COMPARISON OF THE REINFORCED LARYNGEAL MASK AIRWAY AND ENDOTRACHEAL TUBE INTUBATION IN ADULT TONSILLECTOMY

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ABSTRACT

Background: The endotracheal tube is considered the standard for airway control and protection during general anaesthesia, especially when the airway is 'shared' between the anaesthetist and the surgeon. This has been challenged by the introduction of the reinforced laryngeal mask airway. It does not kink, is less traumatic during insertion and is better tolerated during emergence the objectives of this study were to compare the ease of use, safety in airway maintenance and postoperative outcome using either reinforced laryngeal mask airway or endotracheal tube intubation in adult tonsillectomy.

Material & Methods: This cross-sectional comparative study was carried out at Departments of ENT & Anaesthesiology, Combined Military Hospital, Attock, from October 2011 to May 2012. Seventy male recruits, aged 18-22 years, American Society of Anaesthesiologists grade 1, undergoing elective tonsillectomy were randomized into two groups. Laryngeal mask airway group was anesthetized using the modified reinforced laryngeal mask airway, while endotracheal tube intubation group was anesthetized using endotracheal tube. Safety, ease of use, and status during recovery were monitored and compared.

Results: Both the groups were comparable with respect to age and weight. Four per cent patients in reinforced laryngeal mask airway group required repositioning of the tube vs no patient in endotracheal tube group. Frequency of good surgical access was significantly higher in endotracheal tube group as compared to reinforced laryngeal mask airway group. Laryngospasm, cough and desaturation were almost similar in both the groups.

Conclusion: Reinforced laryngeal mask airway seems a safe and logical substitute for endotracheal tube in adult tonsillectomy in experienced hands.

KEY WORDS: Endotracheal intubation; Laryngeal mask airway; Laryngeal masks; Tonsillectomy.

INTRODUCTION

Tonsillectomy remains one of the most commonly performed otolaryngological surgeries.¹ It has risks or challenges, both for the surgeon and anaesthetist, since both are vying for the same space. Conventionally anaesthesia is administered using an Endotracheal tube intubation (ETT). It was during 80’s that Dr. Archie I J Brain of United Kingdom contemplated and started developing an airway device which would be less intensive than the endotracheal tube yet more effective than the face mask. This modification of an anaesthetic mask, was reduced in size and inverted so that it could be positioned directly over the laryngeal opening, in the hypopharynx. Since the early 90’s, this reinforced laryngeal mask airway (rLMA) has gained acceptance as an alternate method of maintaining the airway without endotracheal intubation.²,³

Among the multitude of potential advantages in its use, the most important are: the avoidance of complications related to laryngoscopy and endotracheal intubation, drastic reduction of descending infections related to intubation in children who have had a recent upper respiratory tract infection; reduced tracheal aspiration, and a less irritable recovery from anaesthesia. There is reduced effort of breathing; even lower than breathing spontaneously through a size 8.0 ETT.⁴ To preclude regurgitation, low levels of pressure support ventilation are well tolerated without a leak. Use of rLMA decreases end-tidal CO₂, while slightly increasing SaO₂.⁵ Also there is minimal bronchoconstriction while using
rLMA, compared to bronchoconstriction caused by administration of ETT.\textsuperscript{9}

However, few of the disadvantages of rLMA are difficulty in positioning, low sealing pressure, increased frequency of gastric insufflations, possible aspiration of gastric contents, coughing, laryngospasm and trauma to the airway. Opening the gag may also push the mask into the vallecula causing the aperture to be occluded by the epiglottis. In such a malposition or occlusion spontaneous ventilation may be difficult.

The most common use of rLMA is that of maintaining an airway for short elective peripheral surgery. However it has also proved its mettle in difficult and challenging orofacial procedures.\textsuperscript{7,8} Maximal advantage of the rLMA would be achieved by using a spontaneous ventilation technique with awake removal in recovery. The controversy however goes on as to which is the safer and better option, with proponents and opponents on either side.\textsuperscript{9,12} These problems might be avoided by using the modified reinforced laryngeal mask airway which doesn’t kink or twist, and fits snugly in the mouth gag blade.

The objectives of this study were to compare the ease of use, safety in airway maintenance and recovery using either reinforced laryngeal mask airway or endotracheal tube intubation in adult tonsillectomy.

