

# Comparison of Proseal Laryngeal Mask Airway and Endotracheal Tube for intubation in Paediatric Patients for Surgical Procedures of Short Duration

S. Chitra Devi<sup>1</sup>, M.K. Narasimhan<sup>2</sup>

<sup>1,2</sup>Assistant Professor, Department of Anaesthesiology, Government Stanley Medical College and Hospital, Chennai, Tamilnadu 600001, India.

## Abstract

**Introduction:** Proseal LMA produce very less sorethroat and cough when compared to the endotracheal tube in paediatric patients for short duration surgeries. **Aim:** To compare the paediatric proseal LMA with endotracheal tube for intubation in paediatric patients undergoing elective surgeries short duration under general anaesthesia with respect to ease of insertion, haemodynamic response and complications. **Methodology:** After getting consent and Ethical committee approval eighty patients were selected based on the inclusion and exclusion criteria and randomly allocated into one of the 2 equal groups GROUP P-Proseal laryngeal mask group and GROUP T-Endotracheal group. General anaesthesia given as per routine in our hospital. Group P Proseal LMA of 2 size inserted. GROUP T: Appropriate sized Endo tracheal tube inserted. Maintained with nitrous oxide 66% and oxygen 33% with sevoflurane 0.2-0.4%. Hemodynamics, number of attempts and failure of insertion noted. **Results:** Using endotracheal tube 92.5% patients were intubated in the first attempt, 3 (7.5%) required a second intubation attempt. In the proseal laryngeal mask airway group, the first attempt success rate was 82.7% (31 patients). A second attempt was required in 17.3% (9 patients). Heart rate was significantly higher in ETT group during the first Ten minutes of insertion than the Group P. More incidence of cough with ETT while more incidence of blood on the device with proseal LMA. Data analysed using chi square and student t test. **Conclusion:** we concluded that the proseal laryngeal mask airway could be an effective alternative to endotracheal intubation in children undergoing short duration elective procedures under general anaesthesia.

**Keywords:** Proseal LMA; Endo Tracheal Tube; Number of Attempts; Paediatric Surgery.

## Introduction

The endotracheal tube remains the gold standard in securing the airway. Supraglottic airway devices forms an important adjunct in securing the airway with minimal injury to oro-pharyngeal structures and less haemodynamic response compared to endotracheal tube. The PROSEAL LMA was introduced by Dr. Archie Brain in 2000, has an effective glottic seal favouring positive pressure ventilation, ease of insertion of device, less haemodynamic response to insertion and less postoperative complications. Hence a prospective randomised

single blinded study was designed to compare the paediatric Proseal LMA with the endotracheal tube in terms of placement of device, haemodynamic response and postoperative complications.

## Aim of the Study

The aim of the study is to compare the paediatric proseal laryngeal mask airway with the endotracheal tube for intubation in paediatric patients undergoing elective surgeries short duration under general anaesthesia with respect to ease of insertion, haemodynamic response and complications.

**Corresponding Author:** S. Chitra Devi, Assistant Professor, Department of Anaesthesiology, Government Stanley Medical College and Hospital, Chennai, Tamilnadu 600001, India.  
E-mail: [drchitradevi@rediffmail.com](mailto:drchitradevi@rediffmail.com)

Received on 19.02.2018, Accepted on 09.03.2018

## Materials and Methods

### Study Design

Randomization done using sealed envelope method. Patients posted for short duration surgery (<1 hr) of age 2–8 years of weight 10–20 kg belonging to ASA I and II were selected for the study. Institutional ethical committee approval was obtained. The procedures were explained to the parents of patients in their own language and written informed consent were obtained from them.

A thorough pre-operative assessment was done before surgery with detailed history of the patient, clinical examination with appropriate investigations and they were assessed for the respective surgeries. Pre-operative fasting guidelines (8hrs for solid foods, milk till 6 hrs and clear liquid till 4hrs) were given to them.

*Patients with* difficult airway, history of obstructive sleep apnoea, febrile seizures, upper respiratory tract infection and emergency cases were excluded.

### Methodology

After getting consent, the patients were assessed and kept on fasting guidelines. They were randomly allocated into one of the 2 groups

GROUP P-Proseal laryngeal mask group

GROUP T-Endotracheal group

Patients were brought into the theatre, monitors of pulse oximeter, non-invasive blood pressure, precordial stethoscope, ECG were connected, and intra venous line secured and base line parameters were recorded.

