



Comparison of Gum Elastic Bougie Guided Insertion of The Proseal Laryngeal Mask Airway with Digital and Introducer Tool Techniques

Shruti Gupta, Heena Gupta, Shipra Gupta, Ajay Gupta

Abstract

Introduction: Gum Elastic Bougie (GEB) guided technique of insertion of Proseal Laryngeal Mask Airway (PLMA) was compared with the conventional digital manipulation and introducer tool (IT) technique in adults undergoing elective surgery under general anesthesia. **Material and Methods:** Ninety American Society of Anesthesiologists (ASA) grade 1 and 2 adult patients were randomly divided into three groups. In Group A (n=30) LMA Proseal was inserted by using index finger (Digital technique); Group B (n=30) - LMA Proseal was inserted by using an Introducer Tool (IT); Group C (n=30) - LMA Proseal was inserted by using Gum Elastic Bougie (GEB). Success rate of LMA placement and time taken to insert LMA using these three techniques were compared. Any visible staining on GEB, IT, laryngoscope or LMA Proseal was noted at removal. Any airway trauma and postoperative airway complications were recorded. **Results:** First attempt PLMA insertion success rate was highest with GEB (100%). Insertion of PLMA using GEB guided technique (23.30±4.99 seconds) was faster than IT (25.97 ± 9.74 seconds) and digital technique (29.40±13.95 seconds). Postoperative airway morbidity was least with GEB. **Conclusion:** Gum Elastic Bougie guided insertion technique of PLMA is a better alternative to standard Digital and IT technique.

Key Words

Proseal, Gum Elastic Bougie, Introducer Tool, Digital

Introduction

Proseal LMA introduced by Dr Archie Brain, as a modification of the classic LMA designed for positive pressure ventilation, has increasingly become the mainstay of anesthesia practice in a variety of settings. The dorsal cuff and drain tube broaden its application.^[1] However, it was found to be relatively difficult to insert as compared

to classic LMA.^[2] Many tools have been developed to facilitate the insertion of the Proseal LMA insertion, which can be impeded by folding of its soft cuff.^[3,4] The aim of the present study was to assess the ease of insertion and correct placement of PLMA using a GEB and compare it with an introducer tool and digital technique in adults

Department of Anaesthesiology and Critical Care, GMC Jammu, J&K, India.

Correspondence to: Dr Shipra Gupta, Department of Anaesthesiology and Critical Care, GMC Jammu, J&K, India.

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undergoing elective surgeries.

Material and Methods

After approval from the Institutional Ethical Committee, ninety patients with ASA aged >18 years undergoing elective surgery under general anesthesia were enrolled in the study after taking written informed consent. Patients were divided randomly into 3 groups. In Group A (n=30) - LMA Proseal was inserted by using index finger (Digital technique); Group B (n=30) - LMA Proseal was inserted by using an Introducer Tool; Group C (n=30) - LMA Proseal was inserted by using Gum Elastic Bougie. Exclusion criteria included 1) BMI >30 kg/m² 2) patients with inter incisor gap < 5 cm, thyromental distance < 6.5 cm, Mallampatti Grade , amplitude of head and neck movement < 90° 3) upper respiratory tract infection 4) patients at risk of aspiration (non fasted) 5) ASA Patients were prepared by overnight fasting. Tablet midazolam 7.5 mg was given on the night before surgery and on the morning of surgery. On arrival in the operating room, an intravenous line was established and baseline parameters (heart rate, blood pressure), and oxygen saturation were recorded. Patients was given inj. Ondansetron 0.1 mg/kg, fentanyl 1-2µg/kg and then oxygenated via facemask for 3-5 minutes. Inj Propofol (2-2.5 mg/kg) was injected till the loss of verbal contact followed by neuromuscular blockage by rocuronium 0.75mg/kg. Proper size LMA was introduced using one of the three techniques.

Group A: The digital technique involved the use of index finger to press LMA Proseal into and advance it into palatopharyngeal curve

Group B: The IT technique involved attaching the introducer tool, using a single handed rotational technique to press LMA Proseal against the hard palate and advancing it around the palatopharyngeal curve and then removing the IT.

