VOLUME-7, ISSUE-11, NOVEMBER-2018 • PRINT ISSN No 2277 - 8160

Original Research Paper

Anaesthesiology

LARYNGEAL MASK AIRWAY PLACEMENT IN CHILDREN: COMPARISION BETWEEN DIFFERENT TECHNIQUES.

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ABSTRACT

INTRODUCTION: LMA is effective bridge between facemask and endotracheal tube. It does not stimulate the infraglottic structure thus minimizing stress response and airway resistance, associated with fewer cardiovascular and respiratory changes than endotracheal intubation. Inflatable cuff of LMA provides a low pressure seal over glottis and allows positive pressure ventilation. There are 3 technique of insertion: standard (brain), lateral and rotational.

AIMS AND OBJECTIVE: The aim of study was to evaluate and compare insertion of LMA in child via the standard, the rotational and the lateral approach with the following objectives.

1) Success rate and ease of insertion
- Number of attempts
- Ease of insertion
- Time taken for successful insertion

2) Adverse events during insertion of LMA.
3) Hemodynamic changes
4) Intra and post-operative complication.

MATERIAL AND METHODS:

After the approval of ethical committee, 105 ASA grade 1 and 2 patients of age 1-12 years undergoing surgery were included in the surgery and randomly allotted in 3 groups:

Group S (n=35): LMA placement with standard technique
Group R (n=35): LMA placement with rotational technique
Group L (n=35): LMA placement with lateral technique

After achieving standard anaesthesia protocol, LMA was inserted by skilled anaesthesiologist. Time for successful insertion, ease of insertion, number of attempts, adverse events, hemodynamic changes, intra and post-operative complications were noted.

RESULTS: First attempt success rate is 94% and second attempt success rate is 100% in rotational technique, which is higher than standard and lateral technique. Ease of insertion and less time was taken in rotational technique. Less adverse effects and intra/post-operative complications noted in rotational technique. No statistically significant hemodynamic changes were noted intra and post-operatively.

CONCLUSION: Rotational technique is better than standard and lateral technique in terms of first attempt success rate, ease of insertion, time take for insertion and less intra and post-operative complication.

KEYWORDS :

INTRODUCTION:

Airway management plays pivot role in paediatric age group who are more vulnerable to life threatening hypoxia.LMA is effective bridge between facemask and endotracheal tube. It does not stimulate the infraglottic structure thus minimizing stress response and airway resistance, associated with fewer cardiovascular and respiratory changes than endotracheal intubation. Inflatable cuff of LMA provides a low pressure seal over glottis and allows positive pressure ventilation.

The standard technique (Brain) may be suboptimal in paediatric age group in view of repeated attempts and prolonged time taken for placement.Several techniques like lateral, rotational with or without partially inflated cuff have been described to improve the insertion success rate.

AIMS AND OBJECTIVE:

The aim of study was to evaluate and compare insertion of LMA in child via the standard, the rotational and the lateral approach with the following objectives.

1) Success rate and ease of insertion
a. Number of attempts
b. Ease of insertion
c. Time taken for successful insertion
2) Adverse events during insertion of LMA.
3) Hemodynamic changes
4) Intra and post-operative complication.

MATERIAL AND METHODS:

After the approval of ethical committee, 105 ASA grade 1 and 2 patients of age 1-12 years undergoing surgery were included in the surgery and randomly allotted in 3 groups.

Exclusion criteria: Patients with URTI, Cardiovascular, Pulmonary, Renal or Hepatic disease, Risk of aspiration, Laparoscopy procedures, Oropharyngeal pathology, and limited mouth opening. Patients were randomly assigned to three groups, standard technique (group S), the rotational technique (group R), and the lateral technique (group L).

Group S (n=35): LMA placement with standard technique
Group R (n=35): LMA placement with rotational technique
Group L (n=35): LMA placement with lateral technique

In standard technique (Brains), a completely deflated LMA, held like a pen, guided into the pharynx with the index finger of the operator at the junction of the tube and bowl. With the head extended and the neck flexed by using the hand under the occiput, under direct vision, the tip of the cuff is pressed upwards against the hard palate.The LMA is advanced in to the hypopharynx till a resistance is felt.Then cuff inflated with just enough air to seal up to intra-cuff pressure around 60 cmH20.

In rotational technique(described by McNicol), head was positioned as in group S, and the mask inserted with its lumen facing backward and then rotating through 180 degree as resistance of the posterior pharyngeal wall was felt and then it passed downwards into positioned behind the larynx.

In lateral technique (described by Kundra et al.) Same position was

used as group S, LMA inserted until the entire cuff was inside the mouth, thereafter it was rotated laterally by 45 degree to occupy aperture facing the tongue. With the tube between index finger and thumb, the LMA was advanced as far as possible until resistance was felt and then rotated back to the midline and insertion was accomplished.

After insertion cuff inflation done with volume of air recommended by manufacturer. Insertion time was defined as the time from mouth opening until confirmation of airway patency. In case of three attempts with one technique failed, endotracheal intubation done.

CONFIRMATION OF CORRECT PLACEMENT CAN JUDGE BY:

- Slight outward movement of the tube on cuff inflation
- Expansion of the chest wall on bag compression
- Presence of small oval swelling over neck around
- thyroid and cricoid area
- No cuff visible in oral cavity
- Capnography

Statistical analysis: done using SPSS version 20.0 for windows. All data expressed as mean +/-SD and analysed using paired t test and chi-square test.Hemodynamic were compared using ANOVA. P<0.05 was considered significant

PREPARATION:

A proper pre anaesthetic check-up was performed one day before and in the morning of surgery.Clinical history was obtained and physical examination was done including airway examination and mouth opening for selection of patient. Basic investigation like heamogram, total count/differential count, RFT, urine R/M were advised. A standard anaesthesia protocol was followed for all patients.Children kept NBM for 6 hours. After taking informed consent, oral midazolam 0.5mg/kg 20-30 minutes prior to induction were given.Intra operative monitors like ECG, SPO2, ETCO2, and NIBP were applied and baseline vital parameters were recorded and after taking intravenous line, IV crystalloid was given.

