ORIGINAL ARTICLE

Comparison of the Ease of Insertion of the Laryngeal Tube VBM™ and Laryngeal Mask Airway During Manual in-Line Neck Stabilization

M Noor Zairul, MMed, A Khairul Faizi, MMed, E Norzalina, MMed

Department of Anaesthesiology and Intensive Care, Sarawak General Hospital, Kuching, Sarawak, 93050 Malaysia

Summary

The purpose of this study is to assess whether the newly developed laryngeal tube (LT) VBM™ is easy, simple to use and able to provide adequate ventilation and oxygenation to a patient with an unstable neck who required airway management. We compared the LT to the laryngeal mask airway (LMA) as alternative airway management tool in adult patient with unstable neck who underwent intubation with manual in-line neck stabilization. A randomized single-blinded prospective study was conducted involving a total of 40 ASA I and II premedicated patients who were divided into two groups with 20 patients for each group; either LT or LMA group for airway management during elective surgery. After preoxygenation, anaesthesia was induced and neuromuscular blockade was produced with intravenous drugs. The LT or LMA was inserted after neuromuscular blockade was confirmed using a peripheral nerve stimulator (TOF 1). A size 3, 4 or 5 LT OR a size 3 or 4 LMA was inserted while the patient's head and neck were being stabilized by an assistant who held the sides of the neck and the mastoid processes (manual in-line stabilization). If it was not possible to ventilate the lungs, or if endotrachial carbon dioxide ($ETCO_2$) and/or chest movement did not indicate a patent airway, the LT or LMA was removed. After three failed attempts, the study was terminated and the airway was secured in the most suitable manner determined by the anaesthetist. There was a statistically significant difference for both groups in the time required for successful insertion (time required for LT was 24.8 ± 7.7 seconds and LMA was 36.1± 17.3 seconds) ($p= 0.01$). There was no statistical differences ($p>0.05$) in number of attempts needed to achieve a patent airway although we were able to achieve a clear airway in all patients in LT group at the first attempt compared with 85% in LMA group. The successful insertion rate was 100% for both groups. We conclude that the LT is easier to insert and is a suitable alternative to the LMA for airway management when the patient's head and neck are stabilized by manual in-line method.

Key Words: Laryngeal tube, Laryngeal mask airway, Manual in-line neck stabilization

Introduction

The laryngeal tube (VBM, Germany) is a multiple use, single lumen silicon tube with an angle of about 130 degrees and a blind tip. The tube is short with an S-shape, making blind insertion possible without tracheal intubation or irritation of the vocal cords and trachea. It has two cuffs (proximal and distal) connected to a single pilot balloon and two oval holes. The holes are placed in between the cuffs to provide the route for ventilation and allow suctioning and bronchoscopy with fiberscope. The larger proximal cuff (pharyngeal cuff) stabilizes the tube and blocks the naso- and oro-pharynx. The smaller distal cuff (oesophageal cuff) is

This article was accepted: 8 November 2005

Corresponding Author: Noor Zairul Muhamad, Department of Anaesthesiology and Intensive Care, Sarawak General Hospital, Kuching, Sarawak, 93050 Malaysia

attached at the tip of the tube and when inflated, sealed the oesophageal inlet. This reduces the possibility of gastric ventilation. Both cuffs are high volume, low pressure cuffs which provide good seal and protect from ischaemic damage. There are markings at the proximal end of the tube which is the depth mark, a thick black line in the centre and two thinner lines which indicates the range of depth where the tube can be repositioned to allow sufficient ventilation. This mark, when correctly positioned, lies at the level of the upper incisor teeth. There is a standard 15mm connector at the proximal end of the tube which is attached to a breathing system [1]. The first case report regarding the use of laryngeal tube (LT) was published in 1999[2]. Since then, many studies have been conducted worldwide to evaluate its use as a new device for emergency airway management both in mannequin and in adult patients. Most of the studies have shown that the LT has a potential role in airway management during anaesthesia or cardiopulmonary resuscitation [3]. Insertion of the LT is generally easy and it provides a good airtight seal [4-8]. In patients with unstable necks, the head and the neck may be stabilized manually (manual in-line stabilization), but it is not known whether this procedure affects the ease of insertion of the LT. In a patient with an unstable neck, airway management may be required while the patient's occiput is placed directly on the trolley and while the head and neck are stabilized manually (manual in-line stabilization). The manufacturer of the LT claims that, although insertion of the device is best achieved when the neck is flexed and the head extended (Magill position or sniffing position) [9], it can be inserted in any given position of the head. There have been several reports that studied the ease of the insertion of various forms of the LMA [10-14]. A few studies have concluded that insertion of the LMA classic becomes more difficult when the patient's head and neck are stabilized, but it is often possible to ventilate the lungs through it [10, 12]. However, there has been no study that compares the ease of insertion between the LT and LMA during manual in-line neck stabilization.

