Comparison of lateral insertion technique of Classic™ laryngeal mask airway along right versus left border of tongue in adults

Madhu Rao¹, Ajithkumar Pillai^{1*}, Juhi Sharma², Handattu Mahabaleswara Krishna³,
Ramkumar Venkateswaran³, Eeshwar Murali Vaideeshwar¹

*Assistant Professor¹, Junior Resident², Professor³ Department of Anaesthesiology,
Kasturba Medical College, Manipal Academy of Higher Education, Manipal, Karnataka, India*

Introduction

Appropriate placement of laryngeal mask airway (LMA) is crucial for successful ventilation during conduct of anaesthesia as well as during cardiopulmonary resuscitation. As LMA insertion is generally performed blindly, clinicians are always in search of an ideal technique that will provide a higher incidence of correct placement. We aimed at comparing the lateral insertion technique of Classic™ LMA along the right border of the tongue with that of the left border in adults.

Methodology

In this prospective randomised control study, we included 132 ASA I/II patients of either gender between 18 to 65 years and allocated into two groups. The operators were natural right-handed individuals. In Group R, LMA was inserted through the right border of the tongue and vice versa for Group L. We compared fiberoptic grading of laryngeal view, number of attempts, time taken for successful insertion, ease of insertion and complications.

Results

In our study the fiberoptic grading and the time taken in both the groups were similar. Ease of insertion and number of attempts was in favour of Group L. Even though the overall sore throat incidence was found to be less, it was significantly more in Group R than Group L.

Conclusion

The lateral technique of insertion of the Classic™ LMA along either the right border or the left border of the tongue is comparable in terms of the fiberoptic grading and the time taken for successful insertion. However, left side technique is easier as per the operator, requires fewer number of attempts, has lesser incidence of sore throat after 2 hours.

Keywords: Difficult airway; laryngeal mask airway; fiberoptic grading; sore throat

Introduction

The laryngeal mask airway (LMA) is a supraglottic airway device that is used frequently as the primary airway device for providing anaesthesia and as a rescue device during the management of a difficult airway. As LMA insertion is generally performed blindly, clinicians are always in search of an ideal technique that will provide a high incidence of correct placement. The standard technique of

LMA insertion gives a first attempt success rate of 88-90%.

Several other alternative insertion techniques have been described with varying results. A logical technique of insertion would be to pass the LMA with a partially inflated cuff along the lateral border of the tongue which is the path taken by the laryngoscope blade during conventional laryngoscopy.¹ This path is relatively free of mechanical hindrance.

*Correspondence: Ajithkumar Pillai

E mail: ajithonline07@gmail.com

<https://orcid.org/0000-0002-6358-4811>

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With this background, we designed a prospective, randomised study to compare the lateral technique of insertion of the Classic™ LMA; along the right border with that of the left border of the tongue in anaesthetised adults. Our primary objective was to compare the fiberoptic grades of the supraglottic device placement in both groups. We also compared the number of

attempts taken, time taken for successful insertion, insertion ease and oropharyngeal morbidity with this insertion technique.

Methodology

This prospective randomised study was started after obtaining approval from the departmental dissertation committee and the institutional ethics committee. It was registered at Clinical Trials Registry, India. We selected patients of ASA Physical Status 1 and 2 belonging to either gender aged between 18 - 65 years, undergoing elective minor and intermediate duration surgery requiring general anaesthesia (lasting 15-120 minutes), belonging to Modified Mallampati Class I, II, III, IV. We had three observers in this study. The observer I was the anaesthesiology post graduate who did the preoperative assessment, got the written informed consent from the patient and recorded the study parameters. The observer II was consultant anaesthesiologist who placed the Classic™ LMA. Three individual operators were involved, each of them experienced in the insertion of the Classic™ LMA. All these observers were natural right-handed individuals. Observer III was consultant anaesthesiologist blinded to the technique of insertion who graded the fiberoptic view of glottis through the Classic™ LMA.

Randomisation of 132 patients was done using computer generated random number tables. Group allocation was concealed using sealed envelopes, which were opened by the anaesthesiologist who performed the Classic™ LMA insertion. Patients were allocated into two groups, Group R(GR)- the Classic™ LMA inserted with cuff partially inflated (half the volume recommended by the manufacturer for that particular size) using a lateral insertion technique along the right border of the tongue. Group L(GL)- the Classic™ LMA inserted with cuff partially inflated using a lateral insertion technique along the left border of the tongue.