**MATERIAL AND METHODS**

This cross-sectional comparative study was carried out in the Department of Anaesthesia and ENT, Combined Military Hospital, Attock, Pakistan from October 2011 to May 2012. The study protocol was approved by the Hospital Ethical Committee. All young male recruits undergoing tonsillectomy for recurrent tonsillitis were included in the study. All patients were American Society of Anaesthesiologist Physical Status I (ASA I). Exclusion criteria included inflammatory conditions of the oropharynx like peritonsillar abscesses and peritonsillitis and any contraindications to the use of a laryngeal mask airway.

The patients were randomly assigned to two groups, using random numbers table. Group 1 (rLMA group) patients were anesthetized using a reinforced LMA (Ambu, Company, Denmark), while patients in group 2 (ETT group) were anesthetized using right angle ETT. Procedure was explained and written informed consent was taken from all patients prior to surgery. Access of the surgical field was termed good when both tonsils were completely in view and there was sufficient space for using diathermy and adequate when compromised and the tonsillar bases not being visible. Laryngospasm was defined as spasmodic closure of the larynx.

After securing an intravenous line with injection Ringer lactate, premedication with Nalbuphine 0.1-0.2 mg/kg and injection dexamethasone 0.15 mg/kg was given. Induction with propofol 2.5-3 mg/kg in two groups was done. In group 1 patients, the reinforced laryngeal mask was inserted without the use of a neuromuscular blocker while deepening the patient with sevoflurane 6-7% till the patient failed to respond to jaw lift. Intra cuff pressure was adjusted by filling 20 cc to 30 cc of air. Correct placement was confirmed by the presence of a clinically clear airway, the ability to inflate the patient’s lungs manually with no audible gas leak, auscultation of the chest and by capnography. The Davis tongue blade was lubricated with the liquid paraffin to assist passage over the rLMA. rLMA was stabilized beneath the tongue blade of Boyle Davis mouth gag.

In group 2 patients, orotracheal intubation was facilitated after giving inj. atracurium 0.5mg/ kg body weight. Anaesthesia was maintained in the two groups with sevoflurane 2%-3% in combination of 60% nitrous oxide and 40% oxygen with spontaneous ventilation in group 1 and manually assisted ventilation in group 2. Size 3 & 4 rLMA tubes were used in group 1, while sizes 7, 7.5 ETT tubes were used in group 2 patients. Patients were placed supine and pillow removed to extend the neck in both groups. Standard patients monitoring was observed in the two groups.

Tonsillectomy was performed in both groups by the same senior ENT surgeon (KA), having no previous experience with rLMA. Similar dissection method and electro-cautery for hemostasis was used in both groups. At the end of surgery, the pharynx was cleared of secretions under direct vision and 100% oxygen given till the patient was fully conscious. In group 1, the rLMA was retained in place till full recovery of the airway protective reflexes. In group 2, extubation was done in fully awake patients after giving reversant, injection atropine and neostigmine. All patients were nursed in left lateral position in recovery. Oxygen 3-4 litre per minute was continued through face mask to all patients in recovery room until they regained full consciousness. Guedel’s airway was used in group 2 to maintain airway when required.

Age in years and weight in kg were demographic variables (quantitative data). Size of the tube used (quantitative data), repositioning of the tube, conversion to ETT, access of the surgical field, laryngospasm, cough, desaturation (\(SPO_2\) below 92%) and vomiting were research variables. Last seven were nominal data.

Data was analysed using SPSS version 17. Quantitative data were described by mean and standard deviation (SD) while nominal data by number (frequency) and percentages. Quantitative variables...
were compared through independent samples t-test while qualitative variables were compared through Chi-square test. P-value < 0.05 was considered as statistically significant.

RESULTS

Seventy male recruits were included in this study; 35 in group 1 (who received rLMA) and 35 in group 2 (who were intubated with ETT). Comparison of age, weight and size of the tube between the two groups through independent samples t-test is given in Table 1.

The difference of mean age and weight were not statistically significant between the two groups while for the mean size of the tube the difference was statistically significant.

Table 2 shows inferential analysis of research variables through Chi-square test.

