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Efficacy of Seal of Proseal Laryngeal Mask Airway by Using Digital Insertion and Bougie Guided Insertion Techniques

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Abstract

Introduction: The Laryngeal Mask Airway (LMA) was designed to facilitate separation of the gastrointestinal and respiratory tracts, improve the airway seal, enable controlled ventilation and diagnose mask misplacement. A Drain Tube (DT) enables diagnosis of mask misplacement and also aims to attenuate risks of gastric inflation, regurgitation and aspiration of gastric contents. *Aims and Objectives:* Our objective is to compare digital insertion and bougie guided insertion of the ProSeal LMA with respect to the oropharyngeal leak pressure, number of attempts to successful placement, effective airway time, airway trauma insertion, postoperative airway morbidity and hemodynamic response to insertion. *Materials and Methods:* In our study, compared ProSeal LMA insertions using the digital and bougie guided techniques in 40 adult ASA I & II patients randomized into Two Groups of 20 patients. *Results:* The study finds that effective airway time (37.3 ± 3.7 seconds *vs* 20.8 ± 3.0 seconds) and oropharyngeal leak pressure (31.8 ± 1.7 cm H_2O *vs* 24.2 ± 3.2 cm H_2O) are higher in the bougie guided group as compared to the digitally inserted group and that this association is statistically significant. The two techniques are comparable with respect to other parameters. *Conclusion:* The bougie guided technique of insertion of ProSeal LMA is an acceptable alternative to the digital technique. It has advantages of having a higher leak pressure and lesser chance if malposition. The disadvantages include a higher effective airway time and the potential for stimulation and trauma.

Keywords: Laryngeal Mask Airway; Bougie Guided Insertion; Controlled ventilation

Introduction

Airway management is the cornerstone of anesthesia and resuscitation. In spite of tremendous advances in contemporary anesthetic practice, airway management continues to be of paramount importance to anesthesiologists. Till date, the cuffed endotracheal tube was considered the gold standard for providing a safe seal around the glottis region, especially for laparoscopic surgeries under general anesthesia.[1] The disadvantages of endotracheal intubation, which involves laryngoscopy are in terms of concomitant hemodynamic responses and damage to the oropharyngeal structures at insertion. Postoperative sore throat is also a concern. This precludes the global utility of the tracheal tube and requires a better substitute.[2] Over a phase of time, new airway devices have been added to the anesthesiologist's armamentarium.

Laryngeal Mask Airway combines the advantages of a noninvasive face mask and the more invasive endotracheal tube. Initially, LMA

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was recommended as a better alternative to the face mask. However, ever since its inception, the LMA has questioned the supposition that tracheal intubation is the only acceptable way to maintain a clear airway and provide positive pressure ventilation. Since, its commercial introduction in the late 1980's, it has been used in over 250 million routine and emergency procedures. Though LMA provides all the above benefits, the danger of gastric insufflation, pulmonary aspiration of stomach contents and fear of insufficient ventilation acts as a deterrent to the widespread use of LMA. To overcome the above difficulties, Archie Brain designed the ProSeal Laryngeal Mask Airway (PLMA)™ in 2000, with an altered cuff to improve seal around glottis. The main aim of the Drain Tube is to enhance the scope and safety of the device, mainly when used with positive pressure ventilation.[3] Adult studies have shown that compared to classic laryngeal mask airway, the PLMA forms an improved seal with both respiratory and gastrointestinal tract and provides easy access to the alimentary tract.[4]

Conventional airway management involves the use of the mask, the direct laryngoscope, and the endotracheal tube, whereas fiberoptic bronchoscope has been the gold standard for an access and intubation in difficult airways. Over the airways, continued incidences of hypoxia during airway management led to efforts to device effective alternatives. Much of the latest advances have been in the form of supraglottic airway devices and video units. Preferably such devices should be easier to use technically, allow early and fast introduction, provide satisfactory cuff seal without alteration of cuff shape, prevent pulmonary aspiration, allow positive pressure ventilation, maintain airway framework, allow easy removal alone or if used for intubation, should be available for all ages, should be able to be reused, should be easy to sterilize, should be cheap and most significantly, should be authenticated for consistent use based on effectiveness in large population.

