

# Laryngeal Mask Airway Insertion in Adult: Comparison between Fully Deflated and Partially Inflated Technique

Raihan Uddin<sup>1</sup>, Abdul Jabbar<sup>2</sup>, Muhammad Muniruzzaman,<sup>3</sup> MA Salam Khan<sup>4</sup>

<sup>1</sup>Associate professor, Department of Anesthesiology and SICU, BIRDEM, <sup>2</sup>Medical officer, Department of Anesthesiology and SICU, BIRDEM, <sup>3</sup>Sr. Medical officer, Department of Anesthesiology and SICU, BIRDEM, <sup>4</sup>Professor, Department of Anesthesiology and SICU, BIRDEM

**Corresponding author:** E-mail: dr.raihanuddin393@gmail.com

## Abstract

**Objective:** *The laryngeal mask airway (LMA) Is a supraglottic airway device designed to seal around the laryngeal inlet. A controlled study was designed to compare the effectiveness and complications in inserting the LMA when the cuff is fully deflated and partially inflated.*

**Materials and Methods:** *American society of Anesthesiologists physical status 1 or 2 sixty (60) female patients scheduled for gynecologic procedures were included in this study. Patients were randomly allocated into one of two groups; fully deflated (n=30) and partially inflated group (n=30). A size #4 LMA was inserted. The number of attempts, grade of leak and complications were evaluated.*

**Place and duration:** *The study was performed in BIRDEM General Hospital from January 2018 to December 2018.*

**Results:** *All 60 patients completed the study protocol. The number of attempt, grade of leak and complications were not significantly different between the two groups.*

**Conclusion:** *The fully deflated method Is more accurate and less complications than the partially inflated group but which is not significant.*

**Key words:** *Complication, laryngeal mask airway*

(JBSA 2019; 32(2): 69-72)

## Introduction

The laryngeal mask airway (LMA) is a supraglottic airway device that Is designed to seal around the laryngeal inlet. The LMA Is handled with greater ease by less skillful personal,<sup>1,2</sup> and is known to have a low complication rate. LMA insertion not only allows adequate airway control during both controlled and spontaneous ventilation, but also airway patency can be maintained under less anesthetic doses compared to endotracheal intubation.<sup>3,4</sup>For these reasons, the LMA Is frequently used for airway management in ambulatory anesthesia.<sup>5</sup>

The LMA is used widely in pediatric anesthesia due to frequent ambulatory surgery in children. Therefore, the research on LMA insertion

techniques has been carried out mostly in the field of pediatric anesthesia. Kundra, et al.<sup>6</sup> demonstrated that the lateral approach with a partially inflated cuff as an alternative LMA insertion technique improved the ease and success of LMA insertion in children compared the standard Brain technique. And Ghai, et al.<sup>7</sup> and Nakayama, et al.<sup>8</sup> also reported that the rotational technique with the LMA cuff partially inflated associated with a higher success rate of insertion and lower incidence of complications in children. Meanwhile, in adult patients, there Is a report that inserting the LMA with the cuff partially inflated is likely to be more successful than with the cuff fully deflated.<sup>9</sup>On the other hand, insertion of the LMA with the cuff partially inflated has been

shown to be less successful than with the cuff fully deflated.<sup>10</sup>

Therefore, the study was designed to compare the ease, grade of leak around the cuff and complications when inserting the LMA with the cuff fully deflated and partially inflated.

### Materials and methods

After obtaining approval of the Institutional Review Board and written informed consents from the patients, American Society of Anesthesiologists physical status 1 or 2 sixty (60) female patients (20-50 years old) scheduled for short gynecological procedure, which lasted for 30 min under general anesthesia, were included in this study. Patients with respiratory tract infections, esophageal problems, or cardiovascular diseases, and at risk for aspiration were excluded.

Patients were premedicated with tab. Midazolam (7.5mg) 60 minutes before induction of general anesthesia. Upon arrival at the operation room, standard monitoring devices including 3-lead electrocardiogram, non-invasive blood pressure measurement and pulse oximetry were attached. All patients received IV atropine (0.02 mg). Anesthesia was induced with 2 mg/kg of propofol and 2 µgm/kg of fentanyl. A size #4 LMA was inserted 1 minute after intravenous anesthetic agent. All LMA insertions was done by anesthesiologists who had experienced more than 1000 LMA insertions. Patients were randomly allocated into one of the two groups using computer generated random numbers; the fully deflated (n=30) and partially inflated group (n=30). In the fully deflated group, the LMA was inserted with the fully deflated using the standard method described by Brain<sup>3</sup>. In the partially inflated group, the LMA was inserted using the same method describe by Brain<sup>3</sup> with the cuff inflated with 15 ml of air (half the amount of air recommended by the manufacture). Once the LMA was inserted, the cuff was inflated until it reached a pressure of 60 cmH<sub>2</sub>O using a manometer (cuff pressure gauge). The position of the LMA was confirmed clinically by auscultating both lung field to ensure symmetrical air entry, the absence of gastric insufflation with auscultation of the epigastrium, and the presence of end tidal carbon dioxide tracing. The number of attempts were recorded by an observer not involved in this study.

