Original Research Article

Comparison of conventional and rotational method of LMA insertion for training nursing staff in operation theatre

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Abstract

Background: Laryngeal Mask Airway (LMA) is considered as an effective, safe and easy equipment for airway management as compared with endotracheal intubation in many emergency situations. All health care personal should be well versed with techniques of airway management to prevent morbidity and mortality due to hypoxia. This study was conducted to identify the simple, easy and effective method to train the nursing staff for insertion of LMA. Total 60 nurses working in operation theatre for more than 1 year were included in the study. In group C (conventional method, n-30) LMA was inserted with using the Brain's insertion technique and group R (rotational method, n-30) LMA was inserted using the Guedel airway insertion technique. The success rate was determined in terms of LMA insertion time, attempts for successful insertion, complications associated with LMA insertion like improper placement of LMA, dislodgement of LMA, hypoxia, bleeding, sore throat, airway spasm.

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INTRODUCTION

Laryngeal mask airway (LMA) is a supra-glottic airway device developed by British Anesthesiologist Dr. Archi Brain. Initially designed for use in the operating room as a method of elective ventilation, LMA has proved as a good airway device in many settings, including the operating room, the emergency department, and out-of-hospital care, because it is easy to use and quick to place, even for the inexperienced persons. Also complication like esophageal intubation, trauma, bleeding is more with endotracheal intubation. Initial resuscitation phase in situations like trauma, cardiopulmonary arrest, post -operative hypoventilation immediate airway management is a crucial step Healthcare workers, working in operation units, trauma care unit, intensive care unit, and postoperative area should be trained in airway management. Endotracheal intubation requires considerable skill for laryngoscopy and intubation. Supraglottic airways insertion can be accomplished by relatively less education and training. Conventional or classic method for LMA insertion was introduced by Brain, however over the years many new methods are introduced. We undertook this study to assess and compare two methods- conventional and rotational, for training nursing staff.

Objectives-

1. To study the conventional method of LMA insertion in terms of success rate, easiness, complications for training nursing staff.
2. To study rotational method /180degree method of LMA insertion terms of success rate, easiness, complication for training nursing staff.

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3. To compare the two methods of LMA insertion in terms of success rate, easiness, complication for training nursing staff.

MATERIAL AND METHODS

After approval from institutional ethical committee, a prospective, randomised study was conducted on 60 nursing staff working in operation theatre of the institute.

INCLUSION CRITERIA

1. Nursing staff working in operation theatre for more than at least 1 year persistently.
2. Nursing staff of both sexes
3. Nursing staff of age group between 30-40 years
4. Nursing staff posted in morning duty - 8 a.m. to 4 p.m.
5. Nursing staff undergoing complete training for L.M.A insertion-Theory and demonstration sessions.
6. Nursing staff voluntarily consenting for inclusion in study

EXCLUSION CRITERIA

1. Nursing staff working in operation theatre for lesser than 1 year persistently.
2. Nursing staff < 30 years and >40 years of age
3. Nursing staff posted other than morning duty - 8 a.m. to 4 p.m.
4. Nursing staff not undergoing complete training for L.M.A insertion-Theory and demonstration sessions.
5. Nursing staff not voluntarily consenting for inclusion in study

Nursing staff as per inclusion criteria were explained about the study. They underwent a training session which included a theory lecture about introduction of Laryngeal Mask Airway and methods of insertion of LMA and demonstration of classic and rotational method of LMA insertion on mannequins by an anaesthesiology consultant. The Nurses were randomly assigned to one of the two groups, group C (conventional method) and group R (rotational method). The anaesthesiologists decided the method of LMA insertion.

Patient's selection criteria were as follows –

- Age- 18 to 45 year
- Both sexes
- A.S.A Gr -I and II
- Body mass index between 30-40 kg / m^2
- No airway or cervical deformities
- Scheduled for elective surgical procedures under general anaesthesia
- Adequate starvation
- Informed consent