Materials and Methods

Randomized controlled trial done in Department of Anesthesiology for a period of I year from Aug 2017 to Aug 2018. Patients of either gender of ASA class I& II of age group 20–60 years undergoing surgeries under general anesthesia.

Inclusion Criteria

1. ASA I, II;
2. Age group 20–60 years;
3. Patients posted for surgery under general anesthesia (duration <3 hours).

Exclusion Criteria

1. Patients with clotting and coagulation disturbances due to any reason
2. Patients with an increased risk of aspiration (Hiatus hernia, GERD, obesity, and pregnancy).
3. Patients with an anticipated difficult airway.

Forty ASAI and Il patients, of either sex, between 20 and 60 years, scheduled for surgery under general anesthesia (duration <3 hours) were allocated into two groups of 20 patients each.

The sample size for the study was based on a pilot study on 10 patients. The outcome of the pilot study indicated that a sample size of 30 in each group would give enough power of more than 85%. However, the results of the pilot study are not included in the results of the main study.

Preoperative Evaluation

The following parameters will be examined a day before surgery are Age, height, and weight, Airway evaluation, Basal heart rate and blood pressure. Procedure explained and detailed informed consent obtained. Nil per oral 8 hours prior to surgery. Tab. Alprazolam 0.5 mg. Tab. Pantoprazole 40 mg + domperidone 10 mg at 10 pm day before surgery and 6 am on the day of surgery.

Preparation of procedure room

Anesthesia machine and the ventilatorare tested. A flow sensor check is performed. Bain's circuit is tested. A standby of working laryngoscope with appropriate bladesize, endotracheal tubes, stylet, mask, and oropharyngeal airways are kept ready. Bougie and introducer are also kept ready. ProSeal LMA cuff is inflated and checked for leaks and deflated which is selected according to the weight used algorithm advised by the manufacturers, shows as in (Table 1). A water-based jelly is applied over the cuffed portion of the device as per the manufacturer recommendation. All emergency drugs are prepared. The suction apparatus is tested and connected with soft tipped suction catheter.

The patients will be divided into Two Groups:

Group D-ProSealLMA insertion by digital technique.

Group B- ProSeal LMA insertion by the bougie guided technique.

Monitors were Electrocardiogram, Non-invasive blood pressure, Pulse oximeter and Capnogram. Intravenous line with an 18G cannula is obtained in a superficial vein of the dorsum of the hand. The patients will be premedicated with Inj. Midazolam 0.02 mg/kg, Inj. Glycopyrrolate 0.004 mg/kg, Inj. Ondansetron 0.08 mg/kg and Inj. Pentazocine 0.2 mg/kg.

Procedure

The patient's head is supported on a firm pillow of height 10–12 cm. Preoxygenation is given with 100% oxygen for 3 minutes, and anesthesia is induced with Inj. Lignocaine 1.5 mg/kg and propofol 2 mg/kg. On the loss of verbal contact, the anesthetist checks that the patient could be hand-ventilated with a face mask and checked for manual mask ventilation. Only then, Inj. Succinylcholine 2 mg/kg is given intravenously. After an adequate depth of anesthesia and muscle relaxation achieved i.e., after one minute and jaw is relaxed. ProSeal LMA will be inserted by the digital/bougie technique according to the study group which is explained below:

Group D - The Digital Technique

ProSeal LMA will be selected as per body weight chart and insert using index finger as recommended by the manufacturer. Then cuff of the device is inflated not less than 25% of the maximum recommended volume, as this provides the maximum effective seal.

Group B - Bougie guided insertion

The ProSeal LMA will be primed with well lubricated 16F gum elastic bougie with the straightend protruding 30 cm beyond the drain tube. Under the laryngoscopic guidance, the distal portion of bougie will be placed 5–10 cm into the esophagus. The laryngoscope will be removed and ProSeal LMA will be inserted using the digital technique, while an assistant stabilizes the proximal end the bougie. The bougie will be removed while ProSeal LMA is held in position. All insertions will be performed in sniffing position with cuff fully deflated and using midline approach. Then cuff of the device is inflated not less than 25% of the maximum recommended volume, as this provides the maximum effective seal.

Ventilation is judged to be optimal if the following four tests are satisfactory:

- Adequate chest movement;
- Stable oxygenation not less than 95%;
- "Square wave"capnography and
- Normal range end-tidal CO_2.

