



COMPARISON OF PROPOFOL AND SEVOFLURANE FOR INSERTION OF PLMA

KEYWORDS

Airway management; Proseal laryngeal mask airway;

Dr.D.V.Rama Siva Naik

Dr.Vishala*

Assistant Professor, Dept. of Anaesthesiology, Kurnool Medical College, Kurnool

Associate Professor, Dept. of Anaesthesiology, Kurnool Medical College, Kurnool, *Corresponding Author

ABSTRACT *Background: IV Propofol is widely used for providing anaesthesia for Proseal laryngeal mask airway (PLMA) insertion. Sevoflurane is a new volatile anaesthetic agent with rapid induction and recovery. A randomized study was carried to compare conditions for PLMA insertion using Propofol and Sevoflurane in 60 ASA I & II patients undergoing laparoscopic and non laparoscopic surgeries.*

Patients & Methods: Patients were divided into two groups, Group P patients received IV Propofol 3 mg kg⁻¹ and group S patients, Sevoflurane 8% & 100% O₂ with vital capacity induction technique. After loss of eyelash reflex, inj. Fentanyl 2µg kg⁻¹ IV was injected and PLMA insertion was done. Induction time, effective airway time, conditions for PLMA insertion attempts for PLMA & Ryle's tube insertion, changes in haemodynamic parameters, oxygen saturation and EtCO₂ and post operative complications were studied.

Results: Induction was more rapid in Propofol group. Excellent to satisfactory insertion conditions were obtained in 100% of patients in group P & 96.66% of patients in group S. PLMA was inserted at the first in 96.66% of patients in group P and 93.33% of patients in group S. There was a significant decrease in heart rate in group S at 2 min after PLMA insertion in comparison to group P. Decrease in both systolic and diastolic blood pressure, changes in oxygen saturation and EtCO₂ were comparable in both the groups. In our study 20 patients were those posted for laparoscopic surgery. There were no complications like regurgitation, aspiration or gastric insufflations, failed oxygenation or failed ventilation.

Conclusion: We conclude from our study that insertion of PLMA is easy and comparable with both Propofol and Sevoflurane.

INTRODUCTION :

Since 1980, several supraglottic airway devices have been developed of which the Laryngeal mask airway is the most popular one. In 1999, Dr. Brain improvised upon the classic LMA by introducing a drainage tube and presented a newer version called Proseal LMA (PLMA). PLMA is an advanced LMA which enhances safety and scope of the device particularly during positive pressure ventilation. Closed claim studies¹ have shown that it provides a more effective seal than the classic LMA and it facilitates easy gastric tube placement. Several studies^{2,3,4,5} have shown that PLMA can be safely used in laparoscopic surgeries.

Successful insertion of PLMA without any untoward effects such as gagging and coughing requires adequate depth of anaesthesia and suppression of upper airway reflexes but neuromuscular blocking drug is not required. Propofol is a well known IV induction agent with rapid induction and recovery. Similarly, amongst inhalational agents, Sevoflurane, because of its pleasant odour and low blood gas solubility allows smooth and rapid induction with early recovery. Fentanyl can be used as a co-induction agent because it depresses airway reflexes.⁶ Thus, we decided to undertake a study to compare the conditions for PLMA insertion using two induction agents Propofol and Sevoflurane.

PATIENTS & METHODS

After ethical committee approval and informed written consent this double blinded randomised prospective study was carried out in 60 adult patients of either sex, between the ages 18-60 yrs, belonging to ASA status I & II, who were scheduled for elective surgical procedures as shown in table 1. Patients with anticipated difficult airway, risk of regurgitation or aspiration, cervical spine disease, H/O al-

lergy to the drugs used in the study, URTI in the past 10 days, morbidly obese patients and pregnant patients were excluded from the study.

All patients underwent pre anaesthetic check up and routine investigations were carried out. Tab. Ranitidine 150 mg and Tab. Diazepam 10 mg orally given orally on the previous night and were kept nil orally for 10 hrs. On the day of surgery, basal vital parameters were recorded. The patients were premedicated with inj. Glycopyrrolate 0.2 mg IM 30 min before induction and inj. Midazolam 0.03 mg kg⁻¹ IV 2 min before induction and sedation score was assessed. Score 0- alert, 1- drowsy, 2- sleepy but arousable, 3- sleepy and unarousable.

