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LMA cuff pressure maintenance: A facile technique achieved with 10 ml syringe

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Abstract
Laryngeal mask airway (LMA) has been routinely used for ophthalmic anaesthesia all around the world. The recommended LMA cuff pressure is < 60 cm H2O. This study uses a 10 ml syringe, the plunger of which rebounds against the cuff pressure of the LMA passively leading to adjustment of the pressure. The intracuff pressure was measured using a manometer after the plunger ceased moving. The age group of patient was 1.5 years to 14 years and size of LMA was 1.5 -2.5. The demographics were compared using mean and median. For LMA size 1.5 total number of cases analysed were 9 in which maximum pressure recorded was 28 and minimum was 14, mean was 21.44±5.45 and the median was 24. For LMA size 2.0 total number of cases done were 35 in which maximum pressure recorded was 40 and minimum were 14, mean was 12.34±6.73 and the median was 24. For LMA Size 2.5 total number of cases done were 17 in which maximum pressure recorded was 38 and minimum was 24, mean was 32.12±3.70 and the median was 32. After evaluating all the data we concluded that releasing of pressure using 10ml syringe, the plunger of which rebounds against the cuff pressure of the LMA passively leading to adjustment of the pressure.

Keywords: LMA, Syringe, Cuff pressure.

Introduction
Laryngeal mask airway (LMA) has been routinely used for ophthalmic anaesthesia all around the world. This method leads to stable hemodynamic and lesser complications such as laryngospasm, sore throats. (1) Using of clinical end point (inflation till device moves slightly forward and ability to ventilate with good seal) has been standard way of confirmation of good LMA placement in our practice. (2) This process is usually associated with hyperinflation in paediatric LMA which leads to cuff leakage. (3)
The recommended LMA cuff pressure is < 60 cm H2O. Over inflation of cuff pressure has been adversely associated with increased chance of leakage and cause impairment of mucosal perfusion leading to sore throat, hoarseness and nerve palsies. (4)(5)(6)
Usage of a manometer to decrease these complications is recommended (7) but routine use of the manometer after LMA placement is not applied by most of the centres. This may be due to the fact of unavailability of the manometer &/or time constraints. Need of easier techniques to decrease this problem have been investigated by a lot of researchers but with varying degrees of success
One of such techniques is the use of a syringe rebound technique in which different types of syringes are used to adjust the intracuff pressure of LMA. (8) This study uses a 10 ml syringe, the plunger of which rebounds against the cuff pressure of the LMA passively leading to adjustment of the pressure.

Methodology
The single centre observational study was conducted after receiving approval from the institutional review board. Written parental consent was taken. 61 children, ASA I, between 10-30 kg, posted for ophthalmic surgery under general anaesthesia with an LMA (LMA classic, The Laryngeal Mask Company Limited, Richmond, Australia) were consecutively

included. Patients were excluded if they had abnormal anatomy of the airway, risk of gastric content regurgitation, cardiac/ pulmonary abnormalities and history of upper respiratory tract infections (runny nose, fever and cough).

After patients were cleared from preanesthetic check-up, on the day of surgery, standard monitoring was applied. General anaesthesia was induced with inhalational technique using sevoflurane/ halothane in oxygen. After confirming adequate sedation with loss of eyelash reflex, venous access was achieved, injection DNS was started according to Holliday-Segard method. Injection midazolam 0.05 mg/kg with injection ketamine 0.3 mg/kg here provided. Hemodynamic (HR, SPO2, BP if applicable) were recorded. After adequate sedation confirmed by loss of eye rolling, LMA was "zeroed" to atmospheric pressure and inserted by an experienced anaesthesiologist (experience of more than 100 LMA) with standard technique. LMA size was determined according to standard guidelines (size 1.5 for 5-10kg, size 2 for 10- 20 kg, size 2.5 for 20-30 kg). Positioning of the LMA was confirmed by rise in LMA after addition of air,0.5 ml of air was added at a time. Assessment of ventilation was done and repositioned if necessary. Spontaneous respiration was achieved and maintained with oxygen and inhalational anaesthetics. Hemodynamic were recorded again.