In both the groups, if it is not possible to ventilate the lungs, the following airway maneuvers are allowed: chin lift, jaw thrust, head extension, or flexion on the neck. After any maneuver, adequacy of ventilation is reassessed. If it is not possible to insert the device or ventilate through it, two more attempts of insertion are allowed.

Three attempts will be allowed before insertion is considered a failure. The time between picking up laryngoscope/ProSeal LMA and successful placement will be recorded. Any episode of hypoxia (SpO_2 < 90%) or other adverse events will be noted. In the event of a failed insertion of the ProSeal LMA after three attempts, the patient will be intubated with endotracheal tube and surgery will be allowed to proceed. Oropharyngeal leak pressure will be measured as the pressure at which audible leak is heard at a constant flow of 6 lit/min with the Adjustable Pressure Leak valve kept closed (Drager workstation). Pulse rate, Systolic blood pressure, Diastolic blood pressure and Mean Arterial Pressurewill be recorded prior to insertion and one, three, fiveminute intervals after insertion.

Variables Measured were First attempt success rate, Oropharyngeal leak pressure, Number of insertion attempts and Effective Airway Time (EAT). After securing the ProSeal LMA, the patients were started on controlled ventilation at tidal volume 6–8 ml/kg and respiratory rate of 12–15 breaths/min. Muscle relaxation is provided with a loading dose of vecuronium 0.1mg/kg. Propofol infusion with N_2O:O_2 mixture in a ratio of 4:2 and muscle relaxation with vecuronium 0.02 mg/kg at 15–20 minutes interval is used for maintenance of anesthesia. Analgesics like diclofenac 75 mg or paracetamol 1 gm are started as an intravenous infusion. At the end of surgery, anesthetic agents are discontinued after the effect of last dose muscle relaxant, when the patient begins spontaneous ventilation with adequate tidal volume, suction will be done. N_2O is stopped with the continuation of 100% O_2. Reversal is given with Neostigmine 0.05 mg/kg and glycopyrrolate 0.08 mg/kg. After attaining adequate reversal, the device will be removed under thorough suction. Any visible blood staining on ProSeal LMA orbougie or laryngoscope will be recorded. Mouth, lips, and tongue will be closely inspected for any evidence of trauma.

Statistical Analysis

The results are obtained by statistical analysis. Data isanalyzed using computer software, Statistical Package for Social Science (SPSS) version 10. Physical Status, Mallampati grading classification, mouth opening, size of the device, SpO_2 is analysed using either *t*-test or Chi-square test, depending on their distribution and whether it is a qualitative or quantitative data.

Results

Out of the 40 patients studied, the percentage of patients in each age group and the mean age is comparable and not statistically significant. The percentage of the patients of a gender in each group is comparable even though the sex ratio favors female sex. But it does not affect the outcome of our study. Using Fisher's exact test it was found that, the difference is not statistically significant.

Table 1: Demographic data comparison of the groups

Parameters	ProSeal LMA insertion technique				X^2	*p* - value
	Bougie guided		Digital			
	Count	Percentage	Count	Percentage		
Age						0.629
<30	3	15	2	10	0.49	
30–39	4	20	3	15		
40–49	6	30	9	45		
50–59	7	35	6	30		
Gender						
Male	7	35	10	50		
Female	13	65	10	50	0.92	0.337
ASA						
I	14	70	14	70	0	1.00
II	6	30	6	30		

p -value: <0.05 → Significant.

This study warranted the patients to be within the ASA-PS I & II classes. The percentage of patients within each group are comparable and calculated to be statistically insignificant. The distribution of patients based on weight is comparable. The mean weight is alsocomparable and statistically not significant (Table 1).