All patients were premedicated with Inj. Midazolam 0.03 mg/kg and Inj. Ondensetron 0.1 mg/kg intravenously. On arrival to operation theatre patient's heart rate, systolic BP, diastolic BP, mean BP and oxygen saturation (SpO2) were recorded. Intravenous access was secured by appropriate cannula. Patients were preoxygenated with 100% oxygen via a non-rebreathing mask for 5 minutes. The appropriate size of laryngeal mask airway (LMA) was selected by consultant anaesthesiologist. LMA cuff was checked for leak. The cuff of the LMA deflated completely against a flat surface. A water-soluble lubricant was generously applied to the posterior surface of the mask. Anaesthesia was induced with Inj.Propofol 2 mg/kg and Inj. Fentanyl 2 microgram /kg. Depth of anaesthesia was confirmed. The patient's head was supported on a firm ring with neck flexed and head extended. In conventional technique (group-c), LMA was placed using the Brain's insertion technique. The LMA was held like a pen and index finger was placed at the junction of LMA tube and cuff. Index finger was used to press the LMA against hard palate and posterior pharyngeal wall until definite resistance is felt at the base of the hypopharynx. LMA was then held with nondominant hand and index finger was removed. In rotational technique (group-R), LMA was inserted using the Guedel airway insertion technique. Patient's head was positioned with head extended at the atlanto-axial joint and flexed at neck. Insertion was done with LMA cuff facing towards the nose, hard palate and then was advanced into the base of hypopharynx until resistance felt. At this point, LMA was rotated at 180^0 anti-clockwise and LMA tube black line was positioned and confirmed on the nasal side. Following LMA insertion in both techniques, LMA was inflated with appropriate volume of air and seal was obtained. Successful placement was confirmed by chest expansion, reservoir bag movement and auscultation for clear and equal air sounds. Adequate ventilation was also confirmed by reservoir bag movement, auscultation for clear and equal air sounds over lung fields, appearance of capnograph on monitors and oxygen saturation. After third unsuccessful insertion attempt and or time required more than 90 minutes, anesthesiologist secured the airway. Anaesthesia was continued with muscle relaxant and inhalational anaesthesia. Patients were intraoperatively monitored for heart rate, noninvasive blood pressure and SpO_2, $EtCO_2$. All LMAs were removed in deep plane of anaesthesia. The ease or smooth LMA insertion were recorded on the basis of number of LMA insertion attempts, LMA insertion time was considered from removal of face mask to confirmation of chest expansion and capnographic appearance. Events like laryngospasm, hypoxia (SpO_2 < 90%) during the induction of anaesthesia and trauma (labelled as blood stained LMA on removal) were noted. All study variables were recorded by anaesthesiologists. Data were analyzed using Statistical Software

RESULTS

Table 1: Demographic data

Demographic data	Group C	Group R
Age (years)	38±3.5	39±3.8
Sex		
Male	28	34
Female	32	26
Parameters	(%)	(%)
1.**Attempt**		
First	19 (63)	6 (20)
Second	7 (23)	9(30)
Third	4 (13)	15 (50)
2.**Duration for insertion**		
< 60 seconds	21 (70)	8 (26.6)
>60 -90 seconds	9 (30)	22 (73)
3.**Complications**		
Dislodgement	0	2(6.6)
Inadequate ventilation	1(3.3)	2(6.6)
Hypoxia	0	2(6.6)
Bleeding	0	1(3.3)
Postop sore throat	1(3.3)	1(3.3)
Dysphonia	0	0
Dysphagia	0	0

Demographic data was comparable in both groups. In group C mean age of nursing staff was 38±3.5 years and in group R mean 39±3.8years. In group C 28 male nursing staff and 32 female nursing staff participated. In group 34 male and 26 female nursing staff participated In group C, success rate for insertion in first attempt was 63%, for second attempt 23% and for third attempt success rate was 4%. In group R, success rate for first attempt insertion was significantly low as compared to group C. Only 20% nursing staff could insert LMA successfully in first attempt. 30% nursing staff could insert in second attempt, whereas 50% nursing staff required third attempt for successful insertion. In both groups we never required to abandon the LMA insertion or proceed with endotracheal intubation.21 (70%) nurses in group C could insert LMA successfully within 60 seconds and 9 (30%) nurses required more than 60 second whereas in group R, only 8 nurses (26.6%) could insert LMA within 60 seconds Dislodgement was observed with 6.6% patients in rotational group. No dislodgement was observed in conventional group. Inadequate ventilation incidence was double (6.6%) in rotational group as compared with conventional group (3.3%). No patient experience hypoxia (SpO_2 < 90%) in conventional group, however 2 patients in rotational group developed hypoxia. One patient experienced trauma during LMA insertion in rotational group. Incidence of postoperative sore throat was similar in both groups

DISCUSSION

This prospective, randomized study was conducted as a part of airway management training program to nursing staff working in operation theatre. We trained nursing staff to insert LMA by two different insertions techniques - conventional and rotational with a lecture and hands on training on manikins. The conventional method of insertion described by Dr. Brain is easy. but sometimes it is impossible to insert the LMA with the standard method. Ease and time of airway management may be of special importance in emergency situations. Other described methods are rotational, triple maneuver technique, thumb technique etc. Laryngeal mask airway can be inserted by video-larnygoscope or fibreoptic assitance also. Each method has its own merits and demerits. A questionnaire about LMA insertion showed that only 30%---34% of anesthesiologists favoured the standard technique.[2] The conventional insertion technique for LMA requires the insertion of index finger into the oral cavity and intraoral manipulation which may lead to finger trauma and infection. Still many anaesthesiologist practice intraoral manipulation when the standard technique or the classic LMA is used. The rotational technique of insertion avoids finger insertion into the patient's mouth however may cause dislocation of the arytenoid cartilages, unsatisfactory positioning, and may need laryngoscopy.[1,11,12] Newer supraglottic devices can be just “pushed in” to their correct final position when steered along the palate, without the need for digital intraoral manipulation. Our study showed, success rate for insertion in first attempt was significantly higher (63%) in group C than group R (20%). Brimacombe and Keller, inheir study using LMA Unique with or without intraoral digital manipluation, with 10 registered nurses trained on manikins and a lecture observed the first attempt success rate with digital intraoral manipulation, 84%; without digital intraoral manipulation, 87% and overall success rate with digital intraoral manipulation, 94%; without digital intraoral manipulation, 93% were similar.[10] Brimacombe and Keller, in other study suggested that intraoral manipulation can be avoided and the triple airway manoeuvre or rotational technique can be used.[11] Study Conducted by Merih Eglen *et al.* comparing three different insertion techniques with LMA-Unique (standard, rotational and triple airway manoeuvre) the standard technique success rate was 88.3% and increased to 93.3% after two attempts and for rotational technique first time insertion success rate was 78.3% and increasing to 90% after two attempts.[8] Success rates for three groups in their study were consistent with these results. Handattu M Krishna *et al.* evaluated the modified technique of insertion to avoid the insertion of fingers into the patient's mouth and the success rate for insertion was equal with both the techniques (99%).They had confirmed the correct

