Original article:

A Comparative Study of Classic LMA and Proseal LMA in Paralyzed Anaesthetized Patients

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Abstract:

Introduction: Endotracheal intubation is a quick, simple, safe and non-surgical technique that attains all the goals of airway management, namely maintaining airway patency, protecting the lungs from aspiration and permitting leak free ventilation. It remains the gold standard for airway management and it has a long history as one of the most widely accepted techniques in anesthesia practice.In this prospective study, we tried to evaluate the ease of insertion of the airway seal, the ease of gastric tube placement and post operative complications subsequent to general anesthesia with those of Classic laryngeal mask airway(LMA) or Proseal LMA in paralyzed patients

Materials and Methods: After obtaining institutional ethical committee approval and patient's written informed consent, 50 patients(ASA 1-2) aged between 18-60yrs were randomly allocated, who underwent elective non abdominal surgeries (by opening a sealed envelope) for airway management with PLMA or LMA.

Results: All the results of the present study were expressed as Mean ± sd. There was an insignificant difference between the age (32.46±10.24 yrs vs 33.98±11.46, $p<0.05$), weight (55.84±12.58 kg vs 56.72±11.26 kg, $p<0.05$). Further there was no statistically significance difference between the time duration of surgery LMA group I (70.24±22.38 min) in comparison of PLMA group II 68.48±24.35 min, $p<0.05$). Devices of size 3 and size 4 were used respectively for male and female patients of both groups. The first time attempt was successful in 44 patients of group I out of 50 patients. On the other hand firs attempt success was a little bit more successful if LHMA group II ie 46 patients among 50 patients. However, difference of first attempt was statistically insignificance for both groups.

Conclusion: Findings of the current study suggest that Proseal LMA is little bit difficult to insert. Nevertheless, PLMA is more effective in achieving a better seal in comparison of LMA. Further research is required to determine the role of the Proseal LMA in airway management, but the better seal suggests its role as an alternative to LMA for positive pressure ventilation, either as backup or as a replacement device.

Key Words: LMA, PLMA, Airway, Regurgitation, Pressure.

INTRODUCTION

Endotracheal intubation is a quick, simple, safe and non-surgical technique that attains all the goals of airway management, namely maintaining airway patency, protecting the lungs from aspiration and permitting leak free ventilation. It remains the gold standard for airway management and it has a long history as one of the most widely accepted techniques in anesthesia practice. Although it has been the most widely accepted technique in anesthetic practice, it is not without complications. Most of them arise from the need to visualize and go through the laryngeal opening. Reflex sympathetic stimulation is produced and is associated with raised levels of

plasma catecholamines during Laryngoscopy and endotracheal intubation, which are responsible for hypertension, tachycardia, myocardial ischemia, ventricular arrhythmias and intracranial hypertension.[1,2]

One of the most important airway appliances is the laryngeal mask airway (LMA),which was designed by Dr. Archie Brain (UK) in 1981 and which was developed after the endotracheal tube. Since then, supraglottic airway devices have undergone rapid development and has been used successfully and safely in anesthetic practice with various models.[3,4] The benefits of LMA over the endotracheal intubation include the absence of the need for muscle relaxants and a reduce risk of post-operative sore throat. A potential risk of LMA is an incomplete mask seal which causes gastric insufflations or oropharyngeal air leakage. The use of a novel modification of "laryngeal mask airway (LMA),"LMA–Proseal" (PLMA), which comprises of a second tube which is sideways to the airway tube, was projected to split the alimentary and the respiratory tracts. It allows access to or the escape of fluids from the stomach and reduced the risks of gastric insufflation and pulmonary aspiration, thereby helping to secure the airway It can also determine the correct positioning of the mask.[1]

In this prospective study, we tried to evaluate the ease of insertion of the airway seal, the ease of gastric tube placement and post-operative complications subsequent to general anesthesia with those of Classic laryngeal mask airway(LMA) or Proseal LMA in paralyzed patients.

