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# An Observational Study for Evaluation of Supreme LMA in Paediatric Patients.

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## ABSTRACT

**Background:** The need of securing the airway quickly in an easier and safer way, especially in paediatric patients still remains a major concern. Newer and safer alternates to endotracheal intubations are being introduced. LMA supreme is one of such advancement in the field of paediatric anaesthesiology. Easy and quick insertion without any introducer, gastric access and high seal pressure are few advantages claimed by LMA Supreme. Apart from a few studies; the safety and efficacy of its paediatric version is yet to be established in Indian paediatric population. Thus, we have conducted an observational study for evaluation of Supreme LMA in paediatric patients. Observational clinical study. **Methods:** After obtaining approval from institutional ethical committee and consent from patient's attendants, 50 patients of ASA grade I and II, weighing 10-20 kg of either sex undergoing general anaesthesia were included. After induction of anaesthesia and muscle relaxation, the LMA Supreme size 2 was inserted. Number of insertion attempts, ease of insertion, time taken for insertion, hemodynamic responses, ease of NGT insertion and incidence of airway trauma were recorded. **Results:** In 90% of patients, LMA Supreme was inserted in first attempt. In 94% of cases, insertion was easy. Average time required to insert LMA Supreme was 11.66 ± 0.81 seconds. There were no significant hemodynamic changes noted. In 2 % of cases, airway trauma was observed. **Conclusion:** LMA supreme emerged as a good alternate airway device. It is quick and easy to insert with fast learning curve with least alteration of hemodynamic status in paediatric population.

***Keywords:*** LMA Supreme, Paediatric population.

## INTRODUCTION

Airway management continues to remain one of the most challenging tasks for the anesthesiologists and critical care providers. One should also consider the uniqueness of pediatric airway management. The need of making this indispensable task safer, quicker and easier; has led to the development of a number of new airway aids and devices from time to time. Introduction of LMA-laryngeal mask airway was one such advancement. Originally created as a hands-free replacement for the face mask, the LMA has gone on to replace endotracheal tubes as the preferred airway.[1] LMA offers several advantages, including ease of placement, lower drug requirement, reduced hemodynamic response, reduced intracranial and intraocular tension, smoother emergence and a lower incidence of airway trauma.[2] Various modifications in the structure and design of LMA are being made to make it better.

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The LMA Supreme (SLMA) is one such uniquely designed single use supraglottic airway device. It provides easy insertion without the need for digital or introducer tool guidance. When positioned correctly SLMA forms two seals: one at the upper esophageal sphincter and the other over the glottic opening. Offers gastric access and higher seal pressure. It also has a unique fixation tab (FT), a rectangular structure moulded on to the manifold at right angles which projects over the patient's upper lip [Figure 1]. It is designed to facilitate easy insertion and fixation of the SLMA$^{TM}$, after insertion and inflation of its cuff. The FT was found, in early pilot studies, to act as a Visual guide to 'correct' size selection, that is after inflation of the cuff to a pressure of 60 cm $H_2O$, the FT should be 1.5–2 cm from the upper lip, if the FT is less than this distance the size chosen may be too small and if 3.0 cm from the upper lip the size chosen may be too large.[7] It has been used in adult patients and performed well.[3-5] The latest advent of LMA Supreme is its paediatric versions which are now available in four different sizes–1, 1.5, 2, and 2.5 on the basis of body weight.[6] Apart from a few studies, the safety and efficacy of paediatric version is yet to be established in the Indian paediatric population. So we had conducted this prospective, single blinded observational study to determine the efficacy of SLMA in anaesthetised, paralysed children.