They were pre-medicated with inj.glycopyrrolate 0.01mg/kg body weight and inj.fentanyl 2micro gram/kg body weight five minutes prior to induction. Pre oxygenation was done for 3 minutes. Anaesthesia was induced with inj.propofol as an inducing agent with 2mg/kg body weight with inj.lignocaine 0.5mg/kg I.V body weight. Atracurium 0.5 mg/kg body weight was used as neuro muscular blocking agent with incremental boluses of 0.1 mg /kg body weight when required.

### Group P

PROSEAL laryngeal mask airway size 2 was selected, cuff deflated after checking the patency. Posterior surface of the device was lubricated with

2% lignocaine jelly. The child's head was kept in neutral position. The proseal laryngeal mask was inserted through the oral cavity using index finger technique. The cuff was inflated with 7-10 ml of air. After obtaining an effective airway which was confirmed by normal thoroacoabdominal movements, bilaterally audible breath sounds on auscultation, square wave form on capnograph, pulse oximeter readings, the PLMA was fixed to the chin by tape.

Three attempts were allowed for securing the airway before the device was considered as failure and it was replaced with an ET tube. This is termed as a failed attempt. Gastric tube number 10 was introduced through the drain tube, in this two attempts were allowed for gastric tube insertion before it was considered as a failure, and repositioning of the PLMA was done.

### Group T

In group T patients, appropriate size endotracheal tube was used for securing the airway.

All the patients were maintained with nitrous oxide 66% and oxygen 33% with sevoflurane 0.2-0.4% and manually ventilated with Jackson Rees paediatric circuit. Vital parameters were recorded post intubation immediately after placing the PLMA or endotracheal tube. Haemodynamic monitoring was done at the interval of 5 minutes and subsequently after 10 minutes of placing the device.

After the procedure was over, the patients had spontaneous ventilator efforts and were reversed with inj.neostigmine 0.05mg and injection glycopyrrolate 0.01mg/kg body weight. Thoroughly oral suctioning done and PLMA group gastric drain tube suctioning done. The patients were extubated after good recovery.

At the time of emergence any complications of cough, bronchospasm, or laryngospasm were noted in both the groups. After removal of airway device, blood staining of the endotracheal tube and posterior aspect of proseal laryngeal mask airway were assessed.

Patients were continuously monitored in post anaesthesia care unit and followed up for next 24 hours for any complication of sore throat or hoarseness of voice.

Statistical analysis were done by using SPSS software 16 version. Descriptive standards like mean, median, range, are calculated for all the variables. Student T tests and Chi square tests are used to find the significance between two groups

at the level of 5% confidence (alpha error). Student t test is used for descriptive data and Chi square test for categorical variables.

Both groups were comparable with respect to hemodynamics. Increased incidence of male patients was noted as most of the patients were posted for herniotomies and circumcision.

**Results**

We were able to intubate the patients in 92.5% in the first attempt using an endotracheal tube. 3 of them (7.5%) required a second intubation attempt.

In the proseal laryngeal mask airway group, the first attempt success rate was 82.7% (31 patients).

A second attempt was required in 17.3% (9 patients) in this group. The increase in heart rate and blood pressure after 5 minutes of intubation with the proseal laryngeal mask airway group was found to be lesser than the endotracheal tube.

After 10 minutes of intubation with proseal laryngeal mask airway the hemodynamic parameters were much reduced compared to the endotracheal tube. The hemodynamic response was found to be present even after 10 minutes of intubation with an endotracheal tube.

PLMA has less incidence of cough, bronchospasm and sore throat. there was more percentage patient shaving blood on device with PLMA group compared to the ETT.

**Table 1:** Heart rate

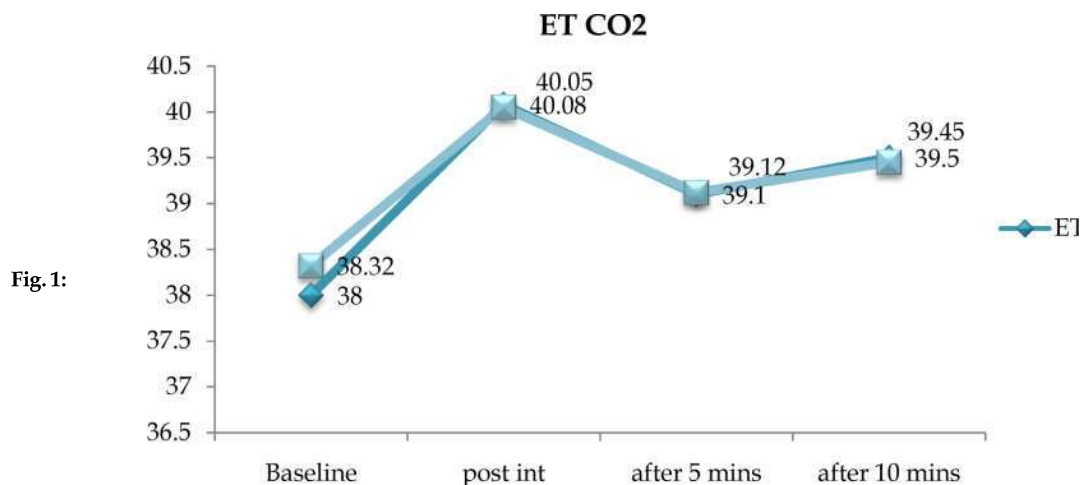
	ETT	PLMA	P Value
baseline	88.2±4.86	95.7±7.16	0.00
Post intubation	107.675±5.3	102.65±6.9	0.00
After 5 min	99.2±5.12	97.2±4.3	0.04
After 10 min	96.75±5.55	92.15±6.3	0.001

