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A Study to Evaluate Suction Catheter Guided Insertion of Proseal™ Laryngeal Mask Airway.

KEYWORDS: Proseal laryngeal mask airway; suction catheter technique; Airway management

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ABSTRACT

Purpose: *The aim of the present study was to evaluate the feasibility of suction catheter guided insertion of Proseal Laryngeal Mask Airway (PLMA) as an alternative to conventional techniques of insertion.*

Methods: *After informed consent, fifty ASA I-II adults with normal airways undergoing elective surgery under general anaesthesia were allocated to undergo suction catheter guided insertion of PLMA.*

Results: *PLMA insertion was successful in all 50 (100%) patients [48(96%) in first attempt and 2(4%) in second attempt]. The mean time for successful placement of PLMA was 16.14 ± 3.02 sec. The mean oropharyngeal sealing pressure was 32.54 ± 5.37 cm H2O. Majority of the patients had fibreoptic score of I and II [45(90%)].*

Conclusion: *Suction catheter guided insertion of PLMA is an easy technique with high first time and overall success rate of placement, short insertion time and high oropharyngeal seal pressure. We suggest that it is a useful alternative to conventional techniques of insertion of PLMA.*

Introduction:

Airway management is one of the key responsibilities of the anaesthesiologists. Difficulty in tracheal intubation and maintenance of a patent airway remains an important cause of anaesthetic morbidity and mortality. The incidence of immediately life threatening "cannot intubate, cannot ventilate' scenario is approximately 1:10,000.[1] The introduction of laryngeal mask airway (LMA) by AIJ Brain in 1981, acted as a savior in changing this scenario to "cannot intubate but able to ventilate".[2]

The classic LMA falls short of being an ideal airway device because its low oropharyngeal seal pressure may be inadequate for positive pressure ventilation and it does not protect against aspiration of gastric contents regurgitated into pharynx.[3] The ProSeal laryngeal mask airway (PLMA; Laryngeal Mask Company, Henley-on-Thames, UK) overcame these shortcomings by having a modified cuff to improve the seal, a drain tube to help prevent aspiration and gastric insufflation, facilitate passage of gastric tube and provide information about possible malposition.[4].

The manufacturer recommends digital and introducer tool technique for insertion of PLMA but both these techniques have lower success rate than classic LMA[5] Several alternative techniques involving the use of gum elastic bougie[6], fibreoptic scope[7], gastric tube[8], suction catheter[9,10] acting as a guide through drain tube have been suggested in literature to improve the success rate of insertion of PLMA. The gum elastic bougie has undergone a number of randomized clinical trials and has shown superiority over the conventional digital technique.[6] The suction catheter has certain advantages over bougie for PLMA insertion which includes less trauma, blind insertion without laryngoscope guidance and wide availability of this cheap device.[9] With this in mind, we planned to study the feasibility of suction catheter guided insertion of PLMA as alternative to conventional techniques.

Methods:

After Institutional Review Board approval and patient's written informed consent, fifty patients of either sex, between the age of 18-60 years, having physical status of American Society Of Anaesthesiologists grade I & II, scheduled for elective surgery under general anaesthesia in supine position were enrolled for the study. Exclusion criteria were patients with known or predicted difficult airways, mouth opening < 2.5 cm, body mass index > 35 kg m^{-2} or at risk of aspiration. All the patients were examined during preoperative visit. They were kept fasting for 6 hours prior to scheduled time of surgery. They were premedicated with oral ranitidine 150 mg and alprazolam 0.01mg kg^{-1} the night before and in the morning 2 hours before surgery along with tablet metoclopramide 10 mg orally in the morning at the same time.