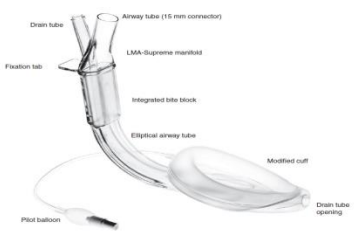


**Figure 1:** LMA-Supreme™ with fixation tab designed to facilitate easy insertion and fixation.

## MATERIALS AND METHODS

After taking consent from parents and approval from the Board of Studies, Department of Anesthesiology& Critical Care and Ethics committee, a study was conducted in J N Medical College Hospital on 50 ASA I-II pediatric patients of either sex of weight between 10 – 20 kg undergoing general anesthesia using neuromuscular blockade and Intermittent Positive Pressure Ventilation (IPPV). Children with upper respiratory tract infection, history of lung disease, non fasting status, esophageal reflux, hiatus hernia were excluded from the study. Patients were premeditated with oral Midazolam 0.5 mg $kg^{-1}$, Inj. Atropine 0.02 mg $kg^{-1}$ i.m. and inj. Ketamine 5 mg $kg^{-1}$ i.m. All standard monitors were attached and intravenous line was placed. Anesthesia was induced with inj. Ketamine 2 mg $kg^{-1}$ i.v. until unresponsive to pain and this was followed by inj. Succinylcholine 1.5 mg $kg^{-1}$ i.v. to facilitate size 2 SLMA insertions as per instruction of manufacturer[9]. A maximum of three attempts was allowed. An attempt was considered unsuccessful if proper placement of LMA was not there as evidenced by Et-$CO_2$ or bilateral equal air entry on chest auscultation and $SpO_2$ on pulse oximetry. In between two consecutive attempts patient was ventilated by face mask. The ease of insertion was recorded in terms of 'Easy' or 'Difficult', assessed using a subjective scale. The time (seconds) between picking LMA in hands to successful placement as evidenced by $EtCO_2$ or by bilateral equal air entry (auscultation method) and $SpO_2$. The insertion time was measured in seconds by an assistant using a stopwatch.

Following successful insertion, breathing circuit was attached and the patient was maintained with $O_2$+$N_2O$ with Sevoflurane (1-2%). Basal values of pulse rate, mean blood pressure were recorded 5 min. prior to induction, after induction & just after insertion by an assistant. Further values were recorded at intervals of 1 minute, 3 minutes, 5 minutes after insertion. Injection fentanyl 2 ug/kg was given and surgery was allowed to commence only after the collection of the last hemodynamic data at 5 minutes post-insertion interval. Neuromuscular blockade was maintained by intermittent injection of Atracurium as and when required. Additional analgesics were given at the discretion of the anesthetist. The ease of orogastric tube placement was timed and assessed using a subjective scale. Intra-operative device repositioning or replacement due to excessive air leak or airway obstruction was noted.

At the end of the surgery, residual neuromuscular blockade was reversed with inj. Neostigmine (40 µg $kg^{-1}$) and inj. Glycopyrrolate (0.01mg $kg^{-1}$). After adequate reversal of neuromuscular blockade, SLMA was taken out. Airway trauma was assessed observing the patient's airway and post procedural blood staining of the device, tongue-lip-dental trauma after removal of the device.

## RESULTS

Patient's age, weight, duration of surgery (DOS), attempts and time for SLMA insertion (TOI), pulse rate and mean arterial blood pressure changes during insertion, ease of orogastric tube placement and incidence of trauma were recorded. Data collected were entered into an EXCEL™ spreadsheet (Microsoft, Redmond, WA, USA) and analyzed. Median age and weight of the children were 4 yrs (range 1.5-8 yrs) and 15 kg (range 10-20 kg) [Figure 2]. Median duration of surgery (DOS) was 50 minutes (range 15-100 minutes) [Figure 2] and maximum of the cases 29/50 were urogenital surgeries. In 45/50 cases (90%) SLMA could be inserted in first attempt. A second attempt was required in rest 5/50 (10%) cases and 3/50 cases were difficult for SLMA insertion. The median time required to pick the SLMA and successfully placing, it was 12 seconds (range 11-15 seconds) [Figure 2]. No statistical significant changes were recorded for pulse rate [Figure 3] or Mean arterial blood pressure change [Figure 4]before and after induction of anesthesia or SLMA insertion. Our all attempts to insert 10 FG orogastric tube through the drain tube were successful. In one case we evidenced lip trauma during SLMA insertion and in another case we found a blood stain in SLMA cuff after removal. In both cases, SLMA insertion was difficult.

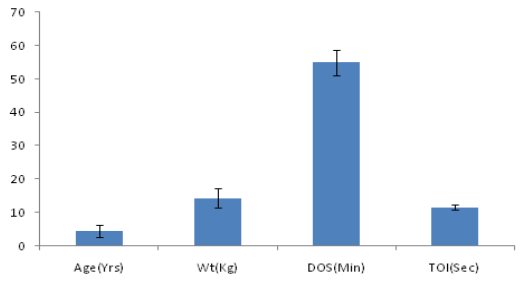
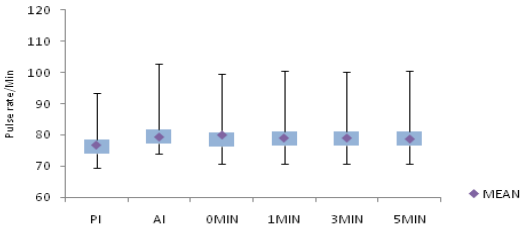



**Figure 2:** Mean Age, Weight (Wt), Duration of surgery (DOS) and Time of device insertion (TOI).




PI- Preinduction; AI- After induction; 0Min- After device insertion
1Min/3Min/5Min- 1,3 or 5 minutes after insertion.