None of the patient required repositioning of ETT in group 1 while in group 2, re-positioning was required in 4 (11.4%) patients (p=0.03), two for proper ventilation and two after being displaced during insertion of mouth gag. In our study, three (8.6%) patients were converted from rLMA to ETT group; as in one case, ventilation was not satisfactory while in two patients, visibility of the field was inadequate. There was no episode of airway obstruction in either group in the remaining patients. The surgeon had an overall significantly good surgical access in the ETT group in 97.14% as compared to rLMA group in 80% cases (p=0.02) while view of the surgical field was adequate in 1% versus 7% in two groups respectively (p=0.02). Upon recovery, laryngeal spasm occurred in one (2.8%) patient in the rLMA group, compared to three (8.6%) patients in the ETT group (p=0.06). All were promptly treated with 100% oxygen, and subsequently no desaturation occurred in any patient. Two (5.7%) patients had cough in rLMA group as compared to six (17.1%) patients in ETT group (p=0.11). No patient in rLMA group had oxygen desaturation less than 92% while it occurred in two (5.7%) patients in ETT group (p=0.15), one from upper airway obstruction and the other due to laryngospasm. None had vomiting postoperatively in either group.

DISCUSSION

In an endeavour to perpetually improve the anaesthetic management of patients, rLMA has come up as a safe & viable alternative to ETT. It has still not gained the acceptance it deserves as it is dependent on the willingness of the anaesthetist and surgeon to adopt new techniques.

In our study, the two patients requiring repositioning of rLMA along with the two patients who were converted from rLMA to ETT were encountered very early in the study (among the first 10 patients). Thereafter, as the surgeon’s experience improved, this rate dropped to zero and there was no unnecessary intervention in the next 25 patients of rLMA group.
Hern et al in his study identified the problems from a surgeons’ perspective claiming poor surgical access and a conversion rate of 11.4% with RMA. Similarly Williams et al in their study highlighted the difficulties associated with the use of the RMA for tonsillectomy.\textsuperscript{14} They noticed difficulties in its insertion or position with a failure rate of 10%.

Gravingsbraten et al, in his study of 1126 adeno-tonsillectomies in children corroborates the safety of RMA compared to that of ETT.\textsuperscript{15} A study by Aziz et al concluded that RMA is associated with less occurrence of cough, bronchospasm and stridor in recovery. It has less hemodynamic changes and adequate surgical access in adeno-tonsillectomy as compared to ETT group.\textsuperscript{16} Yu et al also confirmed in their study that use of RMA has a lower risk of airway related complications compared to that of ETT.\textsuperscript{8}

Angela et al conducted a study to compare the efficacy of RMA and ETT in adeno-tonsillectomy in 131 pediatric cases. They noticed laryngospasm in 12.5% patients in the RMA group, compared to 9.6% patients in the ETT group (p=0.77), which is in contrast to the figures in our study i.e. 2.85% in RMA compared to 8.57% in ETT.\textsuperscript{17} Patki et al in his meta-analysis concludes that RMA use offers no advantage over the tracheal tube in incidence of bronchospasm or laryngospasm during emergence.\textsuperscript{18} Thomson carried out a study in 29 patients undergoing elective eye surgery, and randomized them to ETT or RMA. Almost all ETT patients coughed in the immediate post-operative period, compared to none in the RMA group.\textsuperscript{19} Mandel also concluded in his study that the incidence of coughing is less with the use of RMA than with the use of ETT.\textsuperscript{20} This is in tandem with our results of 5.71% in RMA compared to 17.14 % in ETT.

Brimacombe in his meta-analysis concluded that using RMA had 12 advantages over ETT, except lower seal pressures and a higher frequency of gastric insufflations.\textsuperscript{21} Luckily in our study, since all the patients were prepared and were ASA grade I, we did not encountered a single case of vomiting.

CONCLUSION
In selective (ASA grade I) and prepared patients, RMA provides a safe and reliable alternative means of anaesthetic management with a superior recovery compared to ETT. To fully experience the utility of RMA, the anaesthetists will have to expand their arsenal of anaesthetic management and try this alternate approach in a variety of settings.

REFERENCES
Chaudhry Amjad Ali, et al.


CONFLICT OF INTEREST
Authors declare no conflict of interest.

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None declared.