Patients were pre oxygenated for 3 min with Bain's breathing circuit and were randomly divided into 2 groups: GROUP P - received inj. Propofol 3mg kg⁻¹ IV over 45 secs GROUP S - Inhalational induction was started with 8% Sevoflurane and O₂ flow at 8 L/min with vital capacity breath technique.

Loss of eye lash reflex was taken as the end point of induction and at this time inj. Fentanyl 2 µg kg⁻¹ IV was administered. Fentanyl was administered after loss of eye lash reflex so that it did not interfere with vital capacity induction technique as in other studies.^{11,12} Apnoea occurred in almost all the patients and lungs were manually ventilated during that period.

Induction time (Time to loss of eye lash reflex) was recorded in both the groups. After induction, jaw relaxation was assessed and PLMA of appropriate size (size 3 for adult female patients or patients weighing 30-50 kg and size 4 for

adult male patients or patients weighing 50-70kg) inserted with the introducer insertion technique by an experienced anaesthesiologist blinded to the induction technique and cuff inflated with appropriate amount of air (size 3, 20ml and size 4, 30ml).

Proper placement of PLMA was confirmed by

B/L equal air entry

B/L equal chest movements

bite block should lie between the teeth

absence of gastric insufflation by auscultation over epigastrium

Gel displacement test: Absence of bubbling or movement of column of the lubricant placed on proximal end of drainage tube during IPPV

absence of audible leak on gentle IPPV

passing an orogastric tube easily through the drain tube and

square wave capnography

In both the groups, effective airway time was recorded as the time between picking up the PLMA and obtaining an effective airway judged by no audible leak with gentle manual ventilation. The conditions obtained for PLMA insertion were assessed using the six point variables as shown in table 3. Over all grading of PLMA insertion score was done as score 18- excellent, 16-17 - satisfactory, < 16- poor.

If the first attempt was unsuccessful, second attempt was tried after repeat administration of Propofol or Sevoflurane. The total number of attempts for insertion of PLMA was recorded in both the groups. Anaesthesia was maintained with 50%N₂O +50%O₂, Isoflurane and Vecuronium bromide. We have inserted Ryle's tube in all the patients and the number of attempts was recorded.

Haemodynamic parameters like heart rate, systolic and diastolic blood pressure as well as percentage oxygen saturation were recorded before and after induction, during PLMA insertion, after PLMA insertion at 1, 2, 3 and 5 min, throughout the operation and in the immediate post operative period as shown in graphs 1, 2 & 3. When SpO₂ was 94- 90% oxygenation was graded as suboptimal and failed if it was < 90%.

In patients posted for laparoscopic surgery, monitoring of EtCO₂ was done and values were recorded at base line, after PMA insertion, 15 and 30 min after pneumoperitoneum, before removal of trocar and in the immediate post operative period as shown in table 5. With EtCO₂ readings, suboptimal ventilation was between 45.6-55.5 mmHg (6.0-7.3 kPa) and failed if the reading was > 55.5 mmHg (7.3 kPa). The following intra operative complications were recorded: aspiration, hypoxia (<90%), bronchospasm, arrhythmias, coughing, hiccups, airway obstruction and minor tongue - lip - dental trauma.

At the end of surgery, patients were reversed with inj. Neostigmine 50µg kg⁻¹ IV & inj. Glycopyrrolate 10µg kg⁻¹ IV and PLMA was removed after full return of reflexes and consciousness. Secretions, if present, over both the ventral

and dorsal aspect of PLMA were noted and pH tested with a litmus paper. Post operatively, patients were asked for complications like nausea, vomiting, dysphagia, dysphonia and sore throat. Enquiry about sore throat was made 24 hrs later and was graded, score 0: no complaints, score 1: mild discomfort, score 2: severe discomfort.

Statistical analysis was performed using Student's unpaired t-test for demographic data, changes in haemodynamic parameters, O₂ saturation and EtCO₂. Chisquare test incorporating Fishers exact test and the Mann-Whitney test were used for the variables of induction, conditions for PLMA insertion and attempts for PLMA insertion. P<0.05 was taken as statistically significant.