**Figure 3:** Pulse rate measurements before and after induction or device insertion.

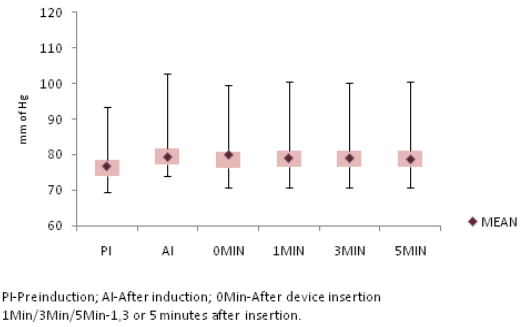



**Figure 4:** Mean arterial blood pressure (MAP) measurements before and after induction or device insertion.

## DISCUSSION

The inventor of the ILMA and PLMA, Dr A.I.J. Brain, designed the SLMA as a single-use laryngeal mask airway device with gastric access, intending to combine the desirable features of both the Intubating LMA Fastrach (ILMA) and the PLMA. Our study was designed to observe the insertion qualities, hemodynamic changes and post-insertion complications of SLMA in the pediatric population. In our study SLMA could be inserted in the first attempt in 90% of cases, which is exactly same, found by Timmermann A et al[10] and Cook TM et al[11] in their studies. The rigid anatomically shaped airway tube of the SLMA facilitates easy insertion of the device without the need for insertion of the fingers of the user into the patient's mouth. We found SLMA insertion easy in 47/50 patients. In 3 cases we used some maneuvers to place the SLMA properly. Tan BH et al [12] and Seet E et al [13]found SLMA insertion easy compared to the PLMA. We assume that relatively larger size SLMA might have been the cause of difficult insertion in those 3 cases. The range of insertion time (TOI) in our study was 11-15 seconds, which is supported by similar findings by Verghese C et al[7], Cook TM et al[11] and Theiler LG et al[14]. We think that the intelligent design of the fixation tube (FT) along with the elliptical and anatomically shaped semi rigid airway tube of the SLMA facilitated rapid insertion. It is of interest that the mean insertion times are similar even though in 5 cases second insertion attempt was required. In our study basal values of pulse rate, mean blood pressure were recorded 5 minutes prior to induction, after induction & just after LMA insertion by an assistant. Further values were recorded at intervals of 1 minute, 3 minutes and 5 minutes. We compared hemodynamic values after induction to values just after LMA insertion (0 minute) by means of statistical significance. There was no significant change in pulse rate or mean arterial pressure during peri-operative period. Changes in vitals after device placement were statistically insignificant (p value >.05).

Some comparative studies of LMA Supreme with other supraglottic devices e.g., by Ali MZ et al[15] also showed similar results. Supraglottic devices are generally thought to cause minimal stress responses, however, this might not necessarily be true as some supraglottic devices, and especially those with large oropharyngeal cuffs have been shown to provoke an increase in mean arterial pressure that might be considerably higher. Smooth and quick insertion of SLMA might be the cause of less stimulation and hemodynamic changes. The reinforced tip of the SLMA, containing drain tube (DT) did not fold over in any patient, as the passage of a orogastric tube was easily performed in all cases. We could not confirmed the proper SLMA position by pediatric flexible fibreoptic bronchoscope due to unavailability. Our observations also lacked the ventilatory parameters. In our study incidence of trauma was negligible. The trauma during insertion of SLMA in 2 cases was assumed due to a larger size SLMA.

In both cases the distance of FT from upper lip was 3 cm, as we measured after insertion. Also incorrect positioning of the SLMA™ results in poor airway seal and an audible and immediately detectable leak of delivered gases through the DT[8]. We conclude that LMA Supreme (SLMA) has emerged as a good alternate airway device in terms of number of insertion attempts, ease of insertion, time taken for device placement, hemodynamic responses, number of attempts for orogastric tube placement and incidence of airway trauma in paediatric patients undergoing general anaesthesia.

## CONCLUSION

LMA supreme emerged as a good alternate airway device. It is quick and easy to insert with fast learning curve with least alteration of hemodynamic status in paediatric population.

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