Group C: For the GEB guided technique, the drain tube of LMA Proseal was primed with a lubricated GEB with its straight end first, leaving the 5 cm bent portion protruding from the proximal end (for the assistant to grip), and the maximum length protruding from the distal end (for the anesthesiologist to manipulate). Under gentle

laryngoscopy, the distal portion of GEB was placed 5-10 cm into the esophagus while the assistant held LMA Proseal and the proximal portion. Then after removing the laryngoscope, LMA Proseal was glided over the GEB while the assistant stabilized the proximal end of GEB so that it did not move further down into the esophagus. GEB was then removed. All these techniques were performed with the patient in the sniffing position with the cuff fully deflated and using a midline approach. After insertion, cuff was inflated with air until effective ventilation was established or the maximum recommended inflation volume reached (successful placement). The time between picking up the laryngoscope or prepared LMA Proseal (cuff deflated, lubricated IT or GEB attached) and successful placement in the pharynx was recorded. The device was then fixed and connected to anaesthetic circuit. A lubricated 16 or 14 French gastric tube was inserted if there was no gas leak from the drainage tube. Correct placement of LMA Proseal was confirmed by the presence or absence of oropharyngeal leaks (detected by listening over the mouth), gastric air leaks (detected by listening with a stethoscope over the epigastrium) and drainage tube air leaks (detected by placing lubricant over the proximal end of the drain tube). Three attempts were allowed before insertion of LMA Proseal was considered a failure. Failed LMA insertion was defined by any of the two criteria 1) failed passage into the pharynx 2) malposition (air leak, failed gastric tube insertion if pharyngeal placement is successful). Anaesthesia was maintained with N₂O:O₂ in the ratio of 66:33% with halothane 0.2-1%. Analgesia was provided with inj diclofenac 75 mg Intravenously (IV) and rocuronium was used to maintain neuromuscular blockade. Residual effect of neuromuscular blocking drugs was reversed with neostigmine 50µg/kg and glycopyrrolate 10µg/kg. Patient was given 100% oxygen during emergence and airway device was removed when patient was awake. Any visible staining on GEB, IT, laryngoscope or LMA Proseal was noted at removal. The mouth, lips and tongue were inspected for evidence of trauma. Patient was asked about sore throat (constant

Table 1. Demographic Variables

	Group A (n=30)	Group B (n=30)	Group C (n=30)
Age (years)	39.67 ± 12.64	39.67 ± 12.64	42.63 ± 10.19
Sex (M: F)	14:16	14:16	12:18
BMI (kg/m ²)	23.17 ± 2.97	22.14 ± 3.32	22.71 ± 2.94
MPG :MPG distribution	17:13	18:12	14:16

Table 2. LMA Proseal insertion characteristics

Time of insertion (seconds)	Group A (n=30)	Group B (n=30)	Group C (n=30)
	29.40 ± 13.95	25.97 ± 9.74	23.30 ± 4.99
Number of Attempts	1	2	3
Failed	24 (80%)	26 (86.67%)	30 (100%)
	1 (3.33%)	0 (0%)	0 (0%)
	1 (3.33%)	3 (10%)	0 (0%)
	4 (13.33%)	1 (3.33%)	0 (0%)

Table 3. Postoperative Complications

	Group A (n=30)	Group B (n=30)	Group C (n=30)
Blood Staining of device	8 (26.67%)	5 (16.67%)	1 (3.33%)
Tongue, lip, mouth trauma	2 (6.67%)	1 (3.33%)	0 (0%)
Sore Throat	6	2	0 (0%)
Dysphonia	0 (0%)	0 (0%)	0 (0%)
Dysphagia	1 (3.33%)	0 (0%)	0 (0%)
Injury on Soft Palate	2	1	0
Indirect Base of Tongue	1	0	1
Laryngoscopy Pharyngeal Wall	1	1	0
Vocal Cord	0	0	0

pain independent of swallowing), dysphonia (difficulty or pain on speaking) and dysphagia (difficulty or pain on swallowing) 24 hours after surgery.

The primary outcome of the study was to compare the three techniques of LMA Proseal insertion with respect to insertion success rate and time. The secondary outcomes were to compare the blood staining on device after its removal and postoperative airway morbidity (trauma, sore throat, hoarseness of voice), if any.

Results

All three groups were demographically comparable (Table 1). First attempt PLMA insertion success rate was highest with GEB (100%) followed by IT (86.67%) and Digital (80%) technique (Table 2). Use of more than one attempt was required in 6 patients out of 30 in group A (Digital technique). There was no statistically significant difference in insertion time of PLMA between Digital and IT techniques as well as IT and GEB guided

technique. However, insertion of PLMA using GEB guided technique (23.30±4.99 seconds) was faster than digital technique (29.40±13.95 seconds) and the result was statistically significant (p<0.05). On device removal, blood staining of PLMA, airway trauma and postoperative airway complications were highest with Digital technique and lowest with GEB (Table 3).