RESULTS

Demographic data and surgical procedures were comparable in both the groups as shown in table 1. Induction time and effective airway time are shown in table 2. Induction was significantly earlier in Protocol group (Group P - 73.9±5.72 sec and Group S - 103.33±10.49 sec). Effective airway time was comparable in both the groups (Group P - 20.76 ±2.22 sec and Group S - 21.5±2.24 sec). Conditions for PLMA insertion were comparable in both the groups (table 3). Attempts for PLMA insertion (table 4) and Ryle's tube insertion were comparable in both the groups.

Table 1
Demographic Data and Surgical Procedures

Variables	Group P	Group S	P'Value
Age (Years)	31.83±8.4	30.86±8.75	>0.05
Weight(kg)	52.86±4.38	52.53±4	>0.05
Sex M	16 (53.33%)	15 (50%)	>0.05
F	14 (46.66%)	15 (50%)	>0.05
ASA I	29 (96.66%)	30 (100%)	>0.05
ASA II	1 (3.33%)	---	---
Non Laparoscopic surgeries	20	20	>0.05
Laparoscopic surgeries	10	10	>0.05

Table 2
Induction Characteristics

	Group P	Group S	P'Value
Induction Time (in seconds)	73.9±5.72	103.33±10.49	<0.001
Effective Airway Time (sec)	20.76 ±2.22	21.5 ±2.24	>0.05

Table 3
Conditions for Pima Insertion

	Grade	Group P	Group S	P'Value
Jaw opening	3 full	27 (90%)	26(86.66%)	>0.05
	2 partial	03 (10%)	04(13.33%)	>0.05
	1 difficult	00	00	--
Ease of insertion	3 easy	30 (100%)	29(96.66%)	>0.05
	2 difficult	00	01(3.33%)	--
	1 impossible	00 00	---	---
Coughing	3 nil	30(100%)	30(100%)	00
	2 transient	00	00	--
	1 persistent	00	00	--
Gagging	3 Nil	30(100%)	30(100%)	>0.05
	2 transient	00	00	--
	1 persistent	00	00	--
Laryngospasm	3 Nil	30(100%)	30(100%)	>0.05
	2 partial	00	00	--
	1 total	00	00	--
Patient movements	3 Nil	30(100%)	29(96.66%)	>0.05
	2 moderate	00	01(3.33%)	--
	1 vigorous	00	00	--

Table 4
Attempts for PLMA Insertion

	Group P	Group S	P Value
1 st attempt	29 (96.66%)	28 (93.33%)	>0.05
2 nd attempt	01 (3.33%)	02 (6.66%)	>0.05

Table 5
EtCO₂ Changes

	Basal	After PLMA insertion	15 min after carboperitoneum	30 min after carboperitoneum	Before removal of trocar	Post op
Group P	29.2±2.34	29.4±1.64	42.7±1.89	43.7±1.49	43.8±1.03	29.1±2.18
Group S	29.0±2.14	29±1.35	42.9±1.19	43.7±0.94	44.3±0.82	29.2±1.93
P value	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05

Both the groups exhibited stable haemodynamic profiles. There was a significant decrease in heart rate in Sevoflurane group at 2 min after PLMA insertion as shown in graph 1. There was a decrease in systolic and diastolic blood pressure in both the groups but intergroup comparison was statistically insignificant as shown in graphs 2 & 3. There was no significant change in oxygen saturation in both the groups. There was a significant increase in EtCO₂ at 15 and 30 min after pneumoperitoneum and before removal of trocar but intergroup comparison was statistically insignificant (table 5).

Two (6.66%) patients in Group S complained of nausea in the post operative period. This was statistically insignificant. 10% of the patients in group P and 13.33% of the patients in group S complained of mild sore throat (grade 1 severity). None of the patients in either group complained of severe sore throat. There was no statistically significant difference between the two groups. 30% of the patients in group P complained of pain on injection of Propofol.

