

Comparison of Index-Finger Guided, Two-Finger Guided, and 90° Rotation Techniques for Insertion of Flexible LMA in Pediatric Patients

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ABSTRACT

Background: Flexible LMA offers the advantage of providing a better surgical field without being compressed compared to other LMAs in surgeries around the oral cavity. The insertion of flexible LMA is comparatively difficult as the shaft is flexible. The aim of this study is to compare the index-finger guided technique, two-finger guided technique, and 90° rotation technique for the success and time of insertion of flexible LMA in pediatric patients.

Methods: After obtaining consent from parents, 84 patients aged between 3 to 12 years of either gender were randomized into 3 groups. After administration of general anesthesia, flexible LMA of appropriate size as per manufacturer recommendations was inserted.

In the index finger guided method (Group A), the LMA was held like a pen and the mask was pushed backward pressing against the palate. In the two-finger guided method (Group B), the anesthetist stood by the side facing the patient. LMA was fixed in between the index and middle fingers, held facing the lower jaw, and pushed along the palatopharyngeal curve. In the 90° rotation method (Group C), the LMA was rotated 90° anticlockwise in the oral cavity and was advanced through the right side of the tongue till resistance was felt and then turned back. The time from insertion of LMA and the number of attempts taken for successful insertion were noted. The data were analyzed using ANOVA.

Results: The mean time of insertion was the least in Group B and highest in Group C. The first attempt success rate was highest in Group B and least in Group C. However, the mean time of insertion and the first attempt success rates were not significantly different between Group A and Group B.

Conclusion: The LMA insertion by the two-finger guided method is the easiest and most efficient method and a good alternative to the standard method (index finger guided) for insertion of flexible LMA.

Introduction

The advantages of supraglottic airway device over endotracheal intubation have now become well established. Hence, the role of supraglottic airways in anaesthesia is increasing as there is less chance of perioperative complications like laryngospasm,

bronchospasm, postoperative sore throat, etc [1]. They also play a vital role in the management of difficult airway. However their role in surgeries around the oral cavity is questionable. As the supraglottic airway devices are prone to compression and kinking during head and neck manipulation, they are not advisable for use in surgeries around the oral cavity.

The flexible LMA consists of a long floppy metallic stem and hence can be moved away from the surgical field.

The authors declare no conflicts of interest.

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The flexible LMA is compact, freely movable, and resistant to kinks and compression [2]. Hence it can be safely used and preferred over regular supraglottic airway devices in various head, neck, and facial surgeries like rhinoplasty, myringotomy, etc. However, it has unique challenges during insertion because of its specific structure. It is more crucial to determine the optimal insertion technique, especially in pediatric patients as the airway changes make the insertion and appropriate placement of flexible LMA more difficult.

The index-finger-guided method in which the flexible LMA is held like a pen is commonly used for insertion. Other methods of flexible LMA insertion like two-step jaw thrust method [3], 90° rotation method and various devices like stylet [4], flexiguide introducer [5], Magills forceps, modified Proseal LMA introducer [6], light wand [7], etc are used. But, the insertion of flexible LMA with these methods is comparatively difficult as the shaft is flexible and the pressure when applied cannot be directly transmitted along the soft flexometallic stem and these devices can cause trauma to the laryngeal soft tissues and displacement of the mask while removing the stylet. A newer technique namely two-finger guided technique was developed for insertion which was evaluated in this study among paediatric patients. The aim of this study is to compare between the index-finger guided technique, two-finger guided technique and 90° rotation technique for the success and time of insertion of flexible LMA in paediatric patients.

Methods

The study was conducted at KLE Charitable hospital, Belagavi from May 2022 to August 2022 after obtaining institutional ethical clearance. Informed consent was taken from parents of participants. Patients of age between 3 to 12 years belonging to ASA grade I and II who were posted for any elective surgeries under general anaesthesia with LMA of duration less than 2 hours were included in this study. Patients with a known difficult airway, trauma to airway, any orofacial anomaly, risk of aspiration of gastric contents and tracheal/ laryngeal pathology were excluded. 84 patients were enrolled for the study. The participants were randomised into 3 groups. The randomization was carried out by the computer generated randomization table.

Anaesthesia Protocol

- After confirming nil by mouth status, patients were premedicated with midazolam 0.5mg/kg administered orally in the recovery half an hour before separation from parents.
- Inside the OT, intravenous line was secured using 22G or 24G IV cannula. The standard monitoring devices like ECG, pulse oximeter and NIBP were connected.
- Patients were pre-oxygenated with 100% oxygen for 3 minutes and Inj. Glycopyrrolate 0.005mg/kg, Inj.

Fentanyl 2mg/kg were administered. Anaesthesia was induced with Inj. Propofol 2mg/kg and Inj. Atracurium 0.5mg/kg IV to achieve skeletal muscle paralysis.

- After adequate muscle relaxation was achieved, the flexible LMA of appropriate size was inserted by one of the 3 methods as per randomization. Flexible LMA size of 1.5, 2, 2.5 and 3 was used for patients of weight 5-10kg, 10-20kg, 20-30kg and 30-50 respectively.

Group A- Index-finger guided method of LMA insertion

The patient's neck was flexed and head was extended. The LMA was held like a pen and the mask was pushed backwards maintaining pressure against the palate until the resistance was felt.

