

A Comparative Study on Supraglottic Airway Devices Classic LMA, Proseal LMA, Blockbuster LMA in Adult Patients Undergoing Short Surgical Procedures

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Abstract

Introduction: The invention of supraglottic devices changed the focus of airway management during general anaesthesia (GA) from intubation to oxygenation and ventilation. There were many improvements in LMA with regard to intubation facility, anatomical similarity and increase in cuff volume. Hence comparative studies with various types of LMA is essential for its proper selection as per the need. Aim: The aim was to compare the utility of three different supraglottic airway devices namely Classic LMA, Proseal LMA and Blockbuster LMA.

Materials and Methods: This was a randomized single blind triple arm study involving 30 patients in each three groups. (Group C: classic LMA, Group P: proseal LMA and Group B: block buster LMA). The number of attempts, time and ease for insertion, sealing pressure, hemodynamic changes and complications were studied. SPSS software was used for statistical analysis. One-way ANOVA, Tukey HSD and chi-square test were used. The p value of < 0.05 was statistically significant.

Results: The time needed for insertion was significantly less with Proseal group and it was easy to insert than others. It also has less incidence of sore throat, blood staining and displacement. There was no significant difference with regards to attempt on first insertion, airway sealing pressure or hemodynamic changes between three groups. The block buster type was easy to insert and had less rate of complications than the classical type.

Conclusion: All the three supraglottic airway devices (classic, proseal, blockbuster LMA) can be safely used during GA and Positive Pressure Ventilation. Proseal LMA was quickly inserted than other types in this study with less complications than blockbuster type.

Keywords: Block buster, LMA, Proseal.

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Introduction

Endotracheal intubation is the definitive airway for ventilation and to prevent aspiration, during general anaesthesia.[1] The invention of supraglottic devices in 1981 changed the focus of airway

management during general anaesthesia from intubation to oxygenation and ventilation. With progress of time, supraglottic devices with advanced features like anatomical similarity, intubation facility

and increased cuff volume have been introduced. Many comparative studies have been done using classic LMA and proseal LMA showing that proseal LMA has a good sealing pressure and ease of insertion with less complications compared to classic LMA.[2,3] Blockbuster LMA is a new type of LMA, invented by professor Ming Tian has 4 way connector with Wing type fixed handle on its either side to fix on both side of patient's mouth avoiding damage to upper and lower lip with an elastic tape to the side fixed hook for rapid and convenient connection. It has a small antero-posterior diameter with a large transverse diameter which creates a large inner lumen reducing the ventilation resistance. It is angulated by more than 95 degrees with short airway tube provides easy insertion and matches oropharyngeal curve and helps in keeping

the LMA stable in position. The connector is integrated with the airway tube to reduce intubation resistance. The outlet of airway tube is circular while the bottom is rising wedge shape which enables endotracheal tube to enter glottis at exactly 30 degrees. Integral block bite prevents airway occlusion. At the right end of airway tube is a through tunnel created by gastric access channel and the mask. The whole upper part of gastric access channel forms an arch shape that connects with the bottom of the airway tube, making it easy to suck out the secretions. It is also fence to epiglottis when it covers the outlet causing ventilation occlusion. The design of inlet at tip of mask –slants upward and outward above the fixed handle as 5mm. Sputum collecting device helps in collecting even small quantity of sputum.