One patient in group P and two patients in group S had blood stain over the dorsal surface of PLMA. pH of the secretions over dorsal surface of PLMA was in the range of 7.0-7.5 in all the patients in both the groups. None of the patients in both the groups had secretions in bowl of the mask, hence no pulmonary aspiration.

DISCUSSION

Several studies have been conducted by Lian Kah et al (1999), Molloy M E et al (1999), P.Sivalingam et al (1999), S.B.Ganatra et al (2002), V.Priya et al (2002) and Ravi Kumar Koppula et al (2005) for insertion of LMA using Propofol and Sevoflurane.

Propofol is a standard induction agent for insertion of PLMA without need for muscle relaxant. Sevoflurane is also used for insertion of PLMA without need for muscle relaxant.

In our study, induction was significantly earlier in group P as in other studies by B.Fredman et al, Thwaites et al, V.Priya et al and S.B.Ganatra et al. P.Sivalingam et al. Effective airway time was comparable in both the groups (table 2).

The time for PLMA insertion was comparable in both the groups in studies by V.Priya et al and Ravikumar et al.

Jaw opening was comparable in both the groups. Jaw opening was comparable in studies by Ravikumar et al and S.B.Ganatra et al. However V.Priya et al and Lian Kah et al observed that jaw relaxation was excellent in Propofol group as compared to Sevoflurane group (72% vs. 44% and 78.9% vs. 55.2% respectively). Overall conditions for PLMA insertion were comparable in both the groups.

PLMA insertion conditions were comparable in both the groups in studies by S.B.Ganatra et al and Ravikumar et al.

Attempts for PLMA insertion was comparable in both the groups (table 4). A second attempt for PLMA insertion was required only in 1 patient in group P and 2 patients in group S. Ravikumar et al and V. Priya et al observed that attempts for PLMA insertion were similar in both the groups. Lian Kah et al in their study found that patients in Sevoflurane group required more attempts at LMA insertion and this was because of inadequate mouth opening.

There was a significant decrease in heart rate at 2 min after PLMA insertion in group S in comparison to group P (graph 1). This might be because of Sevoflurane induced inhibition of β-adrenoreceptor system and its depressant effect on myocardial Ca⁺⁺ channels. V. Priya et al and Thwaites et al observed that changes in heart rate were comparable in both the groups.

There was a significant decrease in systolic and diastolic blood pressure in both the groups but inter group comparison was statistically insignificant (graphs 2 & 3). W. Scott Jellish et al also observed decrease in blood pressure which was comparable in both the groups. Thwaites et al, V.Priya et al, Lian Kah et al and S.B.Ganatra et al observed a significant decrease in blood pressure in group P.

There were no cases of regurgitation in both the groups as evidence by the pH of secretions which was in range of 7.0 to 7.5. None of the patients in both the groups had secretions in the bowl of mask indicating an effective seal around the glottis and hence no pulmonary aspiration.

Two patients experienced postoperative nausea in Sevoflurane group compared with none when Propofol was the induction agent. Propofol is known to have antiemetic effects which persist into the postoperative period. Incidence of sore throat was comparable in both the groups. Lian Kah et al and Ravikumar Koppula et al observed that incidence of sore throat was similar in both the groups.

CHANGES IN HEART RATE

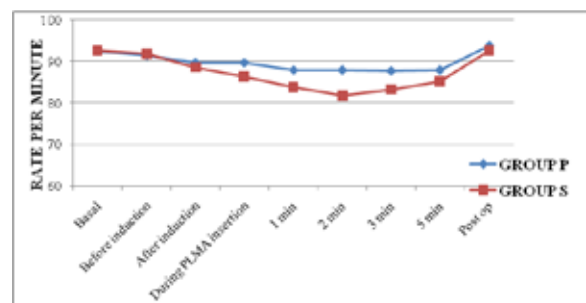


Figure 1 Changes in Heart Rate (per minute)

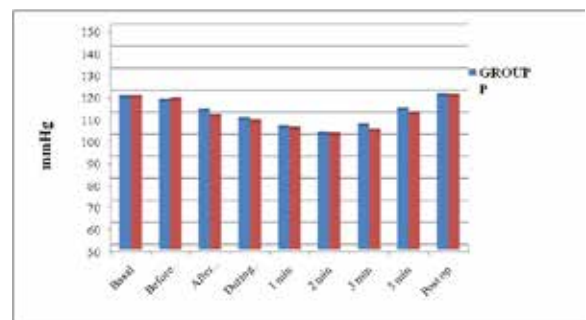


Figure 2
Changes in Systolic Blood Pressure (in mmHg)