Intravenous cannula was inserted and standard monitors [HR, ECG, SpO_2, NIBP] were applied in operating room. Anaesthesia was in supine position with patient's head on standard pillow, 7 cm in height. Induction was performed with intravenous glycopyrrolate 0.2 mg, propofol 2.5 mg kg^{-1}, fentanyl 2 µg kg^{-1} followed by vecuronium 0.1 mg kg^{-1} for neuromuscular blockade. Then after ventilating with 50% nitrous oxide in oxygen for 3 min via face mask using Bain's circuit, suction catheter (SC) guided insertion of PLMA was done as follows: 1) Priming the drain tube of PLMA with 16 G SC well lubricated with water based gel so that it's tip protruded beyond the distal aperture of drain tube. 2) opening the mouth and blindly inserting the SC into the oropharynx followed by insertion of well lubricated PLMA along the palatopharyngeal curve. In all patients, a size 3 (in females) and 4 (in males) PLMA was

Volume : 5 | Issue : 11 | November 2015 | ISSN - 2249-555X

used. All insertions were in sniffing position with the cuff fully deflated and using midline approach. Once the PLMA was inserted into the pharynx, the cuff was inflated to 60 cm H_2O using manometer. Fixation was as per manufacturer instructions.[11] Anesthesia was maintained with 50% nitrous oxide in oxygen and sevoflurane. Successful placement was judged on the basis of the absence of oropharyngeal air leaks (detected by listening over the mouth)[12], gastric air leaks (detected by listening with a stethoscope over the epigastrium)[13], drain tube air leaks (detected by placing a lubricant over the proximal end of the drain tube), or an end-tidal CO_2 < 45 mm Hg. A total of three attempts were allowed before insertion was considered a failure. An attempt was considered when the device was removed and reinserted in the event of failed passage into the pharynx, significant air leak or ineffective ventilation. In case of failure, alternative airway management strategy was used. An easy insertion was defined as insertion without resistance in a single attempt. A difficult insertion was the one where more than one attempts were required to seat the device. The time between picking up the prepared PLMA (cuff deflated, lubricated, SC attached) and successful placement was recorded. Oropharyngeal seal pressure was measured by recording the circuit pressure at which gas was first heard to escape around the PLMA at fresh gas flows of 3 L/min with the pressure limiting valve completely closed. The baseline recordings were made for HR, SBP, DBP, and SpO_2. The changes in HR, SBP, and DBP were noted after induction, at 1 min, 2 min, and 5 min post device insertion. The fiber-optic position of the PLMA was determined by passing the fiber-optic scope to a position just proximal to the mask aperture, and the view was scored as per the classification given by Mizushima et al.[14]

(i) Grade 1: glottis only seen
(ii) Grade 2: epiglottis and glottis seen
(iii) Grade 3: epiglottis impinging on the aperture, glottis seen
(iv) Grade 4: epiglottis downfolded, glottis not seen

Any episode of hypoxia as defined by a SpO_2 <90% or other adverse events were recorded. Trauma to tongue, teeth, gums, and lips was checked. After removal, the PLMA and SC were checked for blood stained secretions. In the post-operative period, patients were asked for sore throat, dysphagia, or hoarseness of voice if any. Continuous parameters (age, weight, height, haemodynamic parameters, various times) in the study were presented as mean and SD (standard deviation) and categorical variables were expressed in percentages. Haemodynamic parameters were compared at different intervals by paired t-test. P- Value <0.05 was considered as statistically significant.

Results:
Demographic data are presented in table 1. PLMA insertion by the SC-guided technique was successful in all 50 (100%) patients [48(96%) in first attempt and 2(4%) in second attempt]. There was no failure of the insertion of PLMA (Table 2). The mean time for SC-guided insertion of PLMA was 16.14 ± 3.02 sec (Table 2). SC-guided insertion of PLMA was easy in 48(96%) and difficult in 2(4%) patients. The mean oropharyngeal seal pressure was 32.54 ± 5.37 cm H_2O (Table 2). Fibreoptic scoring (1/2/3/4) was 21/24/5/0. Thus 45(90%) patients had good fibreoptic score (Grade 1 and 2). No patient had fibreoptic score of grade 4. SC-guided insertion of PLMA did not produce statistically significant haemodynamic changes (p>0.05) (Figure 1). No evidence of trauma to tongue, teeth, gums, and lips was present. No patient gave history of sore throat, dysphagia, or hoarseness of voice in the post-operative period.

Discussion:
The Proseal laryngeal mask airway (PLMA) is a modified laryngeal mask airway with large ventral cuff, dorsal cuff and a drain tube to provide improved ventilatory capabilities and prevention against aspiration and gastric insufflation. The aim of our study was to assess the ease of insertion, oropharyngeal sealing pressure, fiber-optic assessment of positioning, hemodynamic changes, and postoperative complications of SC-guided insertion of PLMA with a view to its use as alternative to conventional techniques of insertion.