After fixing the LMA, air was allowed to rebound against the piston of the newly opened syringe passively. The syringe was kept at room temperature and was activated by drawing and releasing air to overcome the static force of the piston against the syringe. Cessation of piston movement was the end point for use of syringe.

Then a manometer (Hi -LO EVAC) was attached to the pilot balloon and pressure was recorded. In a pilot study, the repeated measurements with the manometer were found to be related to leak of air subsequently, decreasing the pressure of the LMA. So, for the study rather than using the mean pressure, single recording was used.

Maintenance of spontaneous ventilation and recording of hemodynamic were done accordingly.

Postoperatively sore throat and other complications were assessed over a period of one day.

Statistics

The demographics were compared using mean and median.

The pressure and size of LMA was compared using mean and median.

The volume of air inserted and released were compared using student t-test.

Results

The age group range for the study was as shown in Table 1.

The median age for the study was 6 years, ranging between 1.5 years to 14 years.

Table 1.

Age/Sex	Male	Female	Total
1-5	19	11	30
± 6-10	19	5	24
11-15	4	3	7
Total	42	19	61

The mean weight was (±SD) 17.52±6.52 kg.

The mean duration of surgery (±SD) was 24.27±17.93 ranging from 1 minute to 79 minutes.

The median range of LMA used in the study was size 2.

The mean pressure (±SD) recorded was 26.08±6.98 cm of H20.

Minimum pressure for the study was 14 cm H20 and maximum was 40 cm H20 as shown in **Figure 1**.

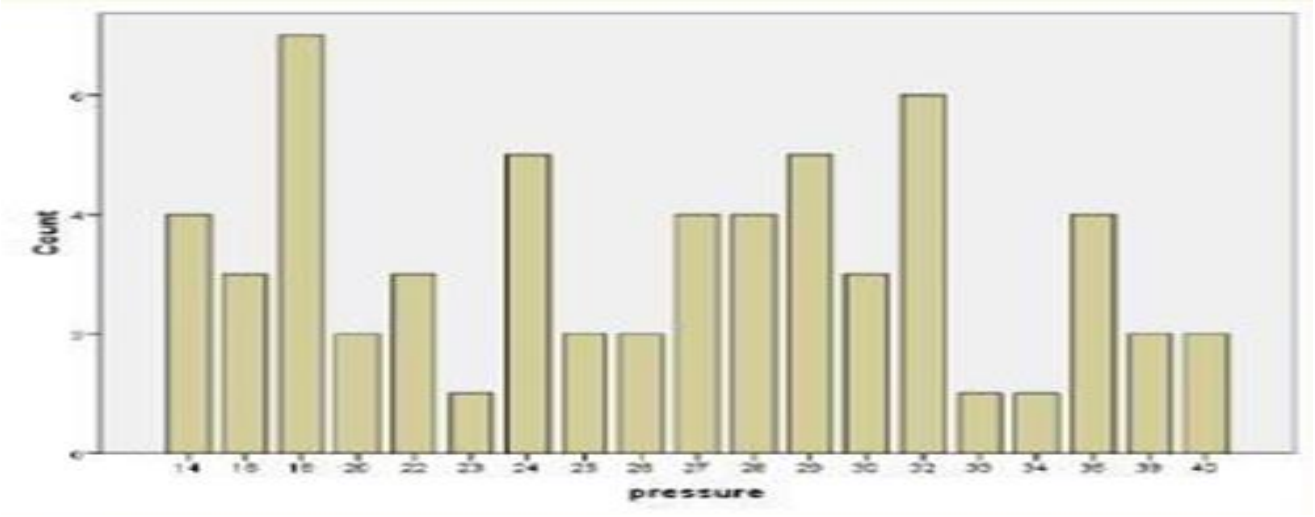

Fig.:1

The mean volume inserted (±SD) to reach clinical end point was 1.9±0.61 and mean volume released (±SD) after application of syringe rebound technique was 1.62±0.89, which was statistically significant (p<0.005).

The following graph shows pressure differences with different LMA sizes.

