

# Comparison of the Success Rate of Laryngeal Mask Air Way Insertion in Classic & Rotatory Methods in Pediatric Patients Undergoing General Anesthesia

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## Abstract

**Background:** Laryngeal mask airway (LMA) is frequently used as a replacement method for endotracheal intubation. Few studies have investigated placement of laryngeal mask airway in pediatric surgical patients. In the present study, we aimed at comparing the success rate of 2 techniques, classic versus rotational, in the correct placement of laryngeal mask airway in pediatric patients.

**Methods:** After obtaining approval from the research committee of Faculty of Medicine, and receiving clearance from the ethics board of the University, this randomized controlled clinical trial (RCT) was administered on children of 2 months to 8 years with ASA class I & II undergoing lower abdominal surgical procedures in Motahari hospital in Urmia. General anesthesia using muscle relaxant was the preferred anesthesia technique for all the patients. Demographic data were recorded. Success rate, number of trials for correct placement, cuff leak pressure, and blood stain on the cuff of the laryngeal mask airway after its removal were all recorded.

**Results:** In the present study, 116 children were evaluated and placed into 2 groups. According to the results of the t test, no significant effect of age, weight, or average number of trials in mask placement was observed between the 2 groups ( $P > 0.05$ ). According to the results of the Fisher's exact test, no significant difference was detected between the 2 groups in blood staining on the cuff ( $P > 0.05$ ); no leak was recorded in any of the LMA placement methods (classic or rotational).

**Conclusions:** Both insertion techniques work well in pediatric surgical patients. Success rate and complications were comparable between the 2 groups.

**Keywords:** Laryngeal Mask Airway, Airway Management, Pediatric Airway

## 1. Background

Airway management is one of the most important tasks of anesthesiologists. Endotracheal intubation is one of the best methods of achieving this goal. However, this method requires laryngoscopy and intubation, which can cause anxiety and stress in patients and may be particularly harmful in patients with hypertension, ischemia, and asthma and produce serious side effects. There is a possibility of damage to the teeth and soft tissues of the mouth as well. Since early 1980s, to facilitate maintaining the airway and avoiding intubation complications, several devices were designed that allowed satisfactory ventilation by being placed above the patient's larynx chamber without entering the trachea or needing laryngoscopy; these devices are called supraglottic airway devices (SADs) (1-3). They have been extensively used since 1990, and are midway between face masks and endotracheal tubes with respect to anatomic position, invasiveness, and security points of

view. Primary laryngeal mask airways (LMAs) (currently known as classic LMAs) have been introduced to clinical use and used in more than 200 million patients since 1988. LMA is inserted blindly, so working smoothly is important. Various techniques of LMA insertion have been devised for acceptable position and performance. The technique that Dr. Brain has developed over many years is reliable, but not always successful, so alternative approaches may be required. Sniff position is recommended for LMA insertion. It is only after deep enough sedation, which is characterized by the ability of jaw thrust, that LMA is inserted. Two tests that are associated with satisfactory position of LMA are producing a pressure of 20 cmH<sub>2</sub>O and possibility of manual ventilation. Retraction with a readvancement maneuver may improve the performance and position of LMA (4). However, using laryngeal mask with classic method may lead to other problems such as direct contact with patient's secretions. One study showed that 2% to 6% of pa-

tients had inappropriate airways and that in 10% to 24% of the patients more than one trial was required for insertion of the mask. Moreover, researchers are looking for improved methods of insertion of laryngeal mask that rectify the shortcomings of the classic method (5). Another study in 2013, using a new insertion method (double person LMA), found that this method is very successful and leads to an obvious increase in the hemoglobin oxygen saturation level in arteries and a clear decrease in the carbon dioxide pressure at the end of expiration process, and can hence be used as a safe method (6, 7). Haghighi et al. (8) have also mentioned that the simplified air way method of LMA insertion have less side effects compared to the classic one (9, 10). In 2008, Kini et al. stated that the laryngoscopic method of LMA insertion results in a better final positioning than the classic method, which was confirmed by fiber optic bronchoscopic test (10). Few such studies have been conducted in Iran. One study revealed that a new insertion method (180-degree rotation) of LMA can reduce the risks of patient secretions and is similar to the classic method in all other aspects (5).

