Airway Management In Pediatric Anesthesia: Laryngeal Mask Airway Vs Endotracheal Tube

M Afzal

Citation

M Afzal. *Airway Management In Pediatric Anesthesia: Laryngeal Mask Airway Vs Endotracheal Tube*. The Internet Journal of Anesthesiology. 2006 Volume 13 Number 1.

Abstract

INTRODUCTION

Laryngeal mask airway (LMA) was invented by Archie Brain in 1981 and came to clinical practice in 1992. It is a valuable and important device for airway management and is particularly useful in outpatient anesthesia ([1]). LMA has proven to be safe and effective adjunct for airway management in both adults and pediatric patients ([2]). Several reports have been published and compared endotracheal intubation (ETT) versus LMA among adults with substantial evidence that LMA has some advantages over ETT and face mask (FM) ([3]).The apparent lack of laryngeal stimulation makes LMA a potentially attractive alternative for airway management in children with upper respiratory tract infections. In addition reports

suggested that the incidence of post operative sore throat associated with LMA placement was much less than that following ETT among adults ([2,4,5]).

This study was designed to determine the incidence of perioperative complications related to LMA versus ETT in pediatric patients undergoing lower abdominal surgery and to evaluate the efficacy and safety of LMA as an alternative to ETT in pediatric anesthesia.

PATIENTS & METHODS

After local hospital ethics committee approval and written informed consent from the parents, 202 pediatric patients undergoing lower abdominal surgery under general anesthesia were enrolled in the study. Patients were divided into two groups: ETT (n=100) and LMA(102).ASA physical status 1 or 11 pediatric patients between the ages of 1 year to12 years who presented for elective orchidopexy, inguinal hernia and circumcision were included in the study. This study was conducted in a university setting hospital. The study design was randomized and double blind. All children having recent upper respiratory tract infection or bronchial asthma which was uncontrolled were excluded from the study. Other exclusion criteria included ASA physical status III, abnormal airway anatomy, children with full stomach and procedures requiring muscle relaxation. Trimeprazine (vallergan) 2mg/kg was given orally one hour before surgery. All children were randomly allocated to receive either LMA or ETT.

After establishing standard monitoring, EKG, heart rate, pulse oximeter and non invasive blood pressure, anesthesia was induced with O2/ N2O /sevoflurane followed by insertion of intravenous cannula. After achieving adequate level of anesthesia with 3% sevoflurane LMA or ETT was placed. LMA size was selected according to body weight, size 2 for patients between 10- 20 kg and size 2.5 for patients between 21-45 kg b.w. After successful placement of LMA or ETT, all patients received caudal analgesia with bupivacaine 0.25% 1ml/kg. Anesthesia was maintained with O2/N2O/sevoflurane. All children were allowed to breath spontaneously. Incidence of gagging, coughing, laryngospasm, breath holding and reposition of LMA were recorded. Removal of LMA or ETT was performed under deep anesthesia and patients were positioned in lateral recovery position before sending to post anesthesia care unit.

Student t- test for independent groups was used to compare between LMA and ETT group with respect to age, weight, duration of surgery and anesthesia.

$P<0.025$ (two tailed) was considered significant. Z- test was used for percentages differences where $P<0.05$ was considered significant.

RESULTS

The demographics of the two groups are given in table 1.

There was no significant difference between the two groups with respect to age, weight, ASA physical status, duration of anesthesia and surgery. The incidence of perioperative complications at induction, tube placement, intraoperative period and at the time of removal of either LMA or ETT are given in table 2. There was no significant difference between groups with respect to the incidence of perioperative cough, laryngospasm, gagging or breath holding ($P>0.05$). There was also no significant difference in the severity of any of the complications except for breath holding. These differences were not, statistically significant ($P> 0.05$). The respiratory events were managed easily and there were no adverse events. The numbers of overall complications in LMA group were 16/102 (15.69%), in ETT group 29/100 (29%), with significant differences ($P < 0.05$).

Figure 1

Table 1: Demographic data of LMA and ETT groups

	LMA (n=202)	ETT(n=100)	P-Value
Age(yr)	4.505+2.586	3.85+3.017	>0.05
Weight(kg)	17.188+7.062	16.398+7.923	> 0.05
Duration of surgery(min)	38.34+5.89	39.29+ 4.16	> 0.05
Duration of anesthesia(min)	53.66+5.46	53.26+3.96	> 0.05

Figure 2

Table 2: Incidence of perioperative complications

	Induction	Tube Placement LMA / ETT	Intraoperative LMA / ETT	Tube Removal LMA / ETT	Total	P-Value
Gagging	0 / 0	1 / 2	0 / 0	0 / 0	1(33.3%) / 2(66.6%)	0.6501
Coughing	2 / 2	2 / 3	0 / 0	2 / 4	6 (40%) / 9(60%)	0.679
laryngospasm	0 / 0	1 / 2	0 / 0	1 / 1	2 (40%)/ 3(60%)	0.679
Breath holding	0 / 2	2 / 4	2 / 4	3 / 5	7(31.8%) / 15(68.1%)	0.8021