The percentage of patients within each group are comparable and calculated to be statistically insignificant. The thyromental distance was measured and two study groups were comparable based on it. But, no significance was noted statistically, (Table 2). Mouth opening among the two groups was comparable and there is no

Table 2: Mouth opening parameters comparison of the groups

Parameters	ProSeal LMA insertion technique				X^2	*p* - value
	Bougie guided		Digital			
	Count	Percentage	Count	Percentage		
Mallampatti grade classification						
I	8	40	9	45		
II	12	60	11	55	0.1	0.75
Thyromental distance						
<6.5	5	25	9	45	3.31	0.191
6.5	2	10	0	0		
>6.5	13	65	11	55		
Mouth opening						
>6	16	80	18	90	0.784	0.376
4–6	4	20	2	10		
ProSeal LMA size based						
3	9	45	7	35	0.42	0.519
4	11	55	13	65		

p -value: <0.05 → Significant.

significance statistically as measured by Fisher exact test. Weight and physical characteristics of the patients, the size of LMA is selected (refer selection guide, (Table 3). The groups were comparable, bears no particular effect on the outcome and are therefore statistically insignificant.

Table 3: Number of attempts for insertion of LMA based comparison of the groups

Number of attempts	ProSeal LMA insertion technique				X^2	*p* - value
	Bougie guided		Digital			
	Count	Percentage	Count	Percentage		
I	18	90	14	70		
II	2	10	5	25	2.786	0.248
III	0	0	1	5		

p-value: <0.05 → Significant.

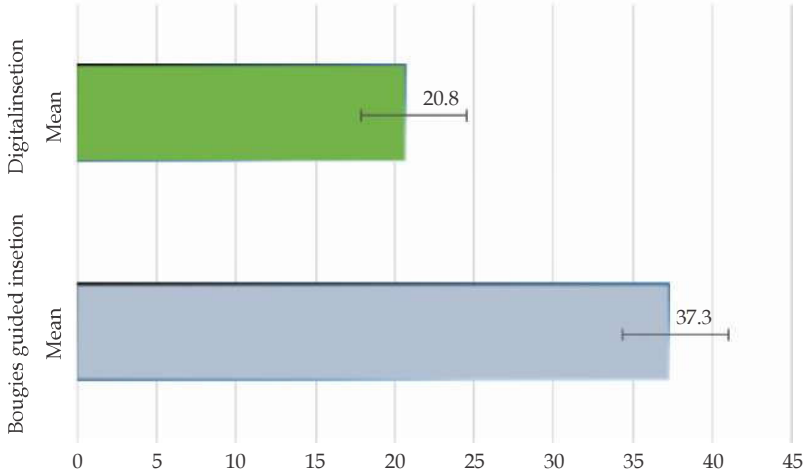

Fig. 1: Graphical comparison of Effective Airway Time based on the group.

Number of attempts in both the groups were comparable and there was no significance statistically.

The effective airway time is longer in patients with bougie-guided insertion compared to digital

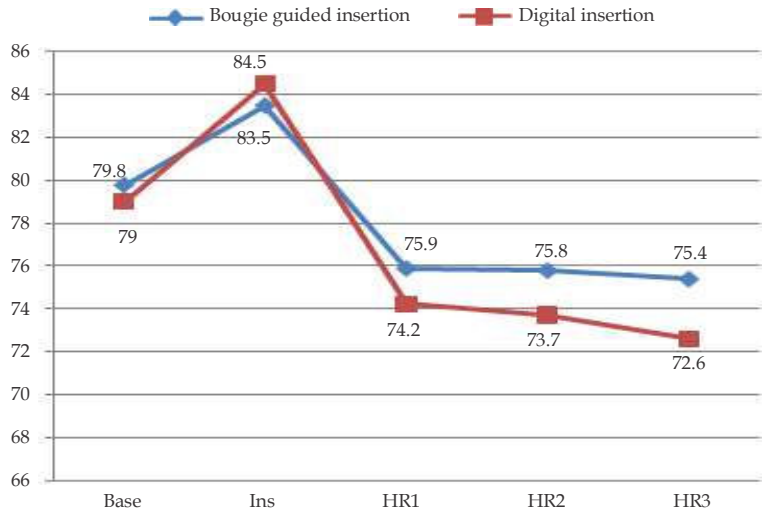

Fig. 2: Graphical comparison of Heart Rate based on the group at different intervals.

insertion. The difference between the two groups is statistically significant (Fig. 1).

With respect to Heart Rate, both the groups are comparable. The mean Heart rate does not show any statistical significance by the different techniques. Also, the mean pulse rate is comparable over the three phases (Fig. 2).

The MAP is more for the bougie guided technique as compared to digital insertion but this is not statistically significant.

There is no statistically significant difference in the incidence of visible blood staining on the LMA device using the two different techniques (Fig. 4).