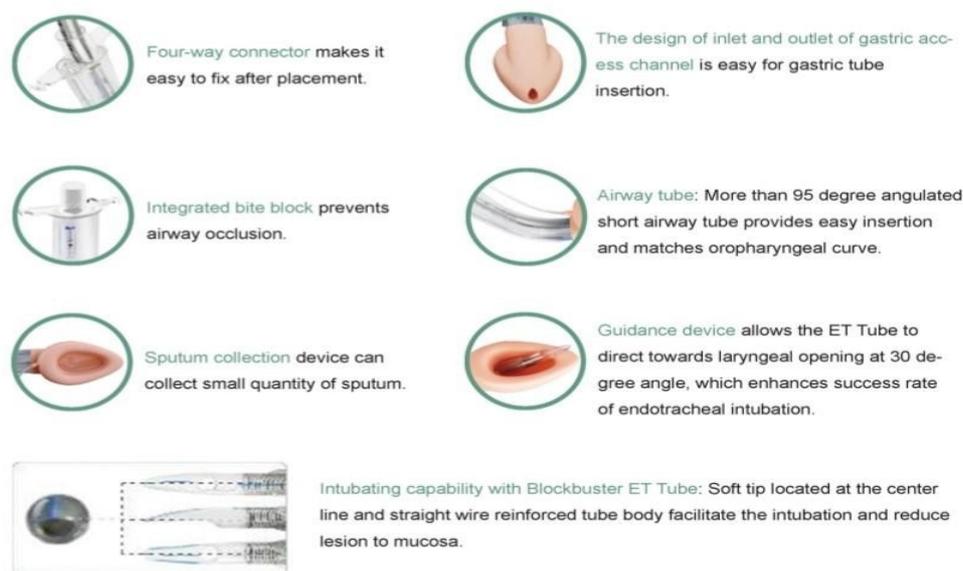


Figure 1

Aim

The aim was to compare the utility of three supraglottic airway devices namely classic LMA, proseal LMA and blockbuster LMA as airway devices for providing GA for short surgical procedures. The outcome was measured by parameters like number of attempts for insertion, time and ease of insertion, sealing pressure, hemodynamic changes and complications.

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Material and Methods

This study was a randomized single blinded triple arm study. The approval from institute's ethical committee was obtained. A pilot study was conducted to determine the sample size. A sample size of 30 patients in each group was calculated to be sufficient (Power – 80%, α value - 0.05, delta value - 3.5 and a standard deviation of 4.8).[7-9]

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Patients of either sex aged 18-60 years and of ASA I & II were included. The duration of surgery was proposed to be 30-120 minutes. Patients of ASA III & IV, obese cases, those with restricted mouth opening, suspected to have difficult intubation, surgery planned for long duration were excluded from the study. Thus 90 patients were selected for this study after obtaining informed consent. They were randomised into three groups of 30 each namely Group C (classic LMA), Group P (LMA proseal), Group B (block buster LMA) by computer generated randomization. Standard procedures for surgery were followed.[9] Standard monitors were attached. Baseline parameters such as BP, PR, temperature, spo2, respiratory rate were noted. Peripheral venous cannulation done. All patients were premedicated with Inj. glycopyrrolate 0.2mg, Inj fentanyl 2mcg/kg, Inj midazolam 0.02mg/kg. After preoxygenation with 100% o2 for 3min, patient were induced with Inj propofol 2mg/kg until loss of response to verbal commands was lost, paralyzed with Inj succinylcholine 2mg/kg iv. Patients head placed in sniffing the morning air position. According to allotted group, the appropriate LMA was inserted. LMA was lubricated with water based jelly, inserted and inflated with 20ml of air, in case of further leak, entire recommended air for inflation was used. The expiratory valve was closed and fresh gas flow 3L was kept. Stethoscope was kept in front of mouth and

positive pressure ventilation was given, the pressure in the manometer in the closed circuit at which audible sound was heard was noted and taken as the oropharyngeal sealing pressure. After that anaesthesia was maintained at N2O:O2 66%, 33%, Inj atracurium 0.1mg/kg or inhalation agent depending on duration of procedure. At end of procedure all patients were reversed with Inj. Neostigmine 0.5mg/Kg and Inj. Glycopyrrolate 10mcg/Kg. After adequate attempts and awakening LMA were removed after thorough suctioning.

Statistical analysis

SPSS software was used for statistical analysis. Descriptive statistics (mean, standard deviation and frequency) were used in the study. One-way ANOVA was used to compare normally distributed parameters. Tukey HSD test was used to identify the source of difference. To compare quantitative data, chi-square test was used. The results were expressed in 95% confidence interval. The value of $p < 0.05$ was considered to be statistically significant.[9]

Results

The age of the participants varied from 25 years to 60 years. There were 47 males and 43 females. They were equally distributed in all three groups without any selection bias with respect to their demographics. Their details are given in table as follows:

Table 1

Parameter		Classic N=30	Proseal N=30	Blockbuster N=30	p-value
Age in years	25 – 45	17	11	20	0.102 not Significant
	46 -55	7	10	8	
	> 55	6	9	2	
	Mean age	31.2	32.4	28	
	SD	7.827	8.657	6.787	
Sex	MALE	16	15	16	0.956 Not significant
	FEMALE	14	15	14	

Attempts of insertion

In our study, LMA was inserted in more than 55% in first attempt itself and by second attempt

in others. The 63% cases in classic LMA, 66% in proseal LMA and 56% in blockbuster type were inserted at first attempt. Ease of insertion was good in all three groups and it did not differ statistically with respect to number of attempts for insertion. The data are given in the table below.