After confirmation of patient identity and fasting status, the patient was shifted to the operation theatre. Routine non-invasive monitoring was started, and intravenous access was secured. The patient was preoxygenated for 3 minutes using 100% oxygen through a facemask and i.v. fentanyl 2µg/kg was administered for pre-emptive analgesia. Anaesthesia was induced with i.v. propofol 2-3mg/kg body weight. Loss of verbal contact was taken as the end point of anaesthetic induction. Following this, patient was

mask ventilated with 2% isoflurane in 100% oxygen for one minute. Jaw relaxation was checked just before insertion of Classic™ LMA. If required, additional boluses of i.v. propofol 10mg were given to ensure proper jaw relaxation. If the patient moved during insertion of the Classic™ LMA, further 10mg boluses of propofol were given. Depending on the group allocated, the Classic™ LMA was inserted by lateral insertion technique either along the right border or the left border of tongue.

Classic™ LMA was held between the index finger and the thumb with index finger being as close as possible to the junction of the bowl of the mask with the shaft. The device was introduced into the mouth with the aperture facing caudad (Figure 1). The LMA was then rotated 45° clockwise or anti-clockwise depending on the group allocation to occupy a position by the side of the tongue with the bowl of the LMA facing the midline (Figure 2). The shaft was gripped and the Classic™ LMA advanced as far as possible until a resistance is encountered (Figure 3). The Classic™ LMA was rotated back 45° so that device returns to midline (Figure 4). The cuff was inflated with the remaining appropriate volume of air and connected to circle system. Appearance of a square wave capnogram trace, as well as free ingress and egress of gases during inspiration and expiration without an audible leak at a peak inspiratory pressure of 20cm H₂O were considered as clinical end points to indicate appropriate position of the Classic™ LMA. Intracuff pressure was maintained at 60cm H₂O throughout the surgery.

Figure 1: showing the Classic™ LMA being introduced into the mouth with the aperture facing caudad.

Figure 2: showing The Classic™ LMA being rotated 45° anti-clockwise in a patient who is in group R to occupy a position by the side of the tongue with the bowl of the LMA facing the midline

Figure 3: showing the LMA shaft being gripped and LMA advanced further till a resistance is felt.

All patients involved in the study were allowed to breath spontaneously throughout the surgical procedure. Anaesthesia was maintained with isoflurane in nitrous oxide and oxygen in a ratio of 2:1. Classic™ LMA was removed when the patient was relatively awake at the end of surgery and was carefully scrutinised for presence of blood.

Figure 4: shows the LMA being rotated back 45° so that device returns to midline

Any additional manoeuvres if required (such as jaw thrust) were recorded. A maximum of two attempts were allowed using the allocated technique, with each attempt not exceeding 60 seconds. If both attempts failed, insertion using proseal LMA was attempted. If that attempt also failed, the study was abandoned and the concerned anaesthesiologist on the case decided the further course of anaesthetic management. The LMA insertion was also abandoned if there was desaturation to 95% or below during the attempt, and mask ventilation with 100% oxygen was initiated.

A fiberoptic scope was passed to a position just proximal to the aperture bars of the LMA and the view obtained is scored as follows.²

- 4 - Only cords seen
- 3 - Cords plus posterior epiglottis seen
- 2 - Cords plus anterior epiglottis seen
- 1 - Cords not seen but function adequate

Time between passage of tip of bowl of LMA past lips until documentation of correct placement by appearance of a square wave response on capnography was the time taken for successful insertion. Passage of LMA into the mouth was taken as one attempt. The number of attempts for successful placement of LMA were noted. The ease of insertion was marked as “easy” or “difficult” as opinioned by the operator. Soreness of throat after 2 hours and 24 hours was noted (yes/no). Blood on the LMA if present was noted after the removal of the LMA (yes/no).

Sample size was calculated on the basis of a pilot study done on 16 patients. In order to detect a difference of 20% in obtaining a fiberoptic grading of 3 or 4 for placement of the LMA between the two groups, with a power of 80% and 95% confidence interval, 64 patients were recruited in each group. 66 patients were enrolled in each group in this study to account for attrition and loss to follow-up. The data obtained from the study was analysed using *SPSS version 20* for Windows. Numerical data (age, weight, timings) were analysed using Independent samples t-test. Categorical data were analysed using Chi-square test. The P value less than 0.05 was considered significant.

