorough comparative analysis of various critical aspects related to the induction of anesthesia and subsequent

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Laryngeal Mask Airway (LMA) placement. Specifically, it aims to compare the induction characteristics, the ease of LMA insertion, the hemodynamic responses, and the incidence of complications associated with two primary induction methodologies: the inhalation of Sevoflurane versus the intravenous administration of Propofol.

MATERIALS AND METHODS

Study Design: A prospective, randomized, controlled trial. After approval of Ethical committee of our institute & properly takeninformed written consent, we conducted a prospective study in Jhalawarmedical college & SRG hospital, Jhalawar in which 80 patients selectedforstudy&randomlydividedintotwogroups.

Group-P (N=40) - Propofol 2mg/kg IV.**Group-S (N=40) -** 8% Sevoflurane.

Inclusion Criteria: Elective - minor surgical procedures, Males and females, ASA physical status I-II, Age above 18 years and below 50 years, Patients with valid informed consent.

Exclusion Criteria

1. Patients refusal
2. Patients not satisfying inclusion criteria.
3. Patients with cardiac disease
4. Patients with allergic to inhaled anesthetics and Propofol.
5. Known case of malignant hyperthermia or suspected genetic propensity
6. Smokers (greater than or equal to twenty cigarettes per day).
7. Patients with chronic illness.

PROCEDURE

Patients in both the groups were NBM for 8 hours. In OT, Monitors connected are NIBP, ECG, and Pulse Oxymetry. Premedicatedwith Inj. Glycopyrrolate 0.2mg IV, Inj. Fentanyl 2microgram per Kilogram, Inj. Ranitidine 50 mg IV, Inj. Ondansetron 0.1mg /kg. Then Preoxygenatedfor 3 minutes with 100% O2. The patients were induced either with Propofol or Sevoflurane with breathing circuit.

Propofol group: Patients in the Propofol group were preoxygenated with 100% oxygen for three minutes and anesthetized using Propofol 2 mg/Kg IV, 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 placement was attempted. If not possible, attempts were repeated every thirty seconds upto a max. 4 attempts, every time preceded by intravenousboluses of Propofol about 0.5 milligrams per kilogram.

Once the Laryngeal Mask Airway was inserted, all the patients were given Sevoflurane 4% and 67% N2O in O2 at a rate of three litres/minute of fresh gas flow for three minutes. Then the Sevoflurane concentration was reduced to two percent for volatile agent conservation. NIBP, ECG, SPO2 readings were recorded for five minutes in one minute interval.

Sevoflurane group: The closed circuit was primed with eight percent (8%) Sevoflurane in a 2:1 of N2O to O2 for one minute at a rate of six liters per minute of fresh gas flow.

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. Loss of consciousness 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. 90s was selected because it signifies the time at which all patients finished their Vital capacity breath.If jaw relaxation was not possible, attempts were repeated each thirty seconds upto a max. 4 attempts. An attempt of opening of mouth was considered as an attempt at placement of Laryngeal Mask airway. Any failure of placement, defined as failure to insert the LMA after 4 attempts, they were rescued with suxamethonium twenty five milligrams intravenously. Unless the patient suffered from O2 desaturation, controlled breaths were not given.

Quality of laryngeal mask airway insertion: assessed with

- Easiness of LMA insertion
- Time taken to LMA insertion (s)
- Number of Attempts (n)
- Successful initial mouth opening
- Gagging ,Coughing, Involuntary movement, Apnea, Jaw relaxation

Statistical Analysis: Quantitative data was analyzed using t-test and qualitative by chi square test. Statistical calculations were carried out using Microsoft Office Excel 2010 and Graph Pad Prism 6.05 (quickcale) Software (Graph pad software Inc. La Jalla CA USA).

RESULTS

The demographic profile of the patients comparing age, sex, weight, height and also type of surgeries show no statistically significant difference and were comparable in 2 groups of our study. All base line vital parameters were similar in both groups.

TABLE 1: LMA INSERTION ASSESSMENT

Parameters	Propofol group(n=40)		Sevoflurane group (n=40)		P- value
	Mean	SD	Mean	SD	
Obliteration of eyelash reflex(sec)	45.13	3.44	59.95	5.58	<0.001(S)
LMA Insertion Time (sec)	13.28	4.53	18.33	3.94	<0.001(S)

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	N	%	N	%	
Successful mouth opening					
Yes	**35**	**87.5**	**26**	**65**	**0.036(S)**
No	**5**	**12.5**	**14**	**35**	
LMA Insertion					
Easy	**35**	**87**	**29**	**72.5**	**.162(NS)**
Difficult	**5**	**12.5**	**11**	**27.5**	

Results: Highly significant difference in the time taken for eyelash reflex obliteration between the Propofol andSevoflurane Group was found (p<0.001). the time required for LMA insertion was significantly shorter in the Propofol Group (mean = 13.28 seconds) compared to the Sevoflurane Group (mean = 18.33 seconds), with a highly significant p-value (p < 0.001).Statistically significant (S) difference in the success of initial mouth opening between the Propofol Group and the Sevoflurane Group and the ease of LMA insertion was similar between the two groups in the study.