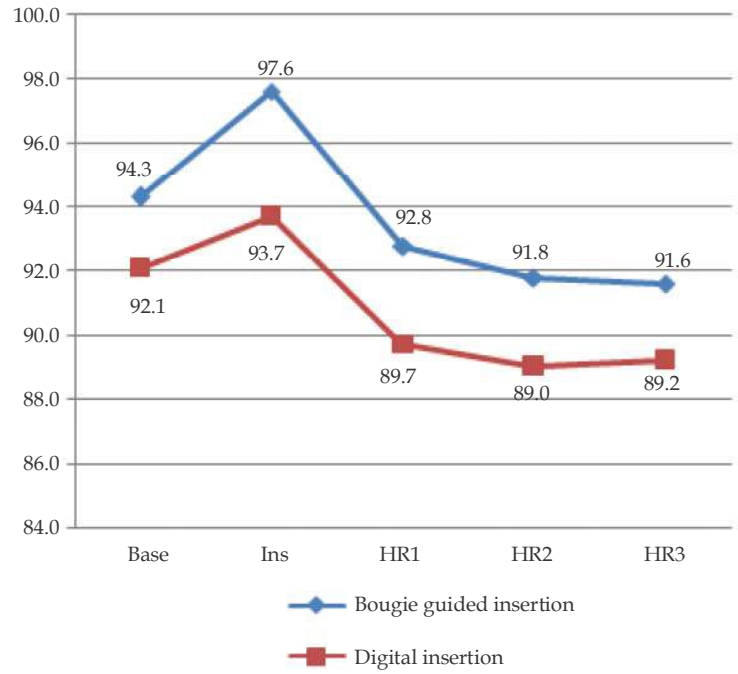

Fig. 3: Graphical comparison of Mean Arterial Pressure based on the group at different intervals.

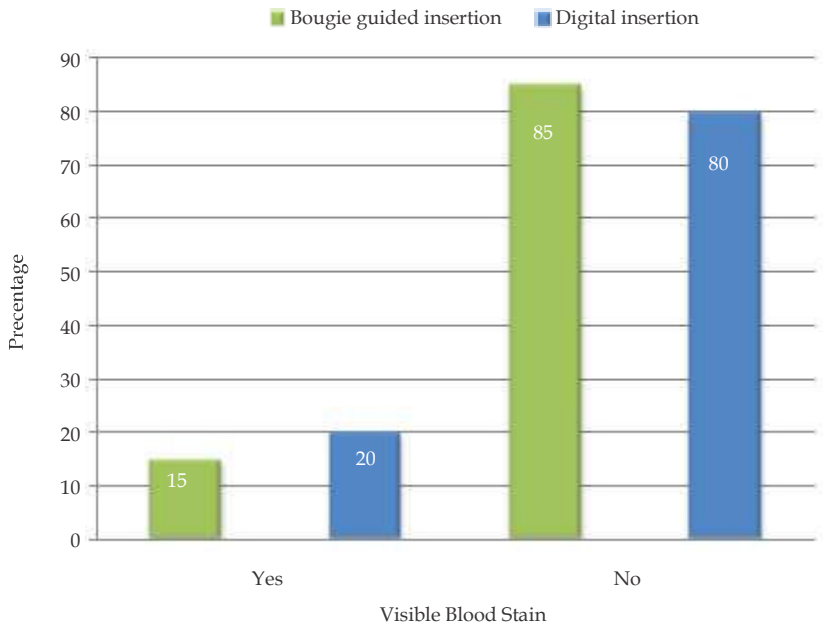

Fig. 4: Graphical comparison of Visible Blood Staining based on the group.

Table 4: Oropharyngeal leak pressure based comparison of the groups

Group	Mean	SD	N	*t*-value	*p* - value
Bougie-guided insertion	31.8	1.7	20	9.36	<0.0001
Digital insertion	24.2	3.2	20		

p -value: <0.05 → Significant.

There is a statistically significant increase in oropharyngeal leak pressure in the Bougie guided group in comparison with the digital insertion group (Table 4).