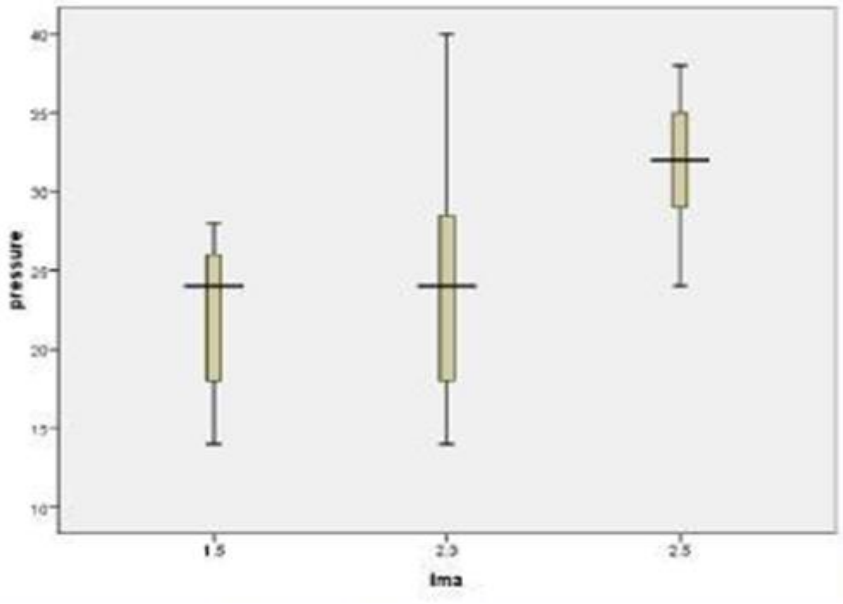

Fig. 2:

For LMA size 1.5 total number of cases analysed were 9 in which maximum pressure recorded was 28 and minimum was 14, mean was 21.44±5.45 and the median was 24.

For LMA size 2.0 total number of cases done were 35 in which maximum pressure recorded was poverty and minimum were 14, mean was 12.34±6.73 and the median was 24.

For LMA Size 2.5 total number of cases done were 17 in which maximum pressure recorded was 38 and minimum was 24, mean was 32.12±3.70 and the median was 32.

Discussion

Ideally, the LMA cuff pressures should be measured routinely using manometry and deflated to achieve intracuff pressure of less than 44mmHg7. Our manometric readings of intracuff pressure after using the syringe technique are consistent with this cut-off of less than 44mmHg.

In our study, we found out that using the syringe technique led to intra cuff pressure manometric reading of <60 cm of H20, in all the instances. In similar research, a three-way stopcock was used to first achieve a pre-set intra cuff pressure, and a syringe was connected to the third port of the three way stop cock to measure the intra cuff pressure using the modified syringe technique. The results showed that the modified syringe technique allowed to offset intracuff pressure equal to or less than 60 cm of H2O, even when the pre-set intracuff pressure was set to higher values of 70 to 120 cm of H2O. However, in 14% (8/56) of the cases, the syringe technique failed to achieve intra cuff pressure of <60 cm of H209.

Our findings were also supported by another research where #2 and #5 LMAs were inflated to achieve 40, 60 or 120 mmHg starting pressures and then, the syringe plungers were allowed to recoil to equilibrium. The results showed that safe residual cuff pressures of <44mmHg was achieved consistently with a number of combination of syringes and preset starting pressures10.

It is important to achieve intracuff pressure of <60 cm of H2O to prevent post-operative complications like sore throat and hoarseness. Therefore, cuff manometers should routinely be used not only to avoid unnecessary hyperinflation but also to improve cuff sealing of LMA in children and prevent complications3.

However, in another study where 332 patients were divided among three groups to achieve the desired intra cuff pressure; clinical end point, pressure transducer and syringe recoil groups; it was found that both the syringe recoil group and pressure transducer group were less likely to have sore throat and dysphagia 1 hour after surgery11.

Our research had some limitations. The pressure readings and the overall result was confounded by the size and brand of syringe and LMA used. We have only used a 10 ml Terumo syringe and "LMA classic, The Laryngeal Mask Company Limited, Richmond, Australia". We have not taken into account the possible variability of readings that could have been observed had we used syringes and LMAs of different brands or sizes. Also, we have not taken into account the incidence of post-operative complications when using the syringe recoil technique.

Conclusion:

Releasing of pressure using 10ml syringe, the plunger of which rebounds against the cuff pressure of the LMA passively leading to adjustment of the pressure.

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