ORIGINAL ARTICLE

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 & Anaesthesia, 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.

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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 CO_2, while slightly increasing SaO_2.[5] Also there is minimal bronchoconstriction while using

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rLMA, compared to bronchoconstriction caused by administration of ETT.[6]

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.[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.[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 abscess and peritonsillitis and any contraindications to the use of a laryngeal mask air way.

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 sevoflorane 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 sevoflorane 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.

Table 1: Comparison of age, weight and size of the tube between the two groups of reinforced laryngeal mask airway (n=35) and endotracheal intubation (n=35) in adult tonsillectomy.

Variables	rLMA group (Mean ± SD)	ETT group (Mean ± SD)	p-value
Age (years)	21.00 ± 2.58	20.00 ± 3.42	0.17
Weight (kg)	62.00 ± 4.67	63.00 ± 3.96	0.33
Size of the tube	03.45 ± 0.49	07.51 ± 0.53	<0.001

Table 2: Comparison of complications between the two groups of reinforced laryngeal mask airway (n=35) and endotracheal tube intubation (n=35) in adult tonsillectomy.

S. No.	Research Variables	Group 1 rLMA No (%)	Group 2 ETT No (%)	p-value
1.	Repositioning of the tube/ rLMA	4 (11.4%)	0 (0%)	0.03
2.	Conversion to ETT	3 (8.6%)	0 (0%)	0.07
3.	Surgical access			
	Good	28 (80%)	34 (97.1%)	0.02
	Adequate	7 (20%)	1 (2.8%)	0.02
4.	Laryngospasm	1 (2.8%)	3 (8.5%)	0.06
5.	Cough	2 (5.7%)	6 (17.1%)	0.11
6.	Desaturation (SPO2 <92%)	0 (0%)	2 (5.7%)	0.15

Hern et al in his study identified the problems from a surgeons' perspective claiming poor surgical access and a conversion rate of 11.4%[13] with rLMA. Similarly Williams et al in their study highlighted the difficulties associated with the use of the rLMA for tonsillectomy.[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 rLMA compared to that of ETT.[15] A study by Aziz et al concluded that rLMA 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.[16] Yu et al also confirmed in their study that use of rLMA has a lower risk of airway related complications compared to that of ETT.[8]

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

Brimacombe in his meta-analysis concluded that using rLMA had 12 advantages over ETT, except lower seal pressures and a higher frequency of gastric insufflations.[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, rLMA provides a safe and reliable alternative means of anaesthetic management with a superior recovery compared to ETT. To fully experience the utility of rLMA, the anaesthetists will have to expand their arsenal of anaesthetic management and try this alternate approach in a variety of settings.

REFERANCES

1. Katzenell U, Bakshi E, Ashkenazi I, Bar-Dayan Y, Yeheskeli E, Eviatar E. A retrospective study of the eligibility for tonsillectomy. Isr Med Assoc J 2010;12:681-3.
2. O'Meara ME, Jones JG. The laryngeal mask. BMJ 1993; 306:224–5.
3. Sierpina DI, Chaudhary H, Walner DL, Villines D, Schneider K, Lowenthal M, et al. Laryngeal mask airway versus endotracheal tube in pediatric adenotonsillectomy. Laryngoscope 2012; 122:429–35.
4. Joshi GP, Morrison SG, White PF, Miciotto CJ, Hsia CC. Work of breathing in anaesthetized patients: reinforced laryngeal mask airway versus tracheal tube. Clin Anes 1998; 10:268-71.
5. Brimacombe J, Keller C, Hörmann C. Pressure support ventilation versus continuous pressure airway ventilation with the reinforced laryngeal mask airway: a randomized cross-over study of anaesthetized adult patients. Anesthesiology 2000; 92:1621-3.
6. Kim ES, Bishop MJ. Endotracheal intubation, but not laryngeal mask airway insertion, produces reversible bronchoconstritrion. Anesthesiology 1999; 90:391-4.
7. Bogetz MS. Using the reinforced laryngeal mask airway to manage the difficult airway. Anesthesiol Clin North America 2002; 20:863-70.
8. Yu SH, Beirne OR. Laryngeal mask airways have a lower risk of airway complications compared with endotracheal intubation: a systematic review. J Oral Maxillofac Surg 2010; 68:2359-76.
9. Johr M. Anaesthesia for tonsillectomy. Curr Opin Anaesthesiol 2006;19:260-1.
10. Cox RC. Anesthetic management of pediatric adenotonsillectomy. Can J Anesth 2007; 54:1021-5.
11. Short JA, Melillo EP. Damage to a laryngeal mask during tonsillectomy. Anaesthesia 1997; 52:507.
12. Kanniah SK. Laryngeal mask airway and Tonsillectomy. Anesth Analg 2006; 103:1051.
13. Hern JD, Jayaraj SM, Sidhu VS, Almeyda JS, O'Neill G, Tolley NS. The reinforced laryngeal mask airway in tonsillectomy: the surgeon's perspective. Clin Otolaryngol Allied Sci 1999; 24:122-5.
14. Williams PJ, Bailey PM. Comparison of the reinforced laryngeal mask airway and tracheal intubation for adenotonsillectomy. Brit J Anaesth 1993; 70:30-3.
15. Gravingsbraten R, Nicklasson B, Raeder J. Safety of reinforced laryngeal mask airway and short-stay practice in office-based adenotonsillectomy. Acta Anesthesiol Scand 2009; 53:218-22.
16. Aziz L, Bashir K. Comparison of armoured reinforced laryngeal mask airway with endotracheal tube for adenotonsillectomy. J Coll Physicians Surg Pak 2006; 16:685-8.
17. Peng A, Kelley KM, Thacker LR, Kierce J, Shapiro J, Baldassari CM. Use of laryngeal mask airway in paediatric adenotonsillectomy. Arch Otolaryngol

Head Neck Surg 2011; 137:42-6.

18. Patki A. Reinforced laryngeal mask airway vs the endotracheal tube in paediatric airway management: A meta-analysis of prospective randomised controlled trials. Indian J Anaesth 2011; 55:537-41.
19. Thomson KD. The effects of the laryngeal mask airway on coughing after eye surgery under general anaesthesia. Ophthalmic Surg 1992; 23:630-1.
20. Mandel JE. Reinforced laryngeal mask airways in ear, nose, and throat procedure. Anesthesiol Clin 2010; 28:469-83.
21. Brimacombe J. The advantages of the LMA over the tracheal tube or facemask: a meta-analysis. Can J Anaesth 1995; 42:1017-23.

CONFLICT OF INTEREST
Authors declare no conflict of interest.
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None declared.