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# LARYNGEAL MASK AIRWAY CUFF PRESSURE APPLICATION DURING GENERAL ANAESTHESIA - INSTRUMENTAL VERSUS CONVENTIONAL METHOD- A COMPARATIVE STUDY.

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**ABSTRACT**

**Objective:** To evaluate the conventional practice of Laryngeal Mask Airway (LMA) cuff inflation and pressure measurement as compared to the instrumental method.

**Study Design:**Prospective observational study.

**Place and Duration of Study:** Aakash Fertility Centre, 10, Jawaharlal Nehru Road , Vadapalani , Chennai, during the period of August 2016 – July 2017

**Methods:** A total of 200 adult female patients posted for hysteroscopic surgery under General Anaesthesia for infertility treatment were selected for this study. Patients with anticipated difficult intubation, risk for aspiration, known anatomical laryngotracheal abnormalities, and emergency cases were excluded. All selected patients were inserted with size 4. The LMA cuff inflated with 25 ml by a qualified anaesthesia technician. Cuff pressures were measured using aneroid manometer. LMA cuff pressure of 50–60 cm of water was considered as standard.

**Results:**In 85% of the patients, the cuff pressure measurements were above the standard. The mean cuff pressure was 88 cm of water.

**Conclusion:**The conventional method for LMA cuff inflation and pressure measuring is unreliable. A routine instrumental cuff pressure, monitoring is suggested.

**KEYWORDS :** Cuff pressure, LMA, measurement

## Introduction

A critical function of the LMA cuff is to seal the airway, thus preventing leaks and aspiration of pharyngeal contents into the trachea during ventilation. In literature, catastrophic consequences of LMA cuff overinflation and insufficient inflation are reported. An LMA with a cuff is generally used for mechanically ventilated patients to prevent gas leakage and pulmonary aspiration. Excessive cuff pressure decreases tracheal capillary perfusion, and insufficient cuff pressure leads to pulmonary aspiration of oropharyngeal content.

The LMA cuff pressure must be in a range that ensures delivery of the prescribed mechanical ventilation tidal volume, reduces the risk for aspiration of secretions that accumulate above the cuff without compromising the tracheal perfusion. A cuff pressure of 50–60 cm of water is recommended for the prevention of aspiration and ventilator-associated pneumonia.

Post intubation sore throat is a common side effect of general anaesthesia. This may partly result from ischemia of the oropharyngeal mucosa due to over-inflation of the cuff. In general, in anaesthesia practice LMA cuff pressure is assessed by palpation of cuff or cessation of audible leak around the cuff is the end point for inflation. We have conducted an observational study to evaluate the efficacy of cuff inflation and assessment of conventional method and instrumental measurement of cuff pressure. The LMA cuff pressure of 50–60 cm of $H_2O$ was considered as standard.

## Methods

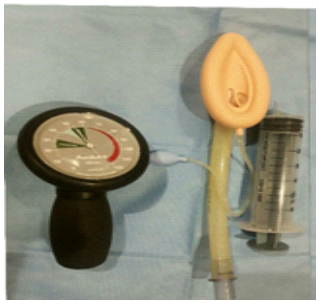
This was a prospective observational study; Informed consent was obtained from the patients who met the eligibility criteria. Two hundred female adult patients above 22 years of age scheduled for elective surgical procedure requiring general anaesthesia and LMA size 4 insertion were included in the study. Patients with anticipated difficult intubation or having a history of difficult intubation, high risk for aspiration, known anatomical laryngotracheal abnormalities, and emergency intubations were excluded. General anaesthesia was induced using intravenous bolus of induction agent Inj.Propofol 2mg / Kg ,Inj.Fentanyl 2mg/ kg and Sevofluraine 3% in 100 % oxygen .All patients were inserted with LMA # 4. Anaesthesia was maintained with sevoflurane, a volatile anaesthetic agent, in a combination of nitrous oxide, oxygen.The duration of the study was 1 year. LMA was inserted by anesthesiologist and cuff was inflated by the qualified anaesthesia technician. A 50 ml syringe was used as a routine for LMA cuff inflation. Adequacy of cuff inflation is generally assessed by palpation of the pilot balloon and sometimes readjusted by anaesthetist by inflating just enough to stop an audible leak around the cuff. The cuff pressure was measured by one of the investigator immediately after induction (before positioning) of anaesthesia using an aneroid manometer. The aneroid manometer (AMBU, Germany) was connected to the pilot balloon of the LMA and LMA cuff pressure was measured and recorded.

## Results

LMA cuff pressure was measured in 200 adult patients who underwent elective surgical procedures under general anaesthesia. There was no significant difference in age ,weight, and duration of surgery ( mean duration 15 minutes.) The overall incidence of LMA cuff pressures within the recommended range (50–60 cm of water) was 15% and in 85% it was above the recommended range.None of the measured cuff pressures was below the recommended range. The mean cuff pressure was 88 cm of water , which is above the standard. The lowest pressure measured was 54 cm of water and highest cuff pressure was 118 cm of water. In 41% the pressure range was 80-90 cm of water, in 25% the pressure range was 90-100 cm of water, in 8% the pressure range was 70-80 cm of water, in 8% the pressure range was 60-70 cm of water and in 3% the pressure range was 100-120 cm of water. In 15% patients only the pressure was measured between 50-60 cm of water.