**Table 2:** Mean arterial pressure

	ETT	PLMA	P Value
baseline	85.55±3.29	85.912±3.44	0.64
Post intubation	87.37±3.95	86.42±3.96	0.21
After 5 min	78.64±3.27	79.75±3.42	0.14
After 10 min	83.12±3.57	78.3±3.52	0.001

**Table 3:** Complications

		ETT	PLMA	P Value
Cough	yes	10	3	0.03
	no	30	37	
Bronchospasm	yes	4	1	0.17
	no	26	39	
Blood on device	yes	4	11	0.01
	no	36	29	



**Fig. 1:**

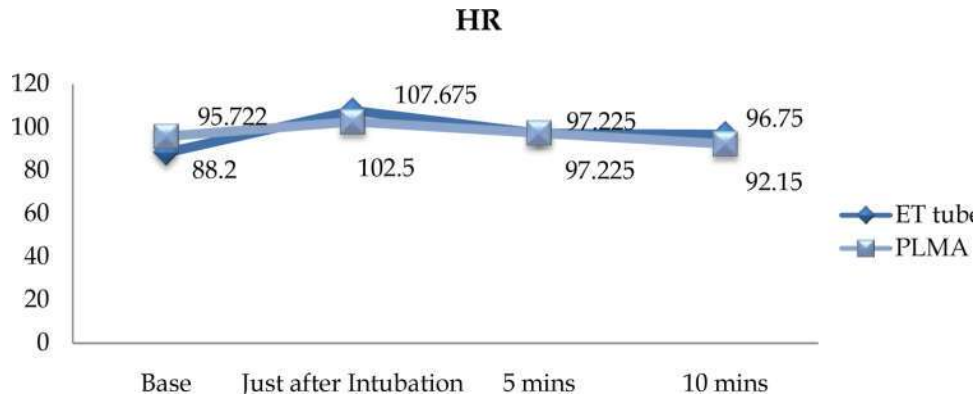


Fig. 2:

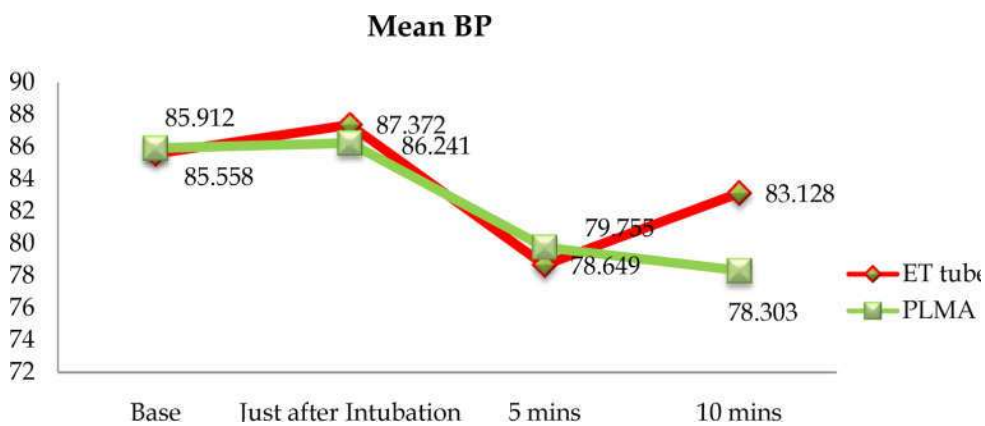


Fig. 3:

## Discussion

The supra glottic airway device is being used widely in paediatric practise and have become a pivot component in airway management in children [1,2,4].