Table 2

Parameter		Classic N=30	Proseal N=30	Blockbuster N=30	p-value
Number of attempts for insertion	One	19	20	17	0.202 not Significant
	Two	11	10	13	
	Mean	1.633	1.8	1.567	
	SD	0.615	0.407	0.504	
Time for insertion in seconds	< 25	12	20	12	0.011 significant
	26 - 35	9	6	10	
	> 35	9	4	8	
	Mean	33.2	24.5	31.333	
	SD	14.646	9.224	9.908	
Airway sealing pressure	< 20	7	5	11	0.195 Not significant
	> 20	23	25	19	
Complications	Displacement	4	0	3	-
	Blood Staining	8	1	4	
	Sore Throat	7	1	3	
	Hoarseness	3	1	1	
	Injury	1	0	2	
	Total	23	3	13	

Time and ease for insertion

The time taken for insertion varies in all 3 groups. The time of insertion in group C varied between 15 to 70 seconds. The time of insertion in group P and group B varied between 15 to 45 seconds. But the mean time of insertion was significantly less in Proseal group, and more patients were intubated easily with Proseal LMA. This was statistically significant with p value of 0.011.

Airway sealing pressure

There is no statistically significant difference in airway sealing pressure between three groups. The dorsal cuff is present in proseal LMA and blockbuster LMA, yet sealing pressure is better with proseal compared to blockbuster LMA.

Complications

There was no displacement of proseal LMA after placement and no injury was noted with proseal type when compared to other types. The blood staining, sore throat and

hoarsness of voice were also least with proseal LMA. The displacement, blood staining and sore throat were less in blockbuster type than the classical type.

Hemodynamic changes

The heart rate varied between 75 to 100 per minute for the patients during study. The NIBP had a range 110/70 to 140/90 across all the groups. SPO₂ was maintained between 99-100% across the groups. There were no significant desaturation noted in any patient. The various hemodynamic parameters like non-invasive blood pressure (NIBP), HR, SpO₂ during insertion, after 5 minutes, inraop period, removal and after removal were not changed significantly between the three groups.

Discussion

So far many studies has been done by comparing the proseal LMA with classic LMA and with many other SADS' like I gel, ambu aura, LMA supreme, SLIPA, Laryngeal tube suction-D. We now intend

to conduct comparison between blockbuster LMA with the other types of LMA.

In our study we were able to intubate more than 55% of patients in the first attempt itself with the highest of 66% for proseal LMA. The study done by H. Shimbori *et al.*, also stated the successful first attempt of insertion was high for proseal of 90%. [10,11] Though the rate of insertion at first attempt for Proseal LMA was high, it did not differ from other types significantly as noted in study by H. Shimbori *et al.*

The time taken for insertion of LMA varied between 15 to 70 seconds across the groups in our study. The Proseal LMA group had more number of patients who were intubated in less than 25 seconds and was very easy for insertion. This is statistically significant when compared to classic and block buster LMA. The block buster LMA was easy to insert than the classical type. In various studies conducted by K. Goldmann *et al.*, Shimbori H *et al.*, Pravesh Kanth *et al.* and Suzzana *et al.*, there were no significant difference between Proseal LMA and Classic LMA by ease of insertion. But in this study proseal type was easy to insert than other types. [11,14]

There was no significant statistical difference in achieving the airway sealing pressure across the groups in our study. This is similar to study conducted by Shimbori H *et al.* where the airway sealing pressure is comparable between classic 18 cm H₂O (6 out of 30) and proseal LMA 19cm H₂O (7 out of 30). The oropharyngeal sealing pressure were measured by studies conducted by Lopez-Gil M. *Et al.* and Keller C. *et al.* [14,15] showed no significant difference across the various LMA as noted in our study. The second generation LMAs provided better sealing pressure and prevents gastric aspiration. The dorsal cuff is present in proseal LMA and blockbuster LMA, yet sealing pressure is better with proseal compared to blockbuster LMA in our study.

There were no significant changes with regard to hemodynamic changes during insertion, intraop and removal of LMA in all groups. But in the study done by Dr. Radha *et al.*, comparing hemodynamic changes with proseal LMA and classic LMA, more hemodynamic changes were noted in proseal LMA compared to classic, attributing it to the presence of dorsal cuff. [10,14]

There was no displacement or injury with Proseal LMA which may be attributed to the better sealing pressure achieved and positioning in pharynx. Similarly, incidence of blood staining, sore throat and hoarseness of voice were least in Proseal group. The blockbuster LMA also had less complications when compared to classic LMA. The Classic LMA had more number of complications which is similar to study done by H. Shimbori *et al.* where LMA-Classic had a higher rate of postoperative blood staining, but there was no significant difference. [18-21]

Conclusion

All the three supraglottic airway devices can be safely used during GA and Positive Pressure Ventilation. The Proseal LMA had the advantage of less time of insertion, better sealing pressure and less complication like displacement, sore throat and blood staining. The block buster type has less complications than classic type. As these LMAs had an added advantage of gastric channel access, easy fixation and intubation options the wise selection as per patients need is necessary.