García-Aguado et al in their study on two hundred and forty three patients to assess the superiority of suction catheter guided insertion of Proseal LMA over digital technique reported 97 % first attempt and 100% overall insertion success rate.[10] This is in concurrence to our first time success rate of 96% and overall success rate of 100%. Perilli V et al in their study on two hundred and fifty four anaesthetised non paralysed adults to compare the effectiveness of SC guided insertion of PLMA with digital technique by untrained physicians reported 83.5% first attempt and 90.1 % overall success rate.[9] The results are lower than ours probably because their study was performed by untrained physicians in comparison to our study performed by expert anaesthesiologists. Nagata T et al in their study on sixty anaesthetised non paralysed adults assessed the efficacy of oral gastric tube guided insertion of PLMA over digital technique by less experienced users and found 100% first time and overall success rate.[8] The results are in concurrence to our study.

The mean time for successful placement of PLMA by SC guided technique in our study was 16.14 ± 3.02 sec. This is in concurrence to that found by Nagata T et al[8] (13.6 ± 5.1 sec). Our time is less than that found by García-Aguado et al[10] (36 ± 24 sec) probably because their study was conducted in nonparalysed patients in contrast to our study on paralysed patients. Our time is also less than that measured by Perilli V et al[9] (38.8 ± 28.3 sec) probably because PLMA insertion in their study were performed by untrained physicians on non paralysed patients in contrast to our study performed by expert anaesthesiologists on paralysed patients.

The mean oropharyngeal sealing pressure in our study was 32.54 ± 5.37 cm H_2O. This is in concurrence with the previous studies[8-10] who reported high oropharyngeal sealing pressures with suction catheter guided technique.

45(90%) patients in our study had good fibreoptic scores (Grade 1 and 2) suggesting optimal anatomical positioning. This is because the SC guides the distal cuff through the oropharyngeal inlet towards the oesophagus. It also makes the drain tube stiffer reducing the possibility of distal cuff folding[10]

There are certain limitations in our study. Firstly, we only studied the feasibility of SC guided insertion technique. This technique cannot be as claimed superior to other methods of PLMA insertion because we did not compare it with them. Secondly our patient group had normal airways. Results may vary in patients with difficult airways.

Volume : 5 | Issue : 11 | November 2015 | ISSN - 2249-555X

Conclusion:
We conclude that Suction catheter guided insertion of PLMA is suitable alternative to other conventional techniques because of high first time and overall success rate of placement, short insertion time, ease of insertion and high oropharyngeal seal pressure with optimal anatomical PLMA positioning.

Table 1:
Demographic data of the study group

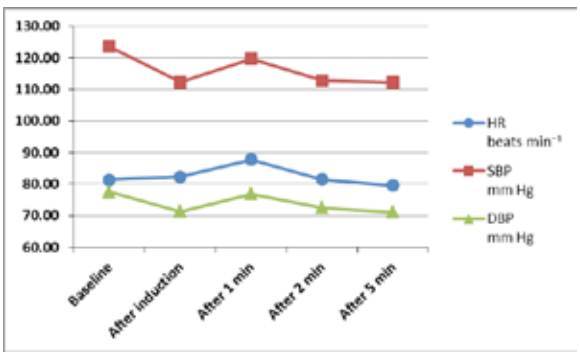
Variable	Measured Value n = 50
Age, yr	39.44 ± 11.76
Sex, M/F, n (%)	31/19 (62/38)
Weight, kg	59.72 ± 8.35
Height, cm	165.24 ± 8.65
BMI, kg m^{-2}	21.80 ± 2.12
ASA, I/II, n (%)	42/8 (84/16)

Data are expressed as mean ± SD or number of patients (%) BMI: Body mass index

Table 2:
Number of attempts, Time of insertion and Oropharyngeal seal pressure

Variable		Measured Value n=50
Number of Attempts, n (%)	One	48 (96%)
	Two	2 (4%)
	Three	0 (0%)
	Failure	0 (0%)
Time of insertion, sec		16.14 ± 3.02
Oropharyngeal leak pressure, (cm H_2O)		32.54 ± 5.37

Figure 1:
Heart Rate (HR), Systolic BP (SBP) and Diastolic BP (DBP) at specified times



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