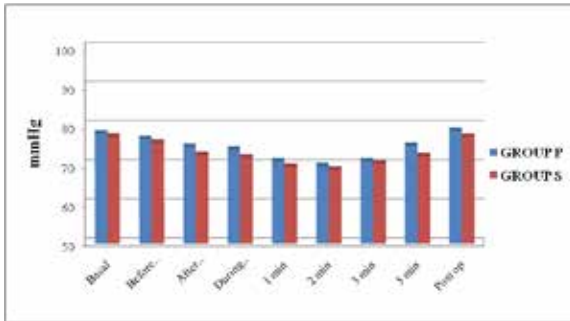
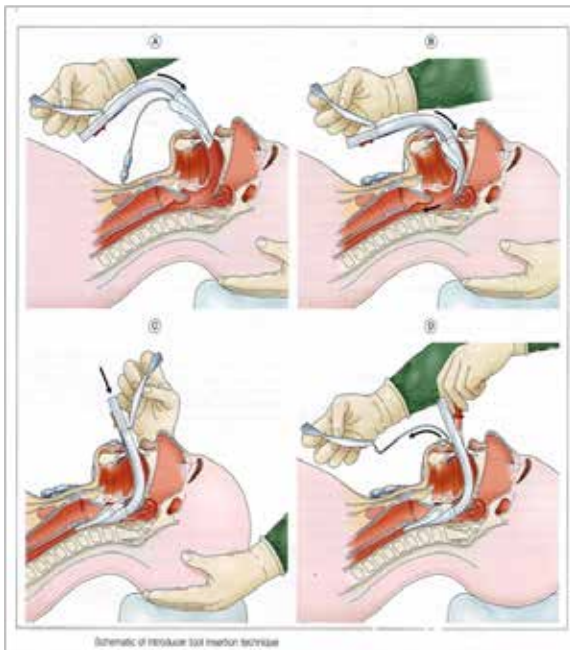


Figure 3
Changes in Systolic Blood Pressure (in mmHg)



SCHEMATIC OF INTRODUCER TOOL INSERTION TECHNIQUE

We studied PLMA insertion in 40 patients undergoing elective non laparoscopic procedures. We also studied PLMA insertion in 20 patients undergoing laparoscopic surgery and included them in this study. We studied the incidence of gastric distension, regurgitation, aspiration, haemodynamic changes and changes in oxygen saturation and EtCO₂ to evaluate PLMA as an airway device. In our study, there were no cases of failed ventilation or failed oxygenation and no crossovers from PLMA to Endotracheal tube. Ryle's tube insertion was successful at the first attempt in all patients undergoing laparoscopic surgery.

In our study, patients didn't have regurgitation or aspiration as evidenced by the litmus test and maintenance of oxygen saturation and endtidal carbon dioxide within normal limits.

Thus Propofol provides faster induction compared to Sevoflurane but pain at the site of injection offsets its antiemetic effect as well. Finally we can say that insertion of Proseal LMA is easy and comparable with both Propofol and Sevoflurane. Also PLMA can be used as a safe airway device in patients undergoing laparoscopic surgeries.