There is no statistically significant difference in the incidence of sore throat postextubation using the two different techniques. Postextubation incidence of dysphagia between the two groups

Table 5: Side effects based comparison of the groups

Sore throat	ProSeal LMA insertion technique				X^2	*p* - value
	Bougie guided		Digital			
	Count	Percentage	Count	Percentage		
Yes	1	5	4	20		
No	19	95	16	80	2.05	0.15
Dysphagia						
Yes	3	15	0	0	3.24	0.072
No	17	85	20	100		
Dysphonia						
Yes	0	0	0	0		
No	20	100	20	100		

p -value: <0.05 → Significant.

was comparable and there was no statistical significance. Postextubation incidence of dysphonia between the two groups was comparable and there is no statistical significance.

Discussion

Demographically the two groups were comparable with respect to age. Of the 40 patients studies (20 in the bougie guided group and 20 in the digitally inserted group), the mean age for bougie-guided insertion group is 43.3 ± 11 years and that for the digitally inserted group is 44.9 ± 9.7 years. (t = 0.49, p = 0.629). The percentage of patients on each age group is comparable. The samples are comparable with respect to gender. The study population shows a slight female predominance but this is not statistically significant. It does not affect the outcome of this study. Using Fisher's exact test, it was found that the difference is not statistically significant (p = 0.337).

The distribution of subjects based on weight is comparable. The mean weight is also comparable. In the bougie guided group the mean weight is 55.9 ± 9 kgs and in the digitally inserted group, the mean weight is 55.1 ± 6.5 kgs. (t = 0.32, p = 0.750).

The study group included patients in the ASA-PS classification I & II. 70% of the patients are ASA-PS I and 30% of patients are ASA-PS II. (p = 1.00). The samples are comparable with respect to ASA-PS classification.

The subjects were comparable with respect to Modified Mallampati classification. Most of the patients studied belonged to MMC - II class (60% in the bougie guided group and 55% in the digitally inserted group). The percentage of patients within each group is comparable and is calculated to be statistically insignificant. Brimacombe[5] in a study of 1500 adult patients undergoing surgery using LMA in which Mallampati grades and fiber optic scores were similarly obtained. Placement failed in 6 patients within 3 attempts (0.4%). 1385 patients were Mallampati I/II, 102 Grade III, and 13 Grade IV. All failed placements occurred in MallampatiGrades I/II. Again there was no correlation between fiber optic scoring and Mallampati grade. Data from the prospective study of Mahiou et al.,[6] looking at 362 patients showed that ease of insertion of the LMA did not correlate with Mallampati grade or Cormack Lehane scoring. The latter finding suggests that the position of the larynx has little bearing on LMA insertion. In a retrospective study by Brimacombe[5] of 272 patients, it was determined that there was no correlation between Mallampati grade and ease of insertion or final fiberoptic position of LMA. This

series included 29 Grade III and 3 Grade IV patients. The overall first-time failure rate was less than 2%. All gradings were standardized and performed as originally described by Mallampati.

The thyromental distance was measured and it is found that the two study groups were comparable based on the thyromental distance and there is no significance as measured by Fisher Exact test. 65% of the subjects in the bougie guided group and 55% of the subjects in the digitally inserted group had TMD > 6.5 cm. Thyromental distance, the distance between the bony point of the mentum and the upper border of the thyroid cartilage, when less than 6.5 cm, would correlate with difficult airway.[7] TMD of less than 6.5 cm is generally accepted as a predictor for difficult airway. Arne et al. in an analysis of 1,200 patients, found that using a cutoff point for TMD of 6.5 cm when pooled with a multi-factor evaluation, decreased the incidence of unexpected difficult intubation to 0.2%.[8] El Ganzouri et al.[9] used a TMD of <6 cm as a predictor of the difficult airway.

Mouth opening among the two groups was comparable and there is no significance statistically as measured by Fisher Exact test. 85% of patients had mouth opening >6 cm and 15% had a mouth opening between 4 and 6 cm ($p > 0.05$). The average distance between upper and lower incisor teeth in patients with normal TMJ function is 47mm with a range of 31–55 mm.