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Bibliography

1. Nolan JD. Prehospital and resuscitative airway care: should the gold standard be reassessed? *Curr*

- Opin Crit Care. 2001; 7:413–21.
2. Kim MS, Bai SJ, Oh JT, *et al.* Comparison of 2 cuff inflation methods before insertion of laryngeal mask airway for safe use without cuff manometer in children. *Am J Emerg Med.* 2013; 31:346–52.
 3. Choi GJ, Kang H, Baek CW, *et al.* A systematic review and meta-analysis of the i-gel[®] vs laryngeal mask airway in children. *Anaesthesia.* 2014; 69: 1258–65.
 4. De Montblanc J, Ruscio L, Mazoit JX, *et al.* A systematic review and meta-analysis of thei-gel[®] vs laryngeal mask airway in adults. *Anaesthesia.* 2014; 69:1151–62.
 5. Lee JR, Kim MS, Kim JT, *et al.* A randomised trial comparing the i-gel[™] with the LMA Classic[™] in children. *Anaesthesia.* 2012; 67:606–11.
 6. Castle N, Owen R, Hann M, *et al.* Assessment of the speed and ease of insertion of three supraglottic airway devices by paramedics: a manikin study. *Emerg Med J.* 2010; 27:860–3.
 7. Higgins JP, Altman DG, Gotzsche PC, *et al.* The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ.* 2011;343: d5928.
 8. Chen Z, Zhang G, Li J. Goodness-of-fit test for meta-analysis. *Sci Rep.* 2015; 5:16983.
 9. Hozo SP, Djulbegovic B, Hozo I. Estimating the mean and variance from the median, range, and the size of a sample. *BMC Med Res Methodol* 2005; 5:13.
 10. Maitra S, Baidya DK, Bhattacharjee S, *et al.* Evaluation of i-gel[™] airway in children: a meta-analysis. *Paediatr Anaesth.* 2014; 24:1072–9.
 11. H shimbori, K Ono, T Miwa *et al.* Comparison of LMA Proseal and LMA classic in children *BJA.* 2004 Oct;93(4):528-31.
 12. Chloros T, Xanthos T, Iacovidou N, *et al.* Supreme laryngeal mask airway achieves faster insertion times than Classic LMA during chest compressions in manikins. *Am J Emerg Med.* 2014; 32:156–9.
 13. Schunk D, Ritzka M, Graf B, *et al.* A comparison of three supraglottic airway devices used by healthcare professionals during paediatric resuscitation simulation. *Emerg Med J.* 2013; 30:754–7.
 14. Chen X, Jiao J, Cong X, *et al.* A comparison of the performance of the I-gelvs. the LMA-S during anesthesia: a meta-analysis of randomized controlled trials. *PLoS One* 2013;8: e71910
 15. Stroumpoulis K, Isaia C, Bassiakou E, *et al.* A comparison of the i-gel and classic LMA insertion in manikins by experienced and novice physicians. *Eur J Emerg Med.* 2012; 19:24–7.
 16. Goliash G, Ruetzler A, Fischer H, *et al.* Evaluation of advanced airway management in absolutely inexperienced hands: a randomized manikin trial. *Eur J Emerg Med.* 2013; 20:310–4.
 17. Castle N, Pillay Y, Spencer N. Insertion of six different supraglottic airway devices whilst wearing chemical, biological, radiation, nuclear-personal protective equipment: a manikin study. *Anaesthesia.* 2011; 66:983–8.
 18. Moher D, Liberati A, Tetzlaff J, *et al.* Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med.* 2009;6: e1000097.
 19. Kwak DI, Yoo JH, No HW, *et al.* Comparison between the LMA Classic[™]and new I-gel[™] supraglottic airway device: a manikin study. *Hong Kong J Emerg Med.* 2013; 20:25–33.
 20. Kim MS, Lee JR, Shin YS, *et al.* Comparison of 2 cuff inflation methods of laryngeal mask airway Classic for safe use without cuff manometer in adults. *Am J Emerg Med.* 2014; 32:237–42.
 21. Ragazzi R, Finessi L, Farinelli I, *et al.*

- LMA Supreme vs i-gel—a comparison of insertion success in novices. *Anaesthesia*. 2012; 67:384–8.
22. Cook TM, Green C, McGrath J, *et al.*

Evaluation of four airway training manikins as patient simulators for the insertion of single use laryngeal mask airways. *Anaesthesia*. 2007; 62:713–8.