Results

A total of 132 patients were included in the study, all of them completed the study. The patients' characteristics were comparable between groups as shown in Table 1.

Table 1: Demographic details

Demographic details	Right	Left	p value
Age (years) (mean±SD)	43.07±1.45	41.06±12.65	0.087 ^v
BMI (kg/m ²) (mean±SD)	23.89±3.55	24.29±3.36	0.503 ^v
Females/Male (n)	23/43	25/41	0.717*
ASA I/II (n)	54/12	55/11	0.819*

*Chi square test, ^v Independent t- test

Modified Mallampati classification of the allocated patients and their distribution in each group and the results were found to be comparable as shown in Table 2.

Table 2: Modified Mallampati classification.

Modified Mallampati classification	Right N (%)	Left N (%)	p value
1	18 (27.3)	15 (22.7)	0.429*
2	36 (54.50)	43 (65.2)	
3	12 (18.2)	8 (12.1)	
4	0 (0)	0 (0)	

*Chi square test

The fiberoptic view was found to be comparable between the two groups (p= 0.505). Most of the

patients had views of grade 4 and grade 3. Grade 4 and 3 were clubbed as good grades and grade 2 and 1 were considered as poor grade. There was no significant difference in the two groups in terms of good and poor grade of view (p=0.829).

Table 3: Brimacombe et al fiberoptic grading of LMA placement

Fiberoptic Grade	Right N (%)	Left N (%)	p value
4	29 (43.9)	27 (40.9)	0.505*
3	23 (34.8)	26 (39.4)	
2	12 (18.2)	8 (12.1)	
1	2 (3)	5 (7.6)	

*Chi square test

Table 4: Fiberoptic grading (good and poor grades)

Fiberoptic Grade	Right (N %)	Left (N %)	P value
Good grades (3,4)	52 (78.8)	53 (80.3)	0.829*
Poor grades (1,2)	14 (21.2)	13 (19.7)	

*Chi square test.

Figure 7: Modified Mallampati classification versus fibre optic grading versus side

There was no significant difference in the time taken for successful LMA placement (p value- 0.720).

Table 5: Time taken for LMA insertion

Time taken	Right	Left	p value
Mean $\pm$ SD (s)	15.46 $\pm$ 6.57	15.09 $\pm$ 5.13	0.720 ^v

^v Independent t- test

In terms of number of attempts, fewer patients from left side insertion required more than 1 attempt (2 patients) as compared to the right side (10 patients).

Table 6: Number of attempts for successful insertion of the LMA

Number of attempts	Right n (%)	Left n (%)	p value
First attempt	56 (84.8)	64 (97)	0.015*
Second attempt	10 (15.2)	2 (3)	

*Chi square test

All 66 patients in GL had easy insertion as graded by the operator, whereas 62 patients in GR had easy insertion.

Table 7: Ease of insertion

Ease of insertion	Right n (%)	Left n (%)	p value
Easy	62 (94)	66 (100)	0.042*
Difficult	4 (6)	0 (0)	

* Chi square test

Tables 8 and 9 show soreness after 2 hour and 24 hours. 24 patients in GR complained of soreness as compared to 10 patients in GL after 2 hours which was statistically significant. Only 1 patient had soreness after 24 hours in GR after 24 hours and none in GL.

Table 8: Soreness of throat after 2 hours

Soreness	Right N (%)	Left N (%)	p value
Yes	24 (36.3)	10 (15.1)	0.005*
No	42 (63.6)	56 (84.8)	

*Chi square test

Table 9: Soreness of throat after 24 hours

Soreness	Right N (%)	Left N (%)	p value
Yes	1 (1.5)	0 (0)	0.315*
No	65 (98.5)	66 (100)	

*Chi square test

Table 10 shows that 1 and 3 patients in GR and GL had blood stains on the LMA at its removal. The two groups were comparable.

Table 10: Blood stains on the LMA

Blood stains	Right N (%)	Left N (%)	P value
Yes	1 (1.5)	3 (4.5)	0.310*
No	65 (98.4)	63 (95.4)	

*Chi square test

Discussion

The laryngeal mask airway (LMA) is one of the primary airway devices used by an anaesthesiologist in his/her daily practice. The standard midline insertion technique of Classic™ LMA was evolved by Dr. Brain in 1981.³ Studies have been conducted to compare other insertion techniques such as standard versus lateral or rotational techniques.⁴⁻⁶ We reviewed various articles on lateral insertion technique and found that there was no mention specifically, of which direction the Classic™ LMA should be rotated during lateral insertion, which is clockwise/anti-clockwise rotation. We designed this study to have an idea about direction in which the LMA should be rotated in order to have a smoother and successful insertion.