An attempt was defined as one passage of the LMA into the oropharynx. Maximal attempts were limited to two. If unsuccessful after two attempts, orotracheal intubation was done. General anesthesia was maintained with halothane (1-1.5 vol %) and inj. Fentanyl (0.5 µgm/kg) if needed. Patients lungs were ventilated with a tidal volume of 8-10 ml/kg at a rate of 8-12 breaths/min in (50 % O<sub>2</sub> + 50 % N<sub>2</sub>O), adjusted to maintain the end-tidal CO<sub>2</sub> partial pressure between 30-40 mm Hg. Arterial blood pressure (systolic, diastolic, and mean), pulse oximetric saturation, and ETCO<sub>2</sub> were monitored throughout the surgery at 5 min intervals. The remaining data were evaluated by another anesthesiologist blinded to the groups. In order to maintain airway pressure at 20 cmH<sub>2</sub>O, manual bagging was done during the evaluation of leakage. The leak around the cuff at an airway pressure of 20 cmH<sub>2</sub>O was graded as 1=no leak, 2=palpable leak only, 3=palpable and audible leak with satisfactory ventilation, 4=palpable and audible leak with inadequate ventilation, and 5=total obstruction with no possible ventilation.<sup>6</sup> At the end of surgery, the LMA was removed. The tip of the LMA was examined for the presence of blood. In the evening of postoperative day, patients were asked if they had any discomfort during swallowing saliva (odynophagia), sore throat and hoarseness. Patients were followed up until discharge and medical records were reviewed for the evaluation of other esophageal and laryngeal injuries.

### Statistical analysis

Statistical analysis was performed with SPSS program. Demographic data, vital signs, number of LMA insertion attempts, grade of leak around cuff and number of complications were compared between the two groups using the Student's t-test or Fisher's Exact test which one is applicable. p<0.05 was considered statistically significant.

### Results

All 60 patients completed the study protocol. There were no cases of insertion failure in both groups. Patients characteristic were similar in both groups (Table-1). There were no significant differences in hemodynamic variables between the groups during surgery.

**Table-I** Patients' Characteristics

	Fully deflated group (n=30)	Partially inflated group (n=30)	p value
Age (years)	34.3 ± 9.4	35.1 ± 8.9	0.736
Weight (kg)	55.7 ± 9.1	56.9 ± 9.3	0.615
Height (cm)	150.3 ± 5.5	152.0 ± 5.7	0.245
Operative time (min)	20.7 ± 9.7	22.4 ± 9.9	0.504
Anesthesia time (min)	30.9 ± 11.3	32.3 ± 10.6	0.623

**Table-II** Comparisons between the two groups

Factors	Fully deflated group (n=30)	Partially inflated group (n=30)	p value
Number of attempt			
1 <sup>st</sup> attempt	28 (93.3%)	26 (86.7%)	0.671
2 <sup>nd</sup> attempt	2 (6.7%)	4 (13.3%)	
Leak around cuff			
Grade 1	27 (90.0%)	26 (86.7%)	0.999
Grade 2	3 (10.0%)	4 (13.3%)	
Grade 3	0	0	
Grade 4	0	0	
Grade 5	0	0	
Complications			
Blood on LMA removal	1 (3.3%)	3 (10.0%)	0.612
Sore throat	2 (6.7%)	3 (10.0%)	0.999

The number of attempts between the two groups were not significantly different. In the fully deflated group, grade 1 leak around the cuff was observed in 90.0% and grade 2 leak was observed in 10.0% of patients. In the partially inflated group, grade 1 leak around the cuff was observed in 86.7% and grade 2 leak was observed in 13.3% of patients. There was no significant difference between the two group.

The incidence rate of blood on LMA removal and sore throat were lower in fully deflated than partially inflated group but which is not significant.

### Discussion

The LMA was invented by Dr. Archi Brain in 1981. Since its invention, the LMA has been proven to be useful in many settings, such as supporting difficult intubations, ambulatory surgery, resuscitation of neonates and adults, teaching blind nasal intubation etc.<sup>11-19</sup>

Brain suggested that the LMA should be inserted with the cuff fully deflated. With the patient's neck flexed and the head extended, the LMA is pushed up softly against the palate in the manner of holding a pen. After the LMA is in place the cuff is inflated and the position of the LMA is confirmed clinically by observing for signs of any airway obstruction.<sup>20</sup>

Many attempt have been made to improve the success rate of LMA insertion by modifying the standard Brain technique, whereas different LMA insertion techniques have been shown to have diverse degree of success.<sup>6-10,20</sup> Matta, et al.<sup>9</sup> demonstrated that inserting the LMA with the cuff partially inflated is likely to be more successful than with the fully deflated cuff. On the other hand, Brimacombe and Berry<sup>10</sup> reported that insertion of the LMA with the cuff partially inflated is less successful than with the cuff fully deflated.

In our study we found that the number of attempts for successful LMA insertions were not

significantly different between the fully deflated and partially inflated groups. Regarding the grade of leak around cuff during insertion and maintenance of LMA during operation were also not significant. Though the complications after removal of LMA (blood on LMA, sore throat) were less in fully deflated than partially inflated group but which was not significant.

In conclusion, although the rate of LMA insertion is easier, the grade of leak around the cuff and the complications are less in fully deflated than partially inflated group but which are not significant.

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