It has been introduced as a replacement of face mask but now been used successfully for airway management in areas where endotracheal tube was considered mandatory [19-22].

The Classic laryngeal mask airway provides a lesser effective oro-pharyngeal seal, leading to gastric distension inflation, regurgitation and aspiration of gastric contents [6,9,10].

It could not be used for positive pressure ventilation because of the ineffective seal produced at the laryngeal inlet [3,10,11].

The Proseal laryngeal mask airway introduced in 2000 provided many added features for an effective and safe airway. It has become a modified form of Classic laryngeal mask airway [4].

The main features of Proseal laryngeal mask airway are oesophageal drain tube, integral bite block, modified cuff design, increased depth of the bowl which makes an effective oropharyngeal seal. This enables the device to be used for positive pressure ventilation [1,4,7,9,10,14].

The presence of the drainage tube forms an effective channel for passive drainage of gastric contents. A gastric tube inserted through the drainage tube helps in the prevention of gastric aspiration and also it is useful to identify the position of the device [6].

In our study we compared the number of attempts of the insertion of the device, hemodynamic parameters, heart rate, systolic & diastolic and mean arterial blood pressures, SpO<sub>2</sub> and EtCO<sub>2</sub> values. Further we observed the post-operative complications the emergence and in 24 hour post-op period.

### Intubation of Device

In our study we were able to intubate the patients in 92.5% in the first attempt using an endotracheal tube. 3 of them (7.5%) required a second intubation

attempt. In the proseal laryngeal mask airway group, the first attempt success rate was 82.7% (31 patients). A second attempt was required in 17.3% (9 patients) in this group.

This result coincided with the studies conducted by the following authors.

Jaya Lalwani [4] – who reported that the incidence of first attempt endotracheal intubation was 96.67% and correspondingly proseal laryngeal mask airway was used to intubate in 83.3%

Brimacombe [13]– reported successful first attempt intubation of both endotracheal tube and proseal laryngeal mask airway of 85% each of the devices.

Mamtha G. Patel [1]– also reported the first time insertion of the endotracheal tube was found to be 100% and for the proseal laryngeal mask airway was 90%.

Misra et al [5] reported 100% placement of the endotracheal tube in patients in first attempt and was able to place the proseal laryngeal mask airway in 88%.

Raufgul [2]– also reported the same incidence of placement in both the proseal laryngeal mask airway and endotracheal tube as mentioned above.

#### *Hemodynamic Stability*

The proseal laryngeal mask airway provided a stable hemodynamic status when used as a supraglottic airway device in paediatric patients undergoing elective surgery. The increase in hemodynamic response is minimal and the effect is sustained for a short time compared to the endotracheal tube intubation.

The baseline parameters of heart rate, mean arterial blood pressure, SpO<sub>2</sub> and EtCO<sub>2</sub> values were compared in both the groups.

The endotracheal tube intubation is associated with an increase in heart rate and blood pressure and this is established in various studies.

The proseal laryngeal mask airway as an intubation device produced a lesser increase in heart rate, systolic, diastolic and mean arterial blood pressure after intubation and subsequently in 5 and 10 minutes of the observation.

The increase in heart rate and blood pressure after 5 minutes of intubation with the proseal laryngeal mask airway group was found to be lesser than the endotracheal tube. After 10 minutes of intubation with proseal laryngeal mask airway the hemodynamic parameters were much reduced compared to the

endotracheal tube. The hemodynamic response was found to be present even after 10 minutes of intubation with an endotracheal tube.

The results obtained were found to be consistent with the work of other authors like

1. Misra et al., Sinha, Shani, Sood [5,18]– they reported that there is increase in hemodynamic response with the endotracheal tube intubation which was sustained for a longer time than the proseal laryngeal mask airway when it was used as an airway device.
2. Jaya Lalwani et al.[4]– who compared the proseal laryngeal mask airway and the endotracheal tube in paediatric patients undergoing short surgical procedures also found that the endotracheal tube group patients had an increased hemodynamic response to intubation which was found to be statistically significant.
3. Lim Y Goel, S Brimacombe [25] et al. observed that hemodynamic response to endotracheal intubation was found to be greater when compared to the proseal laryngeal mask airway group.
4. Mamta Patel [1]– compared the study of proseal laryngeal mask airway with the endotracheal tube for airway management in children under general anaesthesia and reported a significant change in hemodynamic parameters observed with endotracheal airway group compared to the proseal laryngeal mask airway group.

#### *Changes in SpO<sub>2</sub> and EtCO<sub>2</sub> Values*

The above values were comparable in both the groups during intraoperative and post-operative periods providing a good ventilator strategy. There were no significant changes observed by us in our study in both the groups.