We had 14 and 13 patients in GR and GL respectively with grade 1 and 2 fiberoptic view. In either technique, there was no patient with a grade 0, which means cords are not seen fiberoptically and in addition there is a failure of Classic™ LMA to function and provide adequate ventilation. Studies in the past have shown that fiberoptic view does not have an implication on adequate ventilation.⁷⁻¹⁰ Our study is in concordance with this view and further suggests that insertion from the right or left produces

similar views on fiberoptic laryngoscopy with clinically effective ventilation.

We further analysed the data for each side to check if Modified Mallampati classification (MMC) had any bearing on the fiberoptic grade. (Figure 6) There were patients in both groups who belonged to MMC I, II and III and good fiberoptic grades of 3 and 4. There were patients with poor fiberoptic views irrespective of their MMC. None of our patients had an MMC IV. Hence our study provided additional support to the finding that MMC does not have a direct influence on the fiberoptic grading of Classic™ LMA inserted.¹¹ Our study also supports studies in the past that have shown that an LMA can be used as a rescue device when patients have MMC III or IV for ventilation.¹²

The success rate at first attempt in our study was similar to that done by Ghai et al. When the two groups were compared in terms of number of attempts for successful insertion, GL was superior to GR ($p=0.015$). Ten patients in GR needed a second attempt. Out of these, 5 patients had a leak and inadequate ventilation with the adjustable pressure-limiting valve set to 20cmH₂O, 4 patients had inadequate jaw relaxation and moved during the first attempt. On administering additional propofol bolus to these 9 patients, insertion was successful the second time. In 1 patient, size 4 Classic™ LMA was deemed appropriate as per weight criteria. However, his facial anatomy was of small proportions and the LMA bowl size seemed relatively large during first attempt at insertion. His second attempt was hence performed with a size 3 Classic™ LMA which was successful. In GL, 2 patients needed a second attempt of LMA insertion. Leak and inadequate ventilation in the first attempt were the reason for attempting insertion again. This was resolved in both cases after giving a propofol bolus.

We classified ease of insertion as easy or difficult (Table 7). All 66 insertions were easy in GL. In GR, most insertions were graded as easy (62 patients). Results quoted in literature show that lateral insertion is easy in comparison to standard midline technique.^{1,5} They have computed ease of insertion by taking into account, attempts at placement, time taken and complications. Since we have individually assessed these parameters, we used a subjective grading of 'easy' or 'difficult'.

More patients in GR (15.1%) complained of soreness of throat at the second postoperative hour which was statistically significant ($p=0.005$). Of note is the fact that all patients who needed a second attempt at insertion, irrespective of the group had sore throat at 2 hours. After 24 hours soreness was comparable in the two groups ($p=0.315$). We feel that we may not be able to attribute the side of insertion entirely to be the cause of the sore throat at 2 hours in our patients because of the following reasons. The patients were asked a yes/no question for the presence of sore throat and an objective sore throat grading scale was not used. A subjective perception may have confounded the result. Further, intra operative and postoperative analgesia was not standardised for every patient and this may also have a bearing on varying the postoperative sore throat.

Bloodstains on the LMA were assessed at the time of removal as a marker of soft tissue trauma during insertion (Table 10). LMA in all the patients was removed when they were fully awake and not coughing. One patient in GR and 3 patients in GL had bloodstains present. All these patients required a second attempt of insertion. Hence, we can say that presence of bloodstains may be related to the number of attempts of insertion.

Most of the instruments used in anaesthesiology are designed for right-handed practitioners. The operators of our study were right-handed, and our results have proven that left or right insertions are comparable clinically. On the basis of our study it may be postulated that left-handed people can probably insert the Classic™ LMA from the side of their comfort without any difficulty with no clinical difference. Further studies to support the same will have to be conducted.

Conclusion

The lateral technique of insertion of the Classic™ LMA along either the right border or the left border of the tongue is comparable in terms of the fiberoptic grading and the time taken for successful insertion. However, the lateral insertion technique via left side is easier as per the operator, requires fewer number of attempts, and has lesser incidence of sore throat after 2 hours.

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