Based on weight and physical characteristics the size of the device was selected. This bears no particular effect on the outcome and is therefore statistically insignificant. Size 3 ProSeal LMA was used in 40% of the patients and size 4 was used in 60% of the patients (p - 0.519). This bears no particular effect on the outcome and is therefore statistically insignificant ($p > 0.05$). Kihara et al.[10] in 2003, study of 237 adults, found that size selection for the ProSeal LMA is equally effective using the manufacturer's weight-based formula (size 3 for <50 kg; size 4 for 50–70 kg; size 5 for >70 kg) and the sex-based formula (size 4 for females and size 5 for males), in terms of ease of insertion, ventilation, gas exchange, fiberopticposition, mucosal injury and postoperative pharyngolaryngeal complaints, but Oropharyngeal Leak Pressure was higher with the sex-based formula due to the more frequent selection of larger sizes, shown as in (Table 5).

The first attempt success rate was 90% in the bougie guided group and 70% in the digitally inserted group. The second attempt success rate was 10% in the bougie guided group while it was 25% in the digitally inserted group. One subject in the digitally inserted group needed three attempts (p - 0.248). No statistical difference was seen in the number of attempts to position the device adequately in this study.

The effective airway time is longer in patients with bougie-guided insertion compared to digital insertion. The difference between the two groups is statistically significant. In the bougie guided group, the mean airway time was 37.3 ± 3.7 seconds, while in the digitally inserted group it was 20.8 ± 3.0 seconds ($t = 15.56$, $p < 0.05$). M Lopez Gill et al.[11] contrasted bougie-guided insertion of ProSeal LMA with the digital technique in 120 anesthetized children. They also found that the effective airway time was longer (37 *vs* 32 sec, $p < 0.001$) for bougie-guided insertion.

Escherttzhuber S et al.[12] in 2008 compared ProSeal LMA insertion in three equal-sized groups using the digital, Introducer or bougie guided techniques and found that the time taken for successful placement was similar among groups at the first attempt, but was shorter for the guided technique after three attempts. In 2009, Taneja et al. evaluated ProSeal LMA insertion in Three Groups, Group G -Bougie-guided insertion, Group I - Introducer guided, Group D - Digital and found that the total insertion time of ProSeal LMA ranged from 18 to 25 seconds in Group G, 17 to 84 seconds in Group I and 16 to 86 seconds in Group D. The mean insertion time in the Three Groups was 22.1 ± 2.1 seconds in Group G, 31.9 ± 18.83 seconds in Group I and 29.6 ± 18.61 seconds in Group D ($p<0.05$).[13]

Anand Kuppusamy and Naheed Azhar in a 2010 study compared the classical digital placement of ProSeal LMA with gum elastic bougie-guided technique in 60 anesthetized adult patients (with 30 patients in each group). The effective airway time for GEB guided insertion was longer than that of digital technique (36.87 ± 11.2 seconds *vs* 22.32 ± 12.09 seconds).[14]

Both the techniques are comparable with respect to the heart rate. The mean pulse rate shows no significant change by the different techniques. Also, the mean pulse rate is comparable over the three phases. Baseline HR was comparable with 79.8 ± 11.2 bpm in the bougie guided group and 79 ± 8.1 bpm in the digitally inserted group. The mean arterial pressure was comparable at baseline, insertion and MAP 1^{st}, 3^{rd} and 5^{th} mints. In 2002, Howarth et al. inserted the ProSeal LMA using a gum elastic bougie and found that there was no substantial change in heart rate or blood pressure.[15] In a 2010 study, Anand Kuppusamy et al. found no noteworthy difference in hemodynamic response

to PLMA insertion by digital or GEB technique.[14] There was a statistically significant increase in oropharyngeal leak pressure (31.8 ± 1.7 *vs* 24.2 ± 3.2 cm H_2O) in the bougie-guided insertion group as compared to the digital insertion group. In 2000, Brimacombe J and Keller C[3] studied 60 ProSeal LMA insertions using the digital technique. The mean airway seal pressure in this study was 27 cmH_2O. In a 2003 study, Kihara Sand Brimacombe J evaluated 90 ProSeal LMA insertions using the digital technique. The mean airway seal pressure was 25 cmH_2O[16] (Fig. 3).