Small sized laryngeal mask airway has opened its way into pediatric anesthesia (11). Pediatric airway characteristics are different from those of adults; and those different features could not only make correct placement of LMA in pediatric patients difficult but also increases dislodgement rate. Description of various methods for LMA insertion implies that correct placement in pediatric patients is not as easy as it has been thought previously. Based on the survey we have conducted, to date, no other research has compared the classic methods of LMA insertion with 180-degree rotational method in pediatric surgical patients.

## 2. Objectives

Therefore, the present study aimed at comparing the 2 methods in children who referred to the surgery unit of Motahhari hospital in Urmia for selective procedures.

## 3. Methods

After obtaining the approval of the ethical board and the research committee of the University, 116 pediatric patients, with American society of anesthesiology (ASA) class I and II, were entered into the study. All participants that underwent lower abdominal surgery and met the inclusion criteria were randomly allocated into 2 equal groups of control and study. Inclusion criteria were age older than 2 months and younger than 8 years, ASA physical status of type I & II, and lower abdominal surgery. Exclusion criteria included possibility for difficult airway, aspiration risk factors (full stomach, reflux), and age younger than 2 months

or older than 8 years. According to the literature and the study by Stroumpoulis et al. (6), sample size determined to be 116 patients (60 patients in the study and 56 in the control groups).

A standard anesthesia protocol was not applied for all the patients, but to provide an optimal condition for laryngeal mask airway insertion, all patients received muscle relaxant. Patients were randomly assigned into 2 groups based on the sealed envelope method. After anesthesia induction with either intravenous or inhalational drugs, atracurium of 0.5 mg/kg was injected to reach the required muscle relaxation; and after ascertaining enough relaxation in the patient, a suitable LMA, corresponding to the patient's weight, was inserted. All the LMAs were classic disposable types. Informed consent was obtained from the parents for anesthesia procedure. Both insertion techniques and LMA are in common use in our operating rooms and its use is not considered harmful.

The classic method was used for LMA placement, as described by Dr. Brain. Rotational technique was used in the control and the study groups. The same anesthesiologist, who had the experience of at least 50 insertions in the pediatric patients, performed all the insertions. In the classic insertion method, the LMA cuff was fully deflated. The non-dominant hand held the neck in flexion and the head in extension. The LMA was held as a pen and with pressure to the hard palate with the index finger and was inserted into the mouth until feeling a resistance. Then, LMA was held with the nondominant hand, and the index finger was removed. In the rotational method, the cuff was partially inflated, and the head was held as in the classic method. While the lumen faced the hard palate, LMA was inserted. When the resistance of contact to the rear wall of the throat was felt, the LMA was passed by a 180-degree rotation and placed at the back of the throat. Symmetric chest movement, symmetric sound of both lungs, and no resistance in ventilation showed a successful LMA insertion and sufficient ventilation was checked by capnograph. A maximum trial was considered for either methods of LMA insertion, and if suitable insertion with LMA was not achieved, the patient had to be intubated and excluded from the study. The demographic variables (gender, weight, and age) were recorded before the induction. The number of trials of LMA insertion, leak after inflating the cuff with airway pressure of 25 cm H<sub>2</sub>O, and blood stain on the cuff (after removal from the mouth) after emergence from anesthesia were separately recorded.

To prioritize the accuracy over the time of LMA insertion for pediatric patients and to prevent the possibility of decreased care quality, we decided to remove the time variable from the study. After the study, data were entered into the SPSS software (Version 18), and the statistical analyses

were performed. A P value of 0.05 was considered as significant.

#### 4. Results

In the present study, 116 children with ASA class of I and II who were undergoing lower abdominal surgery and met the inclusion criteria were randomly allocated to control and study groups. Eight patients (13.34%) in the rotational method and 11 (19.65%) in classic method were removed and 97 completed the study.

Out of the 60 pediatric patients, 40 (66.7%) were male and 20 (33.3%) were female in the study group. Thirty-six out of 56 patients (64.3%) were male and 20 (35.7%) were female in the control group. According to the Fisher's exact test results, there was no significant difference in the gender of the pediatric patients ( $P = 0.5$ ).

Average age was  $30.93 \pm 26.99$  months in children in the study group versus  $19.17 \pm 3.62$  months in the control group. Average weight was  $12.83 \pm 6.04$  Kg in children in the study group versus  $10.61 \pm 4.25$  Kg in the control group. According to the statistical analysis (t test), there were no significant differences between the 2 groups in age ( $P = 0.06$ ) and weight ( $P = 0.11$ ).