Discussion

The result of our study showed that GEB guided insertion of PLMA has higher success rate, shorter insertion time and less post operative airway morbidity as compared to Digital and IT techniques.

In our study GEB assisted LMA insertion had 100% first attempt success rate compared to IT (86.6%) and Digital (80%) techniques. Higher first attempt LMA insertion success rate were observed with GEB (96.67%) in a study by Sharma D *et al* in 60 anesthetized patients over IT (73%).^[5] Similar outcomes with GEB has been noted



in other studies as well. ¹⁶⁻⁸¹ The GEB guided technique was more frequently successful because it reduces the impaction at the back of the mouth, prevents folding over of the distal cuff and guides the distal cuff directly into the hypopharynx. Gum Elastic Bougie guided technique was successful in all patients and also in those patients in whom PLMA could not be introduced with other two techniques. Other advantage of GEB technique was that the overall insertion time was less due to higher first attempt success rate. There was no statistically significant difference in insertion time of PLMA between Digital and Introducer tool techniques. The insertion time of PLMA using IT and GEB guided technique was also comparable. However, insertion of PLMA using GEB guided technique (23.30 ± 4.99 seconds) was faster than digital technique (29.40 ± 13.95 seconds) and the result was statistically significant ($p < 0.05$). This also correlates with the findings of Brimacombe J and Taneja S et al who showed that the time taken for insertion of PLMA using GEB guided technique (25 ± 14 seconds) was less as compared to Digital (33 ± 19.5 seconds) and IT techniques (37 ± 25.5 seconds). ¹⁹⁻¹¹¹ However, Anand Kuppusamy A and Azhar N *et al* in their study concluded that, effective airway time was longer in GEB guided technique. ^{112, 131} This result is different from the result of our study. The principle cause of delayed insertion with the digital technique in our study was the failure to insert the PLMA in first attempt. The potential disadvantages of GEB technique were potential for airway stimulation and pharyngoesophageal trauma as GEB was stiff and was not meant for esophageal placement. However, there was no case of bronchospasm or laryngospasm using this technique. At the end of the procedure, we checked the PLMA, IT, GEB and laryngoscope for any visible blood stains in all the three groups. 8 patients (26.67%) with Digital technique, 5 patients (16.67%) with IT technique and 1 patient (3.33%) with GEB guided technique has visible blood staining of the dorsal surface of PLMA, whereas IT, laryngoscope and GEB were clear in all cases. Intergroup comparison revealed that post

operative blood staining of PLMA at the end of procedure was less common with GEB guided technique due to need for fewer attempts. Similar to our findings, Das B et al noticed more blood staining in IT group than with GEB though it was clinically insignificant. ¹¹¹¹ Two patients with Digital technique had minor cuts on lips whereas 1 patient with IT technique had minor lip trauma. No patient with GEB guided technique had mouth, tongue or lip trauma at the end of the procedure. These results were in accordance to other studies. ^{111, 121} Consistent to our study, Taneja S found incidence of trauma was significantly less in the GEB-guided group. ¹¹⁰¹ In our study, sore throat was found to be more common complaint with Digital technique and lowest with GEB guided technique. Incidence of sore throat was higher with digital technique in other studies as well. ^{13, 14, 151} Others found no significant incidence of airway complications with IT and GEB. ¹¹ Sore throat may be caused by friction between the Proseal LMA cuff and oropharyngeal tissues during placement and removal, high cuff inflation pressure, forceful LMA advancement. ¹¹⁶¹

Limitations

There were a few limitations in this study. First, we did not include fibroscopic evaluation of various cuff positions, but we relied on the basic tests which were simple, safe, and effective in determining various cuff positions observed in our study. Furthermore, investigator and the assistant recording the data were not blinded to the study technique. This was inevitable because the two techniques cannot be concealed from those involved in the study. Nevertheless, those involved in data analysis were blinded from the technique.

Conclusion

Compared to the Digital and Introducer Tool PLMA insertion technique, Gum Elastic Bougie-guided Proseal Laryngeal Mask Airway insertion is an easier, reliable, higher first-pass success rate and relatively atraumatic technique. Hence, GEB guided insertion technique of PLMA is a better alternative to standard Digital and IT technique.

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Nil.

Conflicts of Interest

There are no conflicts of interest.

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