Table 2: Complications and Adverse Effects

Complications	Propofol Group		Sevoflurane Group		P-value
	No.	%	No.	%	
Complications during Induction					
Hypotension	8	20.00	0	0.00	-
Bradycardia	2	5.00	0	0.00	-
Patients Movement	0	0.00	0	0.00	-
Apnoea	17	42.50	4	12.5	<0.05(S)
Cough	0	0	0	0	-
Hiccups	0	0	0	0	-
Laryngospasm	0	0	0	0	-
Complications during LMA insertion					
Patients Movement	8	20.00	6	15.00	>0.05(NS)
Gagging	6	15.00	5	12.5	>0.05(NS)
Cough	7	17.5	3	7.5	>0.05(NS)
Laryngospasm	0	0	0	0	-

Results: Hypotension occurred in 8 patients during induction in Propofol group managed with fluid and inj mephentermine. Bradycardia was found in 2 patients, managed with inj. Atropine. Apnoea was found in 17 patients in Propofol group and 4 patients in Sevoflurane group. Incidence of patients movement, gagging, coughing was more in Propofol group as compared to Sevoflurane group but statistically not significant.

DISCUSSION

Placement of the LMA under inhalational anesthesia is not performed universally in adult patients. A famous method of anesthesia for Laryngeal Mask airway placement is with use of intravenous Propofol, it has the benefits of inducing anesthesia quickly and depressing reflexes of upper airway. On the other hand, Propofol is not ideal agent; it is associated with many side effects like apnea, pain on injection and hypotension. Recently, single VCB technique induction of inhalational Sevoflurane is used as an alternate method to intravenous induction of Propofol in adult patients. Sevoflurane induction method is quick, with greater acceptance, better hemodynamic profiles and slight excitatory phenomena.

In our study, we observed that both groups were comparable regarding age, sex distribution, height, weight, BMI and ASA grade with statistically insignificant difference (p>0.05).

COMPARISON OF LMA INSERTION CONDITIONS

In our study **-Time taken for induction of anaeasthesia** which was assessed by obliteration of eyelash reflex was 45.13 ± 3.44 seconds in Propofol group as compared to 59.90 ± 5.58 seconds in Sevoflurane group. We observed that Time taken for induction of anaeasthesia was less in Propofol group with statistically highly significance (p<0.001).Results of our study were supported by**Chakraborty N et al (2021)**[6], they observed that Induction time was significantly rapid with IV propofol (51.85±6.66 seconds) than with sevoflurane (68.38±13.93 seconds), with statistically significant difference.(p-value< 0.0001).

In our study we observed that**The time to successful Laryngeal Mask Airway insertion** was prolonged in the Sevoflurane group (18.33 ± 3.94 sec) as compared to Propofol group (13.28 ± 4.53 sec) with statistically highly significant difference (p<0.001).

In our study the **easiness with initial mouth opening**(87.5 % in Propofol, 65 % in Sevoflurane) and **easiness with insertion of LMA** (87.5 % in Propofol, 72.5 % in Sevoflurane) **was** more favorable

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in Propofol group as compared to Sevoflurane group with statistically significant difference ($p<0.05$).

Results of our study were supported by **Ravi S et al (2015)**[7], in their studythe 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 P, LMA insertion at first attempt was successful in 29 cases, the remaining 1 in the second attempt. But this is not statistically significant.

In the study done by **Debbara P et al (2022)**[8]The mean time of intubation, i.e., LMA insertion was much less in the propofol group (20.43±9.460 sec) in comparison with sevoflurane group (34.37 ± 17.338 sec) which was statistically significant, $p = 0.018$. It was easy for insertion of laryngeal mask airway in 32 patients (91%) in the propofol group, compared to the sevoflurane group which was 23 patients (65%).

On analysis of **occurrence apnea during induction** of anaesthesia, in our study, it was found that 42.5 % patients in Propofol group developed apnea whereas only 10 % patients in Sevoflurane group developed apnea and the difference was statistically significant. ($p=0.009$). On analysis of **patient movement during LMA insertion** of anaesthesia, in our study, it was found that 80 % patients in Propofol group and 85 % patients in Sevoflurane group developed patient movement but the difference was not statistically significant.

In our study**, Gagging during LMA insertion** was present in 15% patients of Propofol group as compared to 12.5 % patients of Sevoflurane group. **Coughing during LMA insertion** was present in 17.5% patients of Propofol group as compared to 7.5 % patients of Sevoflurane group. In both situations, the difference was statistically not significant. ($p>0.05$). Similarly patient's movements during LMA insertion were also insignificant in both groups.

The results of our study was supported by the study done by **Ravi S et al (2015)**[7]There were 4 patients out of 30 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.

Haemodynamic parameters: In this study, significant fall in mean systolic blood pressure from the baseline value was seen in both the groups after induction of anesthesia. Comparing both the groups, fall in the mean systolic blood pressure was statistically insignificant. Our study results were supported by **Patel B et al (2016)**[9]**.** They found that changes in heart rate and mean arterial pressure were comparable in both groups without any statistically significant difference. The study done by **Reddy JS et al (2020)**[10] states that MAP is better maintained with Sevoflurane group as compared to Propofol group.

Incidence of patient movement, gagging, coughing was more in Propofol group as compared to Sevoflurane group but statistically not significant. Our study results were supported by the study done by **Harpreet S et al (2022)**[11] where they concluded that The duration of apnea was longer in propofol group (176±1.86 sec) as compared to group sevoflurane(29±1.15 sec), and the incidence of apnea was more frequent in group P(80%) as compared to group S(8%). The overall incidence of complication during insertion of LMA, coughing, gagging was absent in group S and laryngospasm was absent in group P. Movements occur in more in group P patients(18% patients).

CONCLUSION

In our study we concluded that, inhalational induction by vital capacity breath technique using 8%Sevoflurane is an alternate to intravenous induction using Propofol for insertion of Laryngeal Mask Airway in adult patients. In our study even though Sevoflurane is associated with good hemodynamic stability, but the quality of anesthesia provided with Propofol is superior. Thus Sevoflurane is an acceptable alternative to a protocol for LMA insertion in adults.

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