Materials and Methods

A randomized single-blinded prospective study was conducted involving a total of 40 ASA I and II (aged from 18-65 years) premedicated patients who were divided into two groups with 20 patients for each group; either LT or LMA group for airway management during elective surgery. Randomization was by use of sealed opaque envelopes containing the letters LT or LMA and with the power of study of 80%. Exclusion criteria included patients at risk of pulmonary aspiration of gastric contents and those with features suggestive of possible difficult intubation (for example Mallampati III-IV classification[15], a receding chin, protruding front teeth and limited neck extension). After preoxygenation, anaesthesia was induced with intravenous (i.v) fentanyl (Hameln Pharmaceuticals) (1.5 micrograms/kg body weight) and i.v propofol (Astra Zeneca) (2 milligrams/kg body weight). The neuromuscular blockade was produced with either i.v vecuronium (N.V Organon) (0.1 milligrams/kg body weight) or i.v atracurium (Glaxo Smith Kline) (0.5 milligrams/kg body weight). The LT or LMA was inserted after neuromuscular blockade was confirmed using a peripheral nerve stimulator (TOF 1). A size 3, 4 or 5 LT OR a size 3 or 4 LMA was inserted while the patient's head and neck were being stabilized by an assistant who held the sides of the neck and the mastoid processes (manual in-line stabilization). If it was not possible to ventilate the lungs, or if $ETCO_2$ and/or chest movement did not indicate a patent airway, the LT or LMA was removed. After three failed attempts, the study was terminated and the airway was secured in the most suitable manner determined by the anaesthetist. After successful placement of LT or LMA, anaesthesia was maintained with 66% NO_2 in O_2 & 2 MAC Sevoflurane. All patients received standard anaesthesia monitoring which included electrocardiography, pulse oximetry, non invasive blood pressure measurement and capnography. Ease of insertion, which include the time required to successfully insert the airway device, episodes of oxygen desaturation (< 95%), abandonment of technique and the number of attempts needed to achieve a patent airway, were recorded. Time of insertion was defined as from the removal of the facemask to successful delivery of the first tidal volume. Results were presented as mean and standard deviation (S.D) or mean and percentile. The Statistical Package for the Social Science (SPSS) version 11.5 for windows was used in statistical analysis. The data from two groups was analyzed using the independent t-test for continuous variables or the Chi square for categorical data. Differences were considered statistically significant when $P < 0.05$.

Results

Patients' characteristics are shown in Table I. The two groups were well matched. There was statistically significant difference for both groups in time required

for successful insertion (Table II); time required for LT was 24.8 ± 7.7 seconds and LMA was 36.1± 17.3 seconds (p= 0.01). Both groups had no statistical differences (p>0.05) in number of attempts needed to achieve a patent airway although we were able to achieve a clear airway in all (100%) patients in LT group at the first attempt compared with 85% in LMA group (Table II). The successful insertion rate was 100% for both groups (Table II). Ventilation through the LT and LMA were adequate in all 40 patients (100%) when the patient's head and neck placed by manual in-line stabilization.