DISCUSSION

Since the introduction of LMA, it has been the subject of numerous studies in both children and adults ([6,7,8,9]). This study demonstrated that the incidence of intraoperative complications did not show any significant difference in both groups but the use of LMA was safe in pediatric patients .It may be used as an alternative to tracheal intubation in various pediatric surgeries. Brimacombe performed a meta-analysis of 52 randomized, prospective trials comparing the LMA with ETT and FM. Although there was no evidence that any of these differences result in an improvement in patient outcome, the study showed the LMA had 13 advantages over ETT and 4 over the FM ([13]). Advantages over the ETT includes ease and speed of placement by inexperienced personnel, improved hemodynamic stability during induction and emergence, lower incidence of coughing and sore throat, improved oxygen saturation and reduced anesthetic requirements for airway tolerance. Disadvantages included lower seal pressure and higher incidence of gastric insufflation. There are several areas where LMA has the potential to benefit patients compared with ETT. The increased speed and reliability of placement by inexperienced personnel suggest a potential role in resuscitation ([12,13]). The hemodynamic stability at induction and during emergence may be of benefit in patients with cardiovascular disease ([10]). Watcha et al found that the insertion of LMA during halothane anesthesia in children is not associated with acute cardiovascular or intraocular pressure responses, whereas tracheal intubation is associated with increased HR, arterial blood pressure and intra ocular pressure ([11]).

In our study we compared complications associated with LMA and ETT at the time of induction, insertion, intra operative period and at removal of LMA/ETT and we did not find any significant difference between both groups. Alan et al suggested that if decision is made to proceed with anesthesia for patients with uncomplicated upper respiratory tract infection, then LMA provides an acceptable alternative to the ETT([2]). In addition, insertion of the LMA is a technically simpler procedure than tracheal intubation ([8,9,10,11,12,13,14,15]), and is associated with a decreased risk for vocal cord trauma, which has been noted after even short periods of tracheal intubation([16]).

In conclusion this study showed that, LMA can be used safely and effectively in pediatric patients undergoing lower abdominal surgery because of ease of insertion, less risk of airway trauma and low frequency of sore throat.

References

1. Pennant LH, White PF. The Laryngeal mask airway: its uses in

anesthesiololgy. Anesthesiol 1993; 79:144-63.
2. Alan R. Tait, U A Pandit, Terri V L, H M Munro et al. Use of laryngeal mask

airway in children with respiratory tract infection: A comparison with

endotracheal intubation. Anesth Analg 1998; 86: 706-11.
3. Brimacombe J. The advantages of the LMA over the tracheal tube or facemask:

a meta analysis. Can J Anesth 1995; 42: 1017-23.
4. Smith I, White P F. Use of laryngeal mask airway as an alternative to a face

mask during out patient arthroscopy. Anesthesiol 1992; 77:

850- 55.
5. Alexander CA, Leach A B. Incidence of sore throat with the laryngeal mask

airway[letter]. Anesthesia 1989; 44:791-93.
6. Benumof I L. Laryngeal mask airway: indications and contraindications. .

Anesthesiol 1992; 77:843-46.
7. Brain AIJ, McGhee TD, Mc Eteer EJ, et al. The laryngeal mask airway:

development and preliminary trials of a new type of airway. Anesthesia1985;

40: 356-61.
8. Broderick PM, Webster NR, Nunn JF, The laryngeal mask airway : a study of

100 patients during spontaneous breathing. Anesthesia 1989; 44: 238-41.
9. Mason DG,Bingham RM. The laryngeal mask airway in children. Anesthesia

1990; 45: 760-65.
10. Fuji Y, Tanaka H. Circulatory response to laryngeal mask airway insertion or

tracheal intubation in normotensive and hypertensive patients. Can J Anaesth

1995; 42: 32-36.
11. Watcha MF, White PF, Tychse L, Stevens JI. Comparative effects of laryngeal

mask airway and endotracheal tube insertion on intraocular pressure in

children. Anesth Analg 1992; 75: 355-60.
12. Basken PJF. The laryngeal mask in resuscitation (Editorial). Resuscitation 1994;28:

93-95.
13. Davies PRF, Tighe SQM, Greenslade GL et al. Clinical Practice: Laryngeal

mask airway and tracheal tube insertion by unskilled personnel. The Lancet 1990; 336:

977-79.
14. Maltby JR, Loken RG, Wetson NC. The laryngeal mask airway: clinical appraisal in

250 patients. Can J Anaesth 1990; 37: 509-13.
15. Fisher JA, Ananthanarayan C, Edelist G. Role of the laryngeal mask in airway

management (editorial). Can J Anaesth 1992; 39:1-3.
16. Gleeson MJ, Fourcin AJ. Clinical analysis of laryngeal trauma secondary to

intubation. J R Soc Med 1983; 76: 928-32.

Author Information

M. Afzal
Muscat Private Hospital