Average number of trials for LMA insertion in the study and control groups was  $1.23 \pm 0.43$  and  $1.17 \pm 0.39$ , respectively. The results of the t test showed no statistically significant difference between the 2 groups ( $P = 0.61$ , Table 1).

Blood stain on the cuff was observed in 2 out of 60 LMA insertion cases (3.3%) in the study group versus no case in the control group. According to the results of the Fisher's exact test, there was no significant difference between the 2 groups ( $P = 0.75$ ).

The success rate was 86.66% (52 out of 60) in the rotational method, and correct placement failed in 8 patients (13.34%). The success rate was 80.35% (45 out of 56) in the classic method, and 11 patients (19.65%) failed the correct placement. The Fisher's exact test analysis showed no statistically significant difference in the success rate between the 2 groups ( $P = 0.37$ , Table 2).

No case of leak from around LMA cuff was recorded in either method (rotational or classic).

#### 5. Discussion

Laryngeal mask airway (LMA), introduced in the early 1980s, has achieved wide spread popularity as a supraglottic airway device (2). Small sized laryngeal mask airway performed remarkably well in pediatric patients. Pediatric airway is different from that of adults in some features. Examples include large tongue, high larynx, lack of teeth, and

short neck. Successful insertion of pediatric LMA at the first attempt has been reported to be 67% to 92% (12, 13). Several techniques have been proposed to insert LMA, and this indicates that the correct placement is not as easy as it was believed. Few studies have dealt with LMA placement in pediatric patients. However, we found some studies that tried to determine the predictors of failed LMA placement (14, 15). In an attempt to eliminate all possible predictors of difficult insertion, we did not use a standard technique for anesthesia induction. Rather, we chose to use muscle relaxant to give an optimal condition for LMA insertion. Although using inhalation anesthesia technique and keeping spontaneous ventilation is the preferred technique for LMA placement in pediatric patients, spontaneous ventilation could make the insertion difficult and complications more frequent. Lack of experience in LMA insertion could be a possible reason for failure of LMA placement. To eliminate this possibility, we asked one of our anesthesiologists with enough experience in LMA placement to do the insertions.

Several publications were found in the literature regarding the predictors for LMA placement failure in pediatric patients (cam), comparing LMA and the air-Q intubating laryngeal airway (16) and comparing supreme and proseal LMA (17) in pediatric patients. To our knowledge different techniques of LMA placement have not been compared in view of ease of insertion, adequacy of ventilation, and other complications.

We conducted the present study to assess the success rate of pediatric LMA placement in patients. We did not find any statistically significant difference between the 2 groups. Success rate and other variables were comparable in both groups. These comparable findings could have been the result of using muscle relaxant in patients, which might have facilitated LMA insertion and lessened the complications, yielding better ventilator conditions. We chose the 180-degree rotational technique because there is virtually no obstruction to LMA passage, and this technique tries to avoid pushing the tongue into hypopharynx; and it is appealing because there is no contact with patient's mouth and oral secretions.

Using muscle relaxant might be the major limitation of the present study. Another study that utilized inhalation induction technique and sufficient depth of anesthesia indicated that using jaw thrust and relaxation might yield different results.

##### 5.1. Conclusions

We found that both techniques work well in pediatric patients and that complication rate in both insertion techniques are comparable as far as muscle relaxant is used to facilitate LMA insertion.

**Table 1.** Comparison of Age, Weight, and Trial Numbers Between the 2 Groups<sup>a</sup>

Insertion LMA	Rotational (Study)	Classic (Control)	P Value
Age, months	30.93 ± 26.99	19.17 ± 3.62	0.06
Weight, Kg	12.83 ± 6.04	10.61 ± 4.25	0.11
Number of trials	1.23 ± 0.43	1.17 ± 0.39	0.61

<sup>a</sup>Values are expressed as mean ± SD.**Table 2.** Absolute and Relative Success Rate Between the 2 Groups<sup>a</sup>

LMA Insertion Method	Outcome		Total
	Successful	Unsuccessful	
Rotational (study)	52 (86.66)	8 (13.34)	60 (100)
Classic (control)	45 (80.35)	11 (19.65)	56 (100)
Total	97 (83.62)	19 (16.38)	116 (100)

<sup>a</sup>Values are expressed as No. (%).

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