Kihara S et al. studied 237 PLMA insertions in 2004 using the digital technique again.[10] The airway seal pressure was 26 ± 8 cm H_2O. In the year 2002, Howarth et al. used the new technique of bougie-guided insertion.[15] 100 ProSeal LMA insertions were studied and the airway seal pressure was higher at 33 cmH_2O (range 17–40 cm H_2O). In 2012, Joffe AM et al. evaluated 48 PLMA insertions (1 size #3, 24 size #4 and 23 size #5) in 25 male and 23 female patients using the bougie guided technique. The mean airway seal pressure was 30 cm H_2O.[17]

The results obtained in our study are in concordance with these earlier findings. There was a statistically significant increase in oropharyngeal leak pressure in the bougie-guided insertion group as compared to the digital insertion group which shows that when the ProSeal laryngeal mask airway is inserted using the bougie guided technique, it gives a better seal in the airway with improved ventilation. Although in another study by Lopez-Gil et al. in which 120 PLMA insertions were studied in the age group of 1–16 years (ASA I, II) there was no statistically significant difference in oropharyngeal leak pressure between the two techniques. The mean airway seal pressure was 33 cm H_2O inboth the cases.[11]

There is no statistically significant difference ($p > 0.05$) in the incidence of visible blood staining on the device using the two different techniques. 15% of the study subjects had visible blood staining on the device at extubation. In a 2006 study, by Lopez-Gil et al. , 120 ProSeal LMA insertions were studied in the age group of 1–16 years (ASA I, II). Visible blood staining was noted in 3 cases out of 60 in the digitally inserted group and in 4 cases out of 60 in the bougie guided group.[11]

In 2012, Joffe AM et al. evaluated 48 PLMA insertions (1 size #3, 24 size #4 and 23 size #5) in 25 male and 23 female patients using the bougie guided technique.[17] Visible blood staining was evident on 8% of the airway devices. In a 2010 study, Anand Kuppusamy et al., comparing bougie-guided insertion of ProSeal LMA vs digital insertion found that the incidence of blood staining on ProSeal LMA was identical in both the groups.[14] There was no statistically significant difference in the incidence of airway trauma between both the groups.

There is no statistically significant difference in the incidence of sore throat postextubation using the two different techniques. 5% of the subjects in the bougie-guided group and 20% of the subjects, in the digitally inserted group, had sore throat in the postextubation period. In a 2006 study, by Lopez-Gil et al., 120 ProSeal LMA insertions were studied in the age group of 1–16 years (ASA I, II). No case of a sore throat were reported in this study.[11]

AnandKuppusamy and NaheedAzhar in a 2010 study, compared classical digital placement ProSeal LMA with gum elastic bougie-guided technique in 60 anesthetized adult patients (with 30 patients in each group).[14] 3 patients in the digitally inserted group complained of sore throat in the postoperative period. In 2012, Joffe et al.[17] evaluated 48 PLMA insertions (1 size #3, 24 size #4 and 23 size #5) in 25 male and 23 female patients using the bougie guided technique. 38% of the patients had sore throat postoperatively. 15% of the patients had pain on swallowing postoperatively. Sore throat was more frequent in digital technique while dysphagia was more frequent with GEB technique.

There is no statistically significant difference in the incidence of dysphagia in the postextubation using the two different techniques. 15% of the subjects in the bougie guided group had complained of dysphagia ($p = 0.072$). Anand Kuppusamy and Naheed Azhar in a 2010 study compared classical digital placement ProSeal LMA with gum elastic bougie-guided technique in 60 anesthetized adult patients (with 30 patients in each group).[14] 5 patients in the digitally inserted group complained of dysphagia in the postoperative period.

No patient complained of dysphonia in the two groups. Taneja et al. in 2009, compared ProSeal LMA insertion in Three Groups: Group G - Bougie-guided insertion, Group I - Introducer guided, Group D - Digital. There was no incidence of dysphonia in the GEB-guided insertion group, ($p>0.05$).

Conclusion

The first attempt success rate was higher in the bougie guided group in this study. Although this was not statistically significant. Comparison

of effective airway time showed that the digital technique was faster than the bougie guided technique. The shorter-time taken to secure the airway using the digital method was statistically significant.

Complications included airway trauma during insertion as evidenced by visible blood staining and postoperative airway morbidity as evidenced by sore throat, dysphagia, and dysphonia. The incidence of sore throat was higher in the digitally inserted group and the incidence of dysphagia was higher in the bougie guided group. Although these complications do not achieve statistical significance. The disadvantages of the bougie guided placement of the PLMA include airway stimulation and trauma.

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