Premedication in the form of inj.glycopyrrolate 4mcg/kg and inj.fentanyl 2mcg/kg 10 minutes prior to surgery were given.Adequate pre-oxygenation with 100% oxygen for 3 minutes was done.Patients was induced with inhalation of 7% sevoflurane in 100% oxygen and maintained with 4% end tidal sevoflurane in 100% oxygen before insertion of LMA. All LMAs were inserted during spontaneous ventilation. When anaesthesia was judge sufficient for insertion by jaw relaxation, the LMA was inserted using different techniques.

OBSERVATION AND RESULTS:

1) Insertion time and attempts

	Group S N=35	Group R N=35	Group L N=35	P-value
Insertion time (second)	27.62+/-3.33	24.43+/-3.45	27.35+/-3.52	<0.01*
Insertion attempts				
• **First**	27(77%)	33(94%)	26(74%)	<0.01*
• **Second**	7	2	8	0.02
• **Third**	1	0	0	0.33(NS)
• **Failed**	-	-	1	0.36(NS)

2) Adverse events:

	Group S	Group R	Group L	P Value
Hypoxia	0	0	0	-
Airway obstruction	0	0	0	-
Coughing	1	0	1	**0.56(NS)**
Gagging	1	0	1	**0.56(NS)**
laryngospasm	0	0	0	-

3) Intra operative complication:

	Group S (n=35)	Group R (n=35)	Group L (n=35)	P Value
Hypoxemia <90%	1	0	0	0.33(NS)
Displacement	1	0	1	0.55(NS)
Gastric inflammation	1	0	1	0.55(NS)
Bronchospasm	0	0	0	-
Laryngospasm	0	0	1	0.33(NS)

4) Post-operative complication:

	Group S (n=35)	Group R (n=35)	Group L (n=35)	P Value
Blood on LMA	2	0	2	0.55(NS)
Laryngospasm	1	0	0	0.33(NS)

DISCUSSION:

Advantages of LMA:

- Ease of insertion and Use
- Smooth induction and awakening
- Avoiding the complications of face mask and intubation
- Protection from barotraumas
- Cost-effectiveness.

Limitations and Complications of LMA:

- Aspiration of gastric contents
- Gastric distention
- Foreign body aspiration
- Airway obstruction
- Trauma
- Dislodgment
- Nerve injury
- Bronchospasm
- Pulmonary edema

Success rate and ease of insertion:

A) Number of attempts:

Success rate of 77% with the standard technique at first attempt and 89% at second attempt. In case of lateral technique, 74% at first attempt and 88% at second attempt. In case of rotational technique success rate is 94% at first attempt and 100% at the second attempt.

Kundra et al reported that the rotational technique with partially inflated cuff improved the success rate to 94% at the first attempt and 100% at the second attempt in their study. **Ghai at al** compared all 3 techniques and found highest success rate of 80% with standard technique and 96% at the first attempt with rotational technique.

B) Ease of insertion:

Ease of insertion was improved in rotational group as compared to lateral and standard technique. **Jung-won Hwang et al** proved that 90 degree rotational technique improved ease of insertion.

C) LMA insertion time:

Time taken for successful insertion of LMA was significantly lesser in rotational technique as compared to lateral and standard technique.

Ghai et al observed same result in his study that time to successful insertion was significantly lower in group R compared with group S and L (P<0.001). **S.nakayama et al** also found that insertion time was less in rotational group. **Seydhejazi et al** also found LMA insertion time 8.94+/-3.24 with standard technique and 8.34+/-3.26 with rotational technique, which was statistically insignificant.

Adverse events during insertion:

We found that there were no adverse events at the time of insertion in rotational group but with standard and lateral group we had incidence of coughing and gagging. Incidence of laryngospasm, hypoxia and trauma are less with the rotational technique as compared to lateral and standard technique due to high first attempt success rate.

Hemodynamic effects:
In our study, we found that there was no statistically significant hemodynamic changes during LMA insertion and intra operatively. **Efrata et al** found no significant hemodynamic changes in their study in 120 pediatric patients. **Seyedhejazi et al** found that increase in the heart rate and decrease in the blood pressure after LMA insertion by rotational technique than standard technique.

Intra and post-operative complications:
It was higher in lateral and standard technique as compared to rotational technique. Incidence of laryngospasm and trauma was less in group R as compared with group L and S. Pharyngeal mucosal trauma and blood on LMA was less seen in group R as compared to group S and L. **Kazuhiro Watanabe et al** suggested that there were no difference in complication between standard and rotational technique. **Wakeling et al** reported that insertion method with fully inflated cuff significantly lower the chances of pharyngeal mucosal bleeding and lower incidence of post-operative sore throat.

CONCLUSION:

From the above statistical data, we conclude that:
The rotational technique provide shorter duration of successful insertion time of LMA than the other two. The rotational technique of LMA insertion also had more success during first attempt than other two. Adverse events during insertion, intra and post-operative complication can be comparable in all three groups.

The rotational technique is a preferable alternative to the standard and lateral technique especially in paediatric patients.

ACKNOWLEDGEMENTS:

I express my sincere gratitude to Dr Kalpana Vora, Professor to sharing her wisdom with us during the course of this research. Last but not the least I want to thank whole heartedly to patient without whom this report would has been impossible.

DISCLOSURE: Noconflict of interest, financial, or otherwise are declared by authors.

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