MATERIALS AND METHODS

After obtaining institutional ethical committee approval and patient's written informed consent,50 patients(ASA 1-2) aged between 18-60yrs were randomly allocated, who underwent elective non abdominal surgeries (by opening a sealed envelope) for airway management with PLMA or LMA.To make the group comparable,the patients with a known history of difficult airway, cervical spine disease, mouth opening less than 2.5 cm and those who were at a risk of aspiration were excluded from the study. A regular anaesthesia protocol was followed and routine monitoring was applied. Premedications of the patient were done with IV Glycopyrrolate 0.004 mg/kg, IV Midaozolam 0.03 mg/kg, IV Fentanyl 2 micro gm/kg, IV Ranitidine 1 mg/kg and IV Metaclopramide 0.2mg/kg. With patients in the supine position anaesthesia was induced with IV Propofol 2mg/ kg. With Propofol infusion at 3-6 mg/kg/hr with 50% oxygen and nitrousOxide, maintenance was achieved. Neuromuscular blockade was attained with Vecuronium0.08-1 mg/kg and it was maintained with 0.02 mg/kg bolusesto maintain a train- of four count of less than1. With a face mask the patients' lungs were ventilated until the neuromuscular block was complete.

As recommended by the manufacturer by using an introducer tool the Proseal LMA was inserted. The insertion procedure for both the devices was the same and the number of attempts for insertion was documented for both PLMA/LMA. A total three attempts were permitted before the device was considered as a failure, failed attempt was defined as the removal of the device from the mouth. The total time was recorded, between picking up the LMA/PLMA and obtaining an effective airway. One attempt with the other device was allowed If an effective airway could not be achieved, If with the alternate device (PLMA/LMA) effective airway was not achievable,then the airway was achieved with an endotracheal tube, the case was considered as a failure and it was recorded. Through the drainage tube of thePLMA the gastrictube (14-16 no) was inserted. The time which was taken to insert the gastric tube was recorded, and by the synchronous injection of air and epigastric auscultation during apnoea its placement was confirmed. Two attempts were tried in case of a difficulty in introducing the gastric tube with the manipulation of the introducerand if there was any inability to insert the gastric tube then it was recorded.

Portex aneroid gauge was used by noting the pressure at which equilibrium was reached and the airway sealing pressure was determined by closing the APLvalve of the closed circuit at a fixed gas flow of 4lt/min. 40 cms H2O was the maximum allowed pressure. The location of the airway gas leak at the airway sealing pressure was determined as-mouth (audible leak), stomach(epigastric auscultation) and drainage tube with PLMA, which was determined by the gel displacement test i.e. bubbling of the lubricant which was placed on the proximal end of the drainage tube

In both the groups by using a Penlon Anaesthesia ventilator, with a tidal volume of 8ml/kg the ventilation was controlled and by using a Portex aneroid gauge the cuff pressure was kept constant at 60 cm of H2O.The Propofol infusion was sustained till just before the extubation at 2mg/kg/hr. after the removal of the device for any evidence of aspiration auscultation of the chest was done. If the secretions were present they were noted and the pH was tested with a litmus paper which was sensitive to changes of 0.5 unit pH frompH 2.5 -8.5. After the operation the patients were monitored for heartrate (HR), blood pressure (BP), SPO2 and the incidence of nausea and vomiting. After half an hour of the patient admission to the recovery room the patients were questioned directly about the sore throat. and the incidence of sore throat was evaluated by using a 3 point scale,which include

- 0- no complaints at all.
- 1- Throat discomfort,
- 2- Continuous throat pain.

An enquiry about the sore throat was made 24 hrs later also.

RESULTS

All the results of the present study were expressed as Mean ± sd. Table 1 shows that there was an insignificant difference between the age (32.46±10.24 yrs vs 33.98±11.46, $p<0.05$), weight (55.84±12.58 kg vs 56.72±11.26 kg, $p<0.05$). Further there was no statistically significance difference between the time duration of surgery LMA group I (70.24±22.38 min) in comparison of PLMA group II 68.48±24.35 min, $p<0.05$.

Devices of size 3 and size 4 were used respectively for male and female patients of both groups. The first time attempt was successful in 44 patients of group I out of 50 patients. On the other hand firs attempt success was a little bit more successful if LHMA group II ie 46 patients among 50 patients. However, difference of first attempt was statistically insignificance for both groups.

Air way seal pressure was significantly high in PLMA group II patients (15.66±2.46 cm H_2O) in comparison of LMA group I patients (26.52±12.38 cm H_2O). The difference seal pressure was statistically high in group II patients compared to group I patients ($p<0.001$).

It is evident from figure I that time required for achieving an effective airway was significantly longer for PLMA group II compare to LMA group I.