Discussion

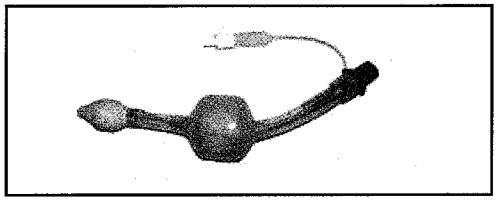
There have been several reports that studied the ease of insertion of various forms of the laryngeal mask airways [10-14]. Asai and colleagues in their study for the ease insertion of LMA classic in 20 patients found that it was always more difficult, and the time taken for insertion was longer; in manual in-line stabilization than in the Magill position; nevertheless, the ventilation was possible in 19 of 20 patients in manual in-line position[10]. Pennant and colleagues reported that the time taken for the insertion of LMA ranged from 22 to 87 seconds with mean time 32 seconds in patients to whom a Philadelphia collar was applied, indicating that insertion was moderately difficult in their study [12]. In contrast to the study done by Brimacombe and colleagues which reported that the LMA was inserted within ten seconds in all 40 patients in the Magill position and 38 of 40 patients during manual in-line stabilization [11]. Therefore, it may be possible to conclude that the insertion of LMA becomes more

Table I: Characteristics of patients. Values are given as mean (SD).

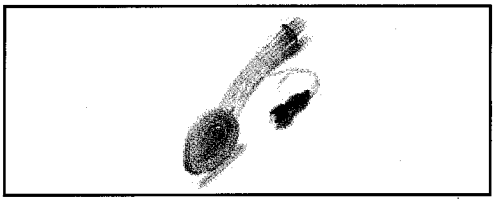
Parameters	Group LT (n=20)	Group LMA (n=20)	p value
Age ; years	40.0 (13.9)	37.1 (14.1)	0.512
Weight ; kg	56.5 (8.8)	58.9 (11.7)	0.483
Height ; cm	160.2 (8.2)	160.8 (6.6)	0.818

Table II: Time to insertion of device, number of insertion attempts and rate of successful insertion. Values are given as mean (SD) or number (proportion).

Parameters	Group LT (n=20)	Group LMA (n=20)	p value
Time to successful insertion; seconds	24.8 (7.7)	36.1 (17.3)	0.01
Number of attempts			
1	20	17	0.198
2	-	2	
3	-	1	
>3	-	-	
Successful insertion; yes: no	20:0 (100:0)	20:0 (100:0)	-



Picture 1: Laryngeal Tube (VBM)



Picture 2: Laryngeal Mask Airway (LMA)

difficult when the patient's head and neck are stabilized, but is often possible to ventilate the lung through it. In theory, the insertion of LT is more difficult because the curve of the LT is less similar (than the curve of the intubating or Proseal laryngeal mask) to the curve of the oropharynx so that it is more difficult to slide the LT along the oropharygeal wall. However, this theory is in contrast to our finding where it seems that the insertion of the LT is easier compared with LMA classic during manual in-line stabilization. The result showed there was statistically significant difference for both groups in time required for successful insertion; time required for LT was 24.8 ± 7.7 seconds and LMA was 36.1± 17.3 seconds with p= 0.01. Looking at this result, we conclude that that insertion of the LMA classic becomes more difficult when the patient's head and neck are stabilized however the time taken for insertion of LT is comparable with the time taken when patient's head and neck are stabilized in the Magill position [16]. Although it was more difficult to insert the LMA in manual in-line stabilization but it is often possible to ventilate the lungs through it and this finding is in agreement with previous studies [10-14]. There was no episode of oxygen desaturation < 95% found in this study and the successful insertion rate was 100% for both groups. Both groups had no statistical differences (p>0.05) in the number of attempts needed to achieve a patent airway although we were able to achieve a clear airway in all (100%) patients in LT group at the first attempt compared with 85% in LMA group. This finding was in agreement with the previous study done by Asai [17] and Dorges [18], where 100% success rate with one attempt for LT. The reason for the relative difficult for the insertion of LMA classic is possibly due to the fact that the curve of the LMA classic is less similar (than the curve of the intubating laryngeal mask airway and Proseal) to the curve of the oropharyngeal wall when the patient's head and neck are placed in the neutral position [19].