Malty al. [26] and Sharma et al. [18] also reported that there was no significant difference observed while using proseal laryngeal mask airway and endotracheal tube while securing the airway.

#### *Complications during Emergence*

We found in our study that there is an increase in incidence of cough in the endotracheal tube group compared with the proseal laryngeal mask airway and it is found to have an important effect during emergence in anaesthesia and in the postoperative period. This result coincided with the study of the following authors who reported the same findings.

Mamta G. Patel [1]- reported an incidence of 13.3% of patients reported cough after surgery.

Rauf Gul [2]- also reported proseal mask airway when it was used as an intubation device an increased incidence of cough with the endotracheal tube group patients compared to the proseal laryngeal mask airway group

Jaya Lalwani [4] - the author observed that when using endotracheal tube as an intubation device cough was present in 30% of patients and it continued in the post-op period also and it was treated with bronchodilators.

There was no such incidence noted in the proseal laryngeal mask group.

#### *Bronchospasm*

This complication was found to be more with the endotracheal group compared with the proseal laryngeal mask airway group.

This finding is in concordance with the study of the following authors who reported that the complication of bronchospasm was found to be more with the endotracheal group compared to the proseal laryngeal mask airway.

Mamta G. Patel [1]- reported an incidence of increased bronchospasm with the endotracheal group when it was used as an intubating device.

Jaya Lalwani [4]- also reported that the endotracheal tube intubation was associated with an increased incidence of bronchospasm of 6.6% in the group. She also noted that the proseal laryngeal mask airway group produced less laryngeal irritation.

Rauf Gul [2]- found that there is an increased incidence of bronchospasm noted in the endotracheal tube group compared with the proseal laryngeal mask airway when it was used as an airway device.

#### *Blood on Device*

In our study we found that the blood staining on the posterior surface of proseal laryngeal mask airway was found in 9 persons (22%) when used for airway intubation.

There was only a reduced percentage in (4%) in the endotracheal group.

Mamta [1] and Rauf Gul [2] - observed the same incidence of parameters of blood staining on the device following intubation.

The above result was found to be consistent with the finding of various other authors also.

#### *Aspiration*

In our study we found that there was no incidence of aspiration in either of the groups, proseal laryngeal mask airway or the endotracheal tube group during the entire induction, intra-operative and post-operative periods.

This coincided with the report of the other authors.

#### *Sore Throat*

The incidence of hoarseness and sore throat was not associated with any of our patients in the immediate post-operative period and also for 24 hours following the surgery.

Hiiggins et al and SHROFF et al- found a greater incidence of sore throat in the patients undergoing intubation with endotracheal tube than with the proseal laryngeal mask airway when it was used as an intubation device.

#### *Positive Pressure Ventilation*

The proseal laryngeal mask airway which has a modified cuff that produce a good effective oropharyngeal seal preventing air leak. This enhanced seal pressure helped in positive pressure ventilation in paediatric patients who were undergoing surgeries under general anaesthesia. This is confirmed by various studies comparing the classic laryngeal mask airway and the proseal laryngeal mask group by the following authors.

David Rr Lardner [10], Bikram Jitdas [7] reported an increased incidence of oropharyngeal seal pressure observed with proseal laryngeal mask airway and it provided effective positive pressure ventilation.

Goldman and Jacob [3] - found the modified cuff of proseal laryngeal mask airway provided an effective oropharyngeal seal enhancing the positive pressure ventilation.

M Lopez, Brimacombe [13]- found that the proseal laryngeal mask airway with an increased oropharyngeal seal provided effective positive pressure ventilation in patients undergoing general anaesthesia.

#### *Drainage Tube*

The proseal laryngeal mask airway has a drainage tube placed lateral to the main airway

tube. This helps in the channelling of gastric contents and prevents gastric inflation, regurgitation and gastric aspiration.

A gastric tube passed into the drainage tube helped in the assessment of placement of the device.

This is supported by the author A.I.J. Brain [6] who stated that the aim of the drainage tube is to provide a safe effective airway device to be used for positive pressure ventilation.

### Conclusion

The observation of the study showed that the proseal laryngeal mask airway proves to be as safe and suitable airway device in paediatric patients undergoing elective surgical procedures.

Hence we arrived at the conclusion that the proseal laryngeal mask airway could be used as an effective alternative to endotracheal intubation in children undergoing short duration elective procedures under general anaesthesia.

### Acknowledgement

We like to acknowledge our patients who willingly participated in the study

*Conflict of Interest:* Nil

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