Group B- Two-finger guided technique

The anaesthetist stood on the side of the patient and facing the patient. The index finger and middle finger were used to fix the flexible LMA to make it more stable. The flexometallic tube was located on the back of the hand and the cuff and palm faced lower jaw. The jaw was lifted with one hand and the cuff was pushed along the palatopharyngeal curve using the index and middle fingers of the other hand until the resistance was met [8].

Group C- 90° rotation technique

After insertion of the partially inflated cuff inside the mouth, the flexible LMA was rotated anticlockwise through 90° and was advanced through the right side of the tongue. When the resistance was felt, it was turned back into the hypopharynx. After insertion, the cuff was inflated and the successful insertion was confirmed by the appearance of square-wave capnography, no audible leak on manual ventilation at peak airway pressures ≥ 10 cm H₂O and adequate bilateral chest expansion [1].

If the first attempt had failed, the LMA was removed and reinserted again. The number of insertion attempts were noted. After 3 failed attempts, endotracheal intubation would have been considered. The time of insertion was defined as time taken from insertion of cuff into the mouth to the time when the end tidal CO₂ curve was confirmed and was noted. Anaesthesia was maintained by Nitrous oxide, Oxygen, Sevoflurane and intermittent maintenance doses of IV Inj. Atracurium 0.1mg/kg through out the surgery. At the end of the surgery, neuromuscular blockade was reversed with Inj. Neostigmine 0.05mg/kg and Inj. Glycopyrrolate 0.01mg/kg and the LMA was removed.

Results

A total of 84 patients participated in the study out of which majority of them were male. The patient characteristics (age, weight) and the duration of surgery did not differ between the three groups. Majority of the participants were aged between 3 to 5 years in all the groups. The mean time of insertion in Group C (90° rotation method) was 33.15±3.1 sec which was significantly higher compared to other two groups. The mean time of insertion was least in Group B (2 finger guided method) i.e., 27.55±3.41 sec. However, there is no

significant difference in group A and group B in terms of time of insertion (p value- 0.42) (Table 1).

The flexible LMA was inserted successfully in the first attempt in 25 participants in group B and it had the highest first attempt success rate of 89.29%. In Group C, the first attempt success rate was 75% which is significantly lesser (p value- 0.001) compared to other two groups. There is no significant difference in group A and group B in terms of first attempt success rate (p value- 0.68).

Table 1- Patients characteristics

	Group A	Group B	Group C	P value
Age	5.36 ± 2.46	5.13 ± 2.03	5.24 ± 2.12	0.92
weight	23.19 ± 7.99	18.65 ± 7.73	22.18 ± 5.7	0.057
Duration of surgery	56.79 ± 24.6	57.86 ± 18.9	56.79 ± 24.6	0.97

Discussion

Flexibe LMA has a wire reinforced shaft which is widely used in various ENT, head and neck surgeries [9]. This peculiar structure of flexible LMA has an advantage of preventing kinking during surgical manipulation and there by preventing obstruction. The diameter of flexible LMA is small and compact thus providing better visual field for surgery especially in adenotonsillectomy [10]. The present study included a newer technique of insertion of flexible LMA namely two- finger guided technique. Qiung et al, described the two-finger technique for insertion of flexible LMA among adults which was used when the standard method failed [8].

This was the first study which evaluated the two-finger method for time of insertion and success rate of insertion of flexible LMA. In the present study the first attempt success rate was highest in Group B. Group C had significantly lower first attempt success rate. These results were similar to the study conducted by Harshvardhan Bharadwaj et al. In their study the highest first attempt success rate was found when classic LMA was inserted by standard technique as compared to 90° rotation method [11]. In the study conducted by Bon Wook et al, there was no significant difference between standard and 90° rotation method for insertion of flexible LMA in terms of first attempt success rate [1].

There was no significant difference between Group B (2 finger guided method) and Group A (90° rotation method) in terms of time of insertion whereas it is significantly higher in Group C. These results were in contrast to the results obtained in the prospective randomized study conducted by Bon Wook, et al among 129 adult participants. It was found that the time of insertion of flexible LMA by standard (10.5s) and 90° rotation method (9.7s) was not significantly different (p

value- 0.5). In the study conducted by Harshvardhan Bharadwaj et al to compare between standard and 90° rotation method for insertion of classic LMA, it was found that the insertion time was shorter in 90° rotation method (12.2s) as compared to standard method (16.6s). These results were in contrast to the results obtained in the present study.

As there was no significant difference between Group A and Group B in terms of time of insertion and first attempt success rate, it was found that index-finger method is as efficient as two-finger method for insertion of flexible LMA. In 90° rotation method, rotating the LMA anti-clock wise and then back requires stabilisation of LMA. As the shaft of LMA being flexible, it was comparatively difficult to have the control and achieve rotation movements which led to highest insertion time and least first attempt success rate in Group C.

In Two-finger guided technique, the mask is fixed between the two fingers which made it easy to stabilise. Moreover, the insertion technique is more in line with the physiological curvature of the finger, hence least insertion time and highest first attempt success rate was observed in Group B. There are limited studies on evaluation of different methods without using aids for insertion of flexible LMA. The limitation of the present study is the correct placement of flexible LMA was not confirmed by flexible fiberoptic bronchoscopy which is the gold standard method. The success of fiberoptic intubation through flexible LMA can be studied in future.

Conclusion

LMA insertion by two-finger guided method is the easiest and efficient method among all the 3 methods with least time taken for insertion and highest first attempt success rate and thus a good alternative to the standard method (index finger guided) for insertion of flexible LMA.

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