Table 3 shows that in the PLMA group, the gastric tube placement was successful in 48 of the 50 patients and it took an average of 11 sec. In one case, the gastric tube could not be passed, even though effective ventilation could be achieved. Regurgitation of the gastric contents through the drain tube was noticed in two of the PLMA cases. There were no cases of regurgitation into the mask with either device, as was detected by the litmus paper. Systolic blood pressure was significantly lower after 15 minutes whereas heart rate was significantly increased after 5 minutes of insertion of device in LMA group I patients compare to PLMA group II. Further, results revealed that no incidences of bronchospam, desaturation or laryngospasm were confronted in either

method of group. After the removal of either device, mild sore throat (grade-1) was noted in 2 and 4 cases of LMA and PLMA respectively. (Table 3)

Table 1: Comparison of basic parameters of both groups.

Parameters	LMA group (n = 50)	PLMA group (n=50)	p value
Age (Years)	32.46±10.24	33.98±11.46	<0.05 ^{NS}
Sex (M/F)	20/30	18/32	<0.05 ^{NS}
Weight (Kg)	55.84±12.58	56.72±11.26	<0.05 ^{NS}
Duration of surgery (Min)	70.24±22.38	68.48±24.35	<0.05 ^{NS}

Table 2: Comparative parameters of both groups.

Parameters	LMA group (n = 50)	PLMA group (n=50)	p value
Attempts	1.12±0.26	1.08±0.22	<0.05^{NS}
Seal pressure (cm H_2O)	15.66±2.46	26.52±12.38	>0.001**

Fig 1: Comparison of effective airway time in both groups.

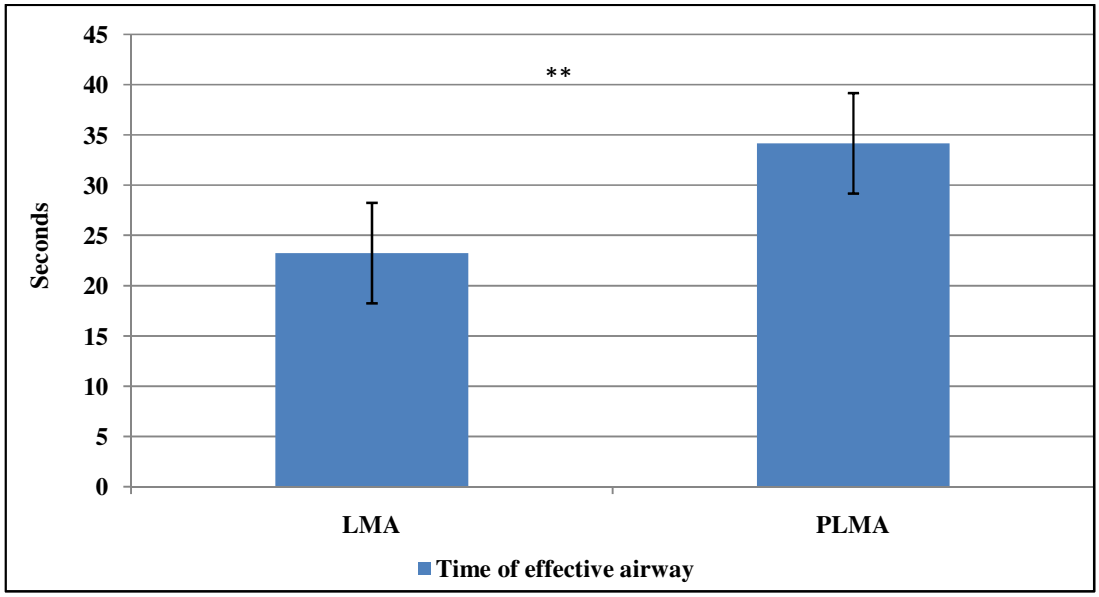

Table 3: Comparison of insertion time and complications of both groups.

Parameters	LMA group (n = 50)	PLMA group (n=50)
Successful gastric tube placement	50	48
Avarage time (Sec)	12	11
Regurgtation	2	4
Mask Regurgtation	-	-
Sore throat	2	4

DISCUSSION

LMA has been found associated withoropharyngeal air leakage or gastric insufflationdue to incomplete mask seal. However, new version of LMA known as "LMA – proseal" contains laryngeal mask with an oesophageal vent which separates respiratory tract and alimentary tract. Moreover, correct position of the mask can be determined by vent.[1,3]There is still dilemma in literature about the size slection in Indian population both male and female as researchers recorded increasedmucosal injury in Asian male population with size 5; whereas, in the same research they observed effective glottis seal in Asian female with size 3 and 4.[2]