Conclusion

We conclude that the LT is easier to insert and is a suitable alternative to the LMA for airway management when the patient's head and neck are stabilized by manual in-line method.

Acknowledgements

We are grateful to Suria- Medik Sdn Bhd, Malaysia, who provided us the LT and cuff inflation devices for the purpose of this trial.

References

1. Anonymous Instructions for Use. Laryngeal –Tube (LT). Sulz, Germany: VBM Medizintechnik GmbH, 2000.
2. Agro F, Cataldo R, Galli B. A new prototype for airway management in an emergency: the laryngeal tube. Resuscitation 1999; 41: 284-5.
3. Genzwuerker HV, Dhonau S, Ellinger K. Use of the laryngeal tube for out of hospital resuscitation. Resuscitation 2002; 51: 221-24.
4. Asai T, Murao K, Shingu K. Efficacy of the laryngeal tube during intermittent positive pressure. Anaesthesia 2000; 55: 1099-102.
5. Dorges V, Ocker H, Wenzel V, Schmuker P. The laryngeal tube: a new simple airway device. Anesthesia and Analgesia 2000; 90: 1220-22.
6. Ocker H, Wenzel V, Schmuker P, Steinfath M, Dorges V. A comparison of the laryngeal tube with the laryngeal mask airway during routine surgical procedures. Anesthesia and Analgesia 2002; 95: 1094-7.
7. Brimacombe J, Keller C, Brimacombe L. A comparison of the laryngeal mask airway Proseal TM and the laryngeal mask airway in paralyzed anesthetized adults patients undergoing pressure-controlled ventilation. Anesthesia and Analgesia 2002; 95: 770-6.

8. Asai T, Kawashima A, Hidaka I, Kawachi S. The laryngeal tube compared with the laryngeal mask: insertion, gas leak pressure and gastric insufflation. British Journal of Anaesthesia 2002; 89: 729-32.

9. Magill IW. Technique in endotracheal anaesthesia. British Journal of Anaesthesia 1930; ii: 817-19.

10. Asai T, Neil J, Stacey M. Ease of placement of the laryngeal mask during manual in-line neck stabilisation. British Journal of Anaesthesia 1998; 80: 617-20.

11. Brimacombe J, Berry A. Laryngeal mask airway insertion. A comparison of the standard versus neutral position in normal patients with a view to its use in cervical spine instability. Anaesthesia 1993; 48: 670-1.

12. Pennant JH, Pace NA, Gajraj NM. Role of the laryngeal mask airway in the immobile cervical spine. Journal of Clinical Aaesthesia 1993; 5: 226-30.

13. Asai T, Wagle AU, Stacey M. Placement of the intubating laryngeal mask is easier than the laryngeal mask during manual in-line neck stabilisation. British Journal of Anaesthesia 1999; 82: 712-4.

14. Asai T, Murao K, Shingu K. Efficacy of the Proseal® laryngeal mask airway during manual in- line stabilisation of the neck. Anaesthesia 2002; 57: 918-20.

15. Mallampati SR, Gatt SP, Gugino LD *et al.* A clinical sign to predict difficult tracheal intubation: a prospective study. Canadian Anaesthetist's Society Journal 1985; 32: 429-34.

16. Chiu CL, Murugasu J, Chan L. A preliminary report on the use of the laryngeal tube for spontaneous ventilation anaesthesia. Asean Journal of Anaesthesiology 2001; 2: 90-94.

17. Asai T, Hidata I, Kawachi S. Efficacy of the laryngeal tube in experienced personnel. Resuscitation 2002; 55: 171-75.

18. Dorges V, Ocker H, Wenzel V, Schmuker P. The laryngeal tube: a new simple airway device. Anesthesia and Analgesia 2000; 90: 1220-22.

19. Asai T, Marfin AG, Thompson J, Popat M, Shingu K. Ease of placement of the laryngeal tube during manual in-line neck stabilisation. Anaesthesia 2004; 59: 1163-166.