**Table 1**

| Cuff Pressure in cm of water | Number of Patients | Percentage |
|---|---|---|
| < 50 cm | 0 | 0% |
| 50 - 60 cm | 30 | 15% |
| 60 - 70 | 16 | 8% |
| 70-80 | 16 | 8% |
| 80-90 | 82 | 41% |
| 90-100 | 50 | 25% |
| 100-120 | 6 | 3% |
| Mean Cuff Pressure - 88 cm of water | | |



## Discussion

The pressure exerted on the pharyngeal wall is one of the primary determinants of sore throat.The intra-cuff pressure in LMA inserted patients should be high enough to prevent macroscopic aspiration and an air leak to ensure adequate ventilation. The cuff pressure should be adequate enough not to impair the mucosal blood flow. It has been shown that continuous lateral wall cuff pressure above 60 cm H2O compromises blood flow. It has been shown that compromised blood flow for 15 min resulted in superficial damage to the t mucosa. It is reported that high LMA cuff pressure resulted in high incidences of sore throat.Digital balloon palpation corresponds poorly with the measured endotracheal cuff pressure, and anaesthetist experience corresponds poorly with measured cuff pressures.The instrumental measurement and adjustment of cuff pressure resulted in a significantly lower incidence of post procedural sore throat, hoarseness, and blood-stained expectorant.The pressure exerted on the oropharyngeal wall depends on the compliance of the oropharynx and the pressure measured at the pilot balloon of LMA cuff. LMA cuff pressure can be considered as a good estimate of the pressure exerted on the mucosa. The highest recorded cuff pressure in our study was 118 cm H2O, and most of the patients (85%) were having high cuff pressure. In our study, we observed that the use of size syringe (50 ml) is one of the important factors for over inflating the ETT cuff, resulted in high cuff pressure. It was shown that there is linear relationship between the measured cuff pressure and the volume of air retrieved from the cuff. Our study showed that injected volumes between 20-22 ml usually produce cuff pressures between 50 and 60 cm H2O, dependent of size of the patient. We suggest the use of a 20 ml syringe alternative to the traditional bigger size syringe. This study has highlighted the issue of training and awareness among anaesthesia personnel regarding cuff inflation and cuff pressure measurement technique. Minor but common complications like postoperative sore throat can be prevented using a routine simple aneroid instrument for cuff inflation and pressure measurement rather than relying on conventional methods.

A limitation of this study is that cuff pressure was evaluated just once after insertion of LMA. We never measured intermittently as the mean duration of the surgery was 15 minutes.The other limitation of our study was lack of control or placebo group. Further studies are required to find out the incidence of postoperative sore throat after repeated instrumental measurement of cuff pressure in prolonged surgeries and surgeries in different positions.

## Conclusion

The conventional method for LMA cuff inflation and balloon pressure measuring is unreliable. Instrumental cuff pressure monitoring is simple and inexpensive and suggested to be used as a routine to prevent the postoperative sore throat.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

## References

1. Brimacombe J ,Berry A et al ,Laryngeal mask airway cuff pressure and position during anaesthesia lasting one to two hour ,Canadian J Anesthesiol. 1994;jul 41(7):589-93.[PubMed]
2. Steele et al. Ambulatory Anaesthesia and Perioperative Analgesia Manual. McGraw-Hill. 2005; p488.
3. Reiger et al. Intracuff pressures do not predict laryngopharyngeal discomfort after use of the LMA. Anaesthesiology. 1997; 87(1): 63-7.
4. Rosenblatt W, Ovassapian A & Eige S. Use of the laryngeal mask airway in the United States: a randomized survey of ASA members. Anesthesiology 1998; 89: A575.
5. McIntyre JWR. History of anaesthesia: oropharyngeal and nasopharyngeal airways: I (1880–1995). Canadian Journal of Anaesthesia 1996; 43: 629–35.
4 Brimacombe J. The advantages of the LMA over the tracheal tube or facemask: a meta– analysis.Canadian Journal of Anaesthesia 1995; 42: 1017–23.
5 Williams PJ & Bailey PM. Comparison of the reinforced laryngeal mask airway and tracheal intubation for adenotonsillectomy. British Journal of Anaesthesia 1993; 70: 30–3.
6 Brain AIJ. The Intavent Laryngeal Mask – Instruction Manual. London: Intavent, 1991.
7 Voyagis GS, Batziouulis PG & Secha– Doussaitou PN. Selection of the proper size of laryngeal mask airway in adults. Anesthesia and Analgesia 1996; 83: 663–4.
8 Berry AM, Brimacombe J, McManus KF & Goldblatt M. An evaluation of the factors influencing selection of the optimal size of laryngeal mask airway in normal adults. Anaesthesia 1998; 53: 565–70.
9 Brimacombe J & Keller C. Laryngeal mask airway size selection in males and female: ease of insertion, oropharyngeal leak pressure, pharyngeal mucosal pressures and anatomical position.British Journal of Anaesthesia 1999; 82: 703–7.
10 Asai T, Howell TK, Koga K & Morris S. Appropriate size and inflation of the laryngeal mask airway. British Journal of Anaesthesia 1998; 80: 470–4