On the other hand, size 3 and 4 have been used respectively for female and male population in the present study. This is similar to the study of Brimacombe et al as they recorded high success rate at the first-time. Moreover, time duration was shorter due to inserter. Success rate was higher and that the effective airway time was shorter with theintroducer. [3]Use of introducerfacilitates the process of insertion in oral cavity more conveniently as it occupies space less than a finger. Moreover, it helps in to assist the full depth of insertion in oropharyngeal inlet. Further, findings of the current study showed that first time success rate was little bit higher in LMA group in comparison of PLMA group. These findings are in agreement with the findings of the earlier studies of Brimacombe J et al,[3] Cook TM et al[4] and Lu PP et al.[5] Studies suggest that failure of insertion was higher in PLMA group might be due to leading edge of semi rigid distal tube was more rigid in proseal compare to classical LMA.[3–5] Time duration of insertion is not important in routine cases; however, difference of time is essential forsecuring the airwayin emergency cases.

Seal pressure more than 20 cm H_2O is considered to be appropriate to maintain the ventilation of lungs in normal subjects.[4]Results of the present study revealed seal pressure was significantly high in PLMA group compare to LMA group. Quality of LMA is determined by leak test or air way sealing pressure to evaluate the efficacy of the seal with airway.[6]Gastric insufflation may increase when leek pressure is exceeded by peak inflation pressure.[4]Correctpositioning of the mask facilitates by optimal positioning of the drain tube.[1] Four out of fifty PLMA cases showed regurgitation of gastric contents; while, drain tube could not pass in two patients nevertheless, ventilation was achieved. Majority of patients in the study showed absence of regurgitation of gastric contents. These findings are consistent with the findings ofBrimacombe et al[7]as they recorded correctly placed PLMAcauses bypass the pharynx and mouth when the drainage tube is open. These findings have led to the useof PLMA in adult as well as in paediatric laparoscopic procedures.[8,9]

There were few haemodynamic changes were observed after the insertion of either device; however, these changes were clinically insignificant. In contrast to the present study Evans et al[10] observed minimal haemodynamic response after the insertion PLMA. Further, there were no episodes ofdesaturation, laryngospasm or bronchospasm in either group patients.

CONCLUSION

Findings of the current study suggest that Proseal LMA is little bit difficult to insert. Nevertheless, PLMA is more effective in achieving a better seal in comparison of LMA.

Further research is required to determinethe role of the Proseal LMA in airway management, but the betterseal suggests its role as an alternative to LMA for positive pressureventilation, either as backup or as a replacement device.

REFERENCES

[1] Brain Al, Verghese C, Strube PJ. The LMA 'ProSeal'--a laryngeal mask with an oesophageal vent. Br J Anaesth 2000; 84:650-4.

[2] Tan SM, Sim YY, Koay CK. The ProSeal laryngeal mask airway size selection in male and female patients in an Asian population. Anaesth Intensive Care 2005; 33:239-42.

[3] Brimacombe J, Keller C. The ProSeal laryngeal mask airway: A randomized, crossover study with the standard laryngeal mask airway in paralyzed, anesthetized patients. Anesthesiology 2000; 93: 104-9.

[4] Cook TM., Nolan JP., Verghese C., Strube PJ, Lees M, Millar JM, Fet PJ et al. A randomized crossover comparison of the ProSeal with the classic laryngeal mask airway in unparalysed anaesthetized patients. Br J Anaesth 2002; 4: 527-33.

[5] Lu PP, Brimacombe J, Yang C, Shyr M. ProSeal versus the Classic laryngeal mask airway for positive pressure ventilation during laparoscopic cholecystectomy. Br J Anaesth 2002; 88:824-7.

[6] Brimacombe J, Brain AIJ: The laryngeal mask airway: Review and practical guide. London: WB Saunders, 1997.

[7] Keller C, Brimacombe J, Kleinsasser A, Loeckinger A. Does the ProSeal laryngeal mask airway prevent the aspiration of regurgitated fluid? Anesth Analg 2000; 91: 1017-20.

[8] Roth H, Genzwuerker HV, Rothhaas A, Finteis T, Schmeck J. The ProSeal laryngeal mask airway and the laryngeal tube suction for ventilation in gynaecological patients undergoing laparoscopic surgery. Eur J Anaesthesiol 2005; 22: 117-22.

[9] Sinha A, Sharma B, Sood J. ProSeal as an alternative to endotracheal intubation in pediatric laparoscopy. Paediatr Anaesth 2007; 17:327-32.

[10] Evans NR, Gardner SV, James MF, King JA, Roux P, Bennett P et al. The proseal laryngeal mask: results of a descriptive trial with an experience of 300 cases. Br J Anaesth 2002; 88:534-9.