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Short communication

A preliminary assessment of the intubating laryngeal mask airway

Koichi Nakazawa, Koshi Makita, Kazuhiko Nishimura, Yuji Saitoh, Naofumi Tanaka, Seiji Ishikawa, and Keisuke Amaha

Department of Anesthesiology and Critical Care Medicine, School of Medicine, Tokyo Medical and Dental University, 1-5-45 Yushima, Bunkyo-ku, Tokyo 113, Japan

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The laryngeal mask airway (LMA) has been widely used for airway management in general anesthesia or cardiopulmonary resuscitation [1]. Insertion of the LMA is less invasive and easier than conventional orotracheal intubation. The clinical applications of the LMA have been various. When the LMA is used for airway maintenance, not only can tracheoscopic and laryngoscopic examinations be safely performed, but orotracheal intubation is also possible in cases with difficult intubation [2]. However, the conventional LMA permits an endotracheal tube (ETT) with a maximum of 6.0 mm ID, and a fiberscope is often necessary to pass through the mask aperture bars.

The intubating laryngeal mask (ILMA) is a prototype of the LMA which is designed to introduce the ETT into the trachea. The ILMA has a shorter metal main stem, and the inner diameter of the main stem is larger than that of the conventional LMA, which allows a 7.5 or 8.0 mm ID ETT. In the present study, we tested the performance of endotracheal intubation using a size 4 ILMA in 40 adult patients who underwent general anesthesia.

The study was approved by the hospital ethical committee, and informed patient consent was obtained. We studied 40 patients ASA I, II, or III, aged 20 to 80 years, who were undergoing elective gynecological or general surgical procedures. These cases include 2 patients whom we expected to be difficult to intubate with the laryngoscope (Cormack grade IV on laryngoscopy). Patients with a history of gastroesophageal reflux were excluded. Before induction of anesthesia, a pulse oximeter and ECG monitor were attached. Anesthesia was induced with propofol, 2 to 2.5 $mg \cdot kg^{-1}$, and vecuronium, 0.2 $mg \cdot kg^{-1}$. Additional propofol was given as necessary. The method of insertion of the ILMA was almost identical with that of the conventional LMA. The tip of the mask was placed on the hard palate with the aperture anterior and then advanced in a smooth movement [3]. After the ILMA was inserted, it was connected to the anesthetic machine by a semiclosed anaesthetic breathing system, and the patient was ventilated with 50% nitrous oxide and 2% isoflurane or 2.5% sevoflurane in oxygen. Two minutes later, a 7.5 mm ID ETT was passed through the ILMA. When endotracheal intubation had failed, a fiberoptic scope was passed into the aperture of the mask, and the viewfinding was scored according to the system of Brimacombe [4]. Subsequent intubation was tried again by changing the position of the mask by moving the attached handle up and down. If intubation could not be achieved after three attempts, the ILMA was removed and the intubation was performed by laryngoscopy.

Patients were divided into four groups: group 1, successful endotracheal intubation at the first attempt: group 2, successful endotracheal intubation at the second attempt: group 3, successful endotracheal intubation at the third attempt: and group 4, intubation not successful after three attempts. The patient's head and neck were not manipulated during insertion of the ILMA or endotracheal intubation. The ease of ILMA insertion, condition of ventilation through the ILMA, and intubation of the ETT were assessed by one of the authors.

Demographic data were analyzed by one-factor ANOVA, and if the differences were significant, multiple comparison was carried out by Tukey's test. The male/female ratio was compared by the chi-square test. $P < 0.05$ was taken as significant.

Address correspondence to: K. Nakazawa
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Table 1. Results of using the ILMA for endotracheal intubation and patients' characteristics

Characteristic	Group 1 ($n = 24$)	Group 2 ($n = 6$)	Group 3 ($n = 3$)	Group 4 ($n = 7$)
Age (yr)	49 ± 4.3	57.5 ± 6.1	50 ± 4.9	54 ± 7
Male/female	24/0*	6/0	2/1	2/5
ASA (I/II/III)	10/10/4	2/4/0	2/1/0	4/3/0
Weight (kg)	63.8 ± 2.1*	61 ± 3.6	57 ± 6.4	53.7 ± 2.5
Height (cm)	166.3 ± 2.1*	164.3 ± 3.6	164 ± 4	157 ± 1.9

*$P < 0.05$ *vs* group 4.

Table 2. Fiberoptic scores according to Brimacombe [3] of 16 patients in whom endotracheal intubation failed at the first attempt

	Score[a]				
Group	0	1	2	3	4
2 ($n = 6$)	—	1	2	2	1
3 ($n = 3$)	—	2	1	—	—
4 ($n = 7$)	4	3	—	—	—

[a]0, Failure to function and cords not seen; 1, cords not seen but function adequate; 2, cords plus anterior epiglottis seen; 3, cords plus posterior epiglottis seen; 4, only cords seen.

Patient characteristics are shown in Table 1. There was no significant difference in age; however, weight and height were significantly higher in group 1 than in group 4, and the male/female ratio also differed between groups 1 and 4. In all cases, insertion of the ILMA was performed quite smoothly without difficulty; however, ventilation through the ILMA was inadequate because of leakage or airway obstruction in four patients in whom intubation failed (Table 2). In 24 of 40 patients, endotracheal intubation was successful at the first attempt. All of these patients were men; endotracheal intubation failed in 5 of 6 women and 2 of 34 men (Table 1). If the women are excluded, endotracheal intubation was successful at either the first or the second attempt in 88% of the patients. On removal of the ETT, there were no undesirable events such as laryngeal edema or bleeding. Postoperative sore throat and hoarseness occurred transiently in 28% and 10% of patients, respectively.

The results of endotracheal intubation by ILMA were almost identical to those in the preliminary report by Kapila et al. [5]. Endotracheal intubation failed in some patients, apparently because of the inappropriate size of the mask or malposition of the mask. Intubation was not successful in patients in whom air leakage or airway obstruction occurred during ventilation through the ILMA. In most of the female patients, fiberoptic findings revealed that the position of the mask aperture was too deep, and only the arytenoid area could be seen through the fiberscope. We believe that a size 3 mask is preferable for women or for patients weighing less than 60 kg. On the other hand, when the epiglottis was folded down, the movement of the mask outwards and inwards sometimes allowed successful endotracheal intubation.

In the present study, there were two patients in whom intubation was expected to be difficult (Cormack grade IV on the laryngoscope), but we could intubate them smoothly at the first attempt with the ILMA.

On the basis of these results, we believe that the ILMA has some advantages in the following clinical situations. First, in cases with difficult intubation, intubation can be safely performed with adequate ventilation and anesthesia using the ILMA. Second, we found that insertion of the ILMA was easier and more successful than insertion of the conventional LMA [6]. Therefore the use of the ILMA might be recommended for airway maintenance by inexperienced paramedical stuff in emergencies.

We had only one ILMA (size 4) during this study and were unable to make careful choice of the size. However, sizes 3, 4, and 5 have become available recently, and multicenter studies evaluating the ILMA are now under way. They will provide further information about the usefulness of the ILMA for intubation. In conclusion, the appropriate size of the ILMA is crucial for successful intubation. One should confirm that the ILMA functions well before inserting the ETT. The ILMA has some possibilities for useful clinical applications besides endotracheal intubation.

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