REFERENCE

1. Joseph Brimacombe, Christian Keller. Proseal LMA. A randomised, crossover study with the standard LMA in paralysed, anaesthetized patients. *Anaesthesiology* 2000, 93: 104-9 | 2. Prerana P. Shroff, Surekha K. Kamath: Randomised Comparative study between the Proseal LMA and Endotracheal tube for laparoscopic surgery. *Internet Journal of Anaesthesiology*, 2006. Volume 11 Number 1. | 3. J. Roger Maltby et al, Michael T. Beriault, Neil C. Watson, David Liepert and Gordon H. Fick. The LMA Proseal as an effective alternative to tracheal intubation for laparoscopic cholecystectomy. *Can J Anaesth* 2000; 47 : 622- 626. | 4. J. Roger Maltby et al, Michael T. Beriault, Neil C. Watson, David Liepert and Gordon H. Fick. LMA- Classic and LMA - Proseal are effective alternatives to Endotracheal intubation for gynaecological laparoscopy. *Can J Anaesth* 2003; 50 (1): 71 - 77. | 5. Bimla Sharma, Chand Sahai, Abhijit Bhattacharya, V.P. Kumra, Jayshree Sood. Proseal laryngeal mask airway: A study of 100 consecutive cases of laparoscopy surgery. *Ind J Anaesth* 2003; 47(6): 467- 472. | 6. Tagaito, Yugo, Isono, Shiroh, Nishino, Takashi. Upper airway reflexes during a combination of Propofol and Fentanyl anaesthesia. *Anaesthesiology* 1998; 88 (6):1459-1466. | 7. Lian KT, Chow MY, Lee TL. Sevoflurane vs. propofol for LMA insertion in adults. *Anesth Analg*. 1999; 88(4), 908- 912. | 8. Molloy ME, Buggy DJ, Scanlon P. Propofol vs. sevoflurane for LMA insertion. *Can J Anesth*, 1999; 46(4), 322-326. | 9. P.Sivalingam, R.Kandaswami, G.Madhavan and P.Dhaksinamoorthy. Conditions for LMA insertion: comparison of Propofol vs. Sevoflurane with or without Fentanyl. *Anesthesia*. 1999; 54: 271 -276. | 10. S.B.Ganatra, J.D'Mello, M.Butani, P.Jhamanani. Sevoflurane vs. propofol for LMA insertion. *Eur J Anesth*, 2002; 14: 371-375. | 11. V.Priya, J.V.Divatia, D.dasgupta. A comparison of propofol vs. Sevoflurane for LMA insertion. *Ind J Anesth*. 2002; 46(1): 31-34. | 12. Ravikumar Koppula, Anitha Shenoy. Comparison of sevoflurane with propofol for LMA insertion. *J Anesth Clinical Pharmacol*, 2005; 21(3): 271-274. | 13. P.S.Gill, J.Shah and A.Ogilvy. Midazolam reduces the dose of propofol for LMA insertion. *Eur J Anaesthesiol*, 18: 3, 166-170. | 14. Scanlon P, Carey M, Power M, Kirby F. Patient response to laryngeal mask insertion after induction of anesthesia with propofol and thiopentone. *Can J Anesth*. 1993; 40: 816-818. | 15. P Bapat, RN Joshi, E Young, RH Jago. Comparison of propofol versus thiopentone with midazolam or lidocaine to facilitate laryngeal mask insertion. *Can J Anesth*. 1996; 43(6): 564-568. | 16. I Driver, C.Wilson, S.Wiltshire, P.Mills and R.Howard- Griffin. Co-induction and laryngeal mask insertion: a comparison of thiopentone versus propofol. *Anaesth*. 1997; 52(7): 698-700. | 17. A.Thwaites, S.Edmonds and I.Smith. Comparison of sevoflurane vs. propofol. *Br J Anesth*, 1997; 78: 356-361. | 18. Brian Fredman, Micheal H. Nathanson, Ian Smith, Junke Wang, Kevin Klein, Paul F.White. Sevoflurane for outpatient anesthesia: A comparison with propofol. *Anesthesia Analgesia* 1995; 81: 823-828. | 19. Doi M, Ikeda K. Airway irritation by volatile anesthetics during brief inhalation: comparison of halothane, isoflurane, enflurane and sevoflurane. *Can J Anesth*, 1993; 40(2): 122-126. | 20. Vandana Talwar, Rajesh Pattanayak, Sujesh Bansal. Comparison of propofol versus thiopentone for facilitation of Laryngeal Mask insertion. *Journal Anesth Clin Pharmacol* 2004; 20(1): 33-38 | 21. W.Scott Jellish, Cynthia A. Lien, H. Jerrel Fontenot, Richard Hall. The comparative effects of Sevoflurane versus Propofol in the induction and maintenance of anaesthesia in adult patients. *Anesth Analg* 1996; 82: 479-85. |