placement with fiberoptic assessment.[14] Higher success rates for insertion and lower incidence of complication in paediatric population with rotational technique was suggested by Nakayama S *et al.* and attributed to difference in anatomy between paediatric and adult larynx.[9] Brimacombe Berry [13] stated that if the standard approach is used correctly the first time success rate should be 95.5% in less than 20 s. other studies in which same success rates were not reached [4,5,6.] First time insertion rate using the standard technique is reported was low as (75%) by J R Maltby.[7] Successful placement was confirmed in our study by chest expansion, reservoir bag movement and auscultation for clear and equal air sounds. One of the difficulty encountered in insertion of LMA is epiglottis down folding during insertion. According to Brimacombe and Berry, with the classic LMA, incidence of epiglottis down folding of 3.3% with the standard method and 7% with the rotational method.[11]Epiglottic down folding was determined in more patients with the standard technique. Aoyama *et al.* also pointed this entity in her study using classic LMA with anaesthetised patients.[16] As LMA is considered as emergency airway equipment, the time taken for correct placement is very important.90 seconds were considered as time limit in our study and then the anaesthesiologist took over the procedure. In our study we noticed significant difference for the duration for successful insertion. 70% staff could successfully insert the LMA within 60 seconds by conventional method as compared to rotational method where only 26.6% staff could successfully insert LMA within 60 seconds. Extra time required in rotational group was mostly during the 180^0 rotation of the LMA. Time for successful insertion in the study conducted by Merih Eglen was less than 1 minute in all groups, in the triple group (8.63 s) in the standard (11.78 s) and rotational group (11.57s)[8] insertion time for all groups in this study was less as compared to other studies.[8] Handattu M Krishna *et al.* did not observe any significant difference for duration for correct placement. We noted that difficulty during rotation of LMA in rotational group caused not only failed attempt but also required more duration. Our study included nursing staff trained with one lecture and hands on training on manikins. This difficulty would be overcome by repeated and extensive training on anaesthetised and paralysed patients. Brimacombe concluded that insertion of the LMA-Unique is equally successful with or without digital intraoral manipulation by inexperienced personnel in paralyzed adults after manikin-only training.[10] Roberts I *et al.* proposed that manikin training alone may be adopted as a future training modality as in their study comparing manikins versus anaesthetised patients, 75% nurses passed the LMA successfully at the first attempt in manikins trained group and 80% nurses were successful at first attempt in anaesthetised patients trained group.[15] We studied complications during LMA placement in both groups. LMA dislodgement was observed with 6.6% patients in rotational group. No dislodgement was observed in conventional group. The LMA cuff twisting, or abnormal laryngeal anatomy could be the reason. This confirmation needs laryngoscopy or fibreoptic assistance. Adequate ventilation was confirmed by reservoir bag movement, auscultation for clear and equal air sounds over lung fields, appearance of capnograph on monitors and oxygen saturation. Inadequate ventilation incidence was double (6.6%) in rotational group as compared with conventional group (3.3%). No patient experience hypoxia ($SpO_2 < 90\%$) in conventional group, however 2 patients in rotational group developed hypoxia. Incidence of trauma as blood seen on LMA after removal, was nil in Group C and 3.3% in group R. Trauma can happen during any time such as pressing against hard palate or during rotation. The incidence of blood on LMA and postoperative sore throat were similar in both groups of in Krishna HM *et al.* study of with or without intraoral digital manipulation insertional techniques.[14] Incidence of postoperative sore throat was similar in both groups in their study. Sore throat incidence can be minimized with applying water based jelly to LMA, gentle insertion, restricting insertion attempts and limiting LMA cuff pressure up to 60 mmH_2O.

CONCLUSION

we conclude that conventional or classic method for insertion of classic LMA is better method than 1800 rotational method to train the inexperienced paramedical staff. The conventional method proved to be easy faster and less associated with complications

LIMITATIONS

Fibreoptic confirmation of LMA position was not done in our study. Blinding of insertion techniques was not done.

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