An Experience with Intubating Laryngeal Mask Airway for Difficult Airway Management: Report on 38 Cases

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A retrospective study was performed on 38 patients (23 males and 15 females) in whom the intubating laryngeal mask airway (ILMA) was used for airway management at Srinagarind and Siriraj Hospital in 2003. The patients' age and weight ranged between 12 and 75 years and 40 and 94 kg, respectively. Difficult tracheal intubation was suspected before starting general anesthesia in 17 patients, whereas it was found difficult after induction of general anesthesia in 21.

The ILMA was successfully placed in all patients with airway patency classified as 'good' and 'acceptable' in 36 patients (94.7%), and 'poor' in two. Oxygen saturation during intubation was maintained above 95 percent in all patients. Tracheal intubation through the ILMA was successful in 34 patients (89.5%), which was described as 'easy' in 27 of 34 patients (79.4%). In the remaining 7, 2-5 attempts were required for successful tracheal intubation. The types of endotracheal tubes used were: 1) the pre-formed silicone tube in 55.9 percent, 2) the pre-formed flexible tube in 41.2 percent; and, 3) the standard polyvinyl tube in 2.9 percent. In the four patients with failed tracheal intubation through the ILMA, three were successfully intubated with conventional laryngoscopy and one with gum elastic bougie. There were no serious complications following the use of the ILMA in these patients. The ILMA proved a safe, very useful and easy to use device with a high success rate for difficult airway management.

Keywords : *Intubating laryngeal mask airway, Difficult airway management, Endotracheal tube*

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Difficult airway management remains a significant cause of morbidity and mortality associated with anesthesia[1]. The incidence of difficult airway is not well documented. However, data from previous studies shows that the incidence of difficult tracheal intubation ranges between 1.15 and 3.8 percent[2,3]. Likewise, data from Srinagarind Hospital (unpublished, 2003), showed 0.7 percent incidence of difficult tracheal intubation.

Many different devices for airway management have been recommended by the ASA difficult airway algorithm[4]. Among them, the intubating laryngeal mask airway (ILMA) is easy to use with a high rate of success[5,6]. The ILMA is designed to facilitate tracheal intubation particularly among those with a difficult airway, either as a blind or fiberoptic bronchoscope assisted technique[6,7]. This device consists of a curved, short, stainless steel tube with an LMA and a guiding handle (Fig. 1).

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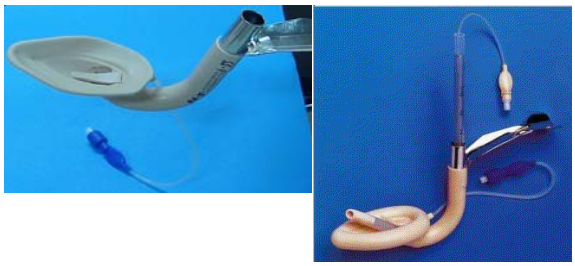

Fig. 1 Left, the intubating laryngeal mask airway (ILMA). Right, tracheal tube was inserted into the ILMA

Since its introduction to clinical practice in 1997[7], the use of the ILMA in known, or potentially, difficult airways has been widely reported[8]. Because the ILMA is a new device, there have not been any reports about its use in Thai patients. Therefore, the authors report clinical experience using the ILMA in Thai patients with difficult airway management.

Material and Method

After the review board of the Faculty of Medicine, Khon Kaen University, approved the protocol for this report, the authors reviewed the anesthetic records of patients in whom the ILMA was used at Srinagarind Hospital (Khon Kaen) and Siriraj Hospital (Bangkok) between January and December, 2003.

The indication for using an ILMA in this study included either for an expected, or an unexpected, difficult airway management.

Age, sex, body weight, causes of difficult airway managment, success of the ILMA insertion, airway patency with the ILMA, success and ease of tracheal intubation through the ILMA, types of endotracheal tube used, oxygenation and associated complications during intubation were documented and analyzed. Descriptive statistics, frequency and percentage were used for categorical data.

Results

During a 1-year period, there were 38 patients (23 males and 15 females) in whom the ILMA was used. Difficult tracheal intubation was suspected before starting general anesthesia in 17, whereas it was difficult after induction of general anesthesia in the rest. The age and weight of patients ranged between 12 and 75 years and 43 and 94 kg, respectively (Table 1). The causes of difficult tracheal intubation are presented in Table 1.

The ILMA was successfully placed in 36 patients with airway patency was classified as 'good' or 'acceptable' in 94.7 percent of cases. Although airway patency was described as 'poor' in two cases, oxygen saturation during intubation was maintained above 95 percent.

Tracheal intubation through the ILMA was successful in 34 patients (89.5%) which was described as 'easy' in 27 of 34 patients (79.4%). In the remaining 7 patients, between 2 and 5 attempts were required before tracheal intubation was accomplished.

The types of endotracheal tubes used were: 1) the pre-formed silicone tube (diameter 7.0 mm) in 55.9 percent of the patients; 2) the pre-formed flexible tube (diameter 6.0-7.5 mm) in 41.2 percent; and 3) the standard polyvinyl tube (Portex 6.5 mm) in 2.9 percent.

The tracheal intubation through the ILMA failed in 4 patients. Improper ILMA placement was thought to be the major cause for failure (poor airway patency in two patients and acceptable in two). However, they were successfully intubated with conventional laryngoscopy in three patients and with a gum elastic bougie in the other. There were no serious complications following the use of the ILMA in these patients.

Discussion

The success rate of blind tracheal intubation through the ILMA was about 90 percent. Although the success rate was higher than the 84 and 86 percent reported by Harry[13] and Vlymen[14], respectively, it was still lower than 95 percent (overall success rate) reviewed by Caponas[7].

The failure rate of 10 percent (4 cases) in this study was attributed to many factors. First, the operators (anesthetists) had no, or limited, experience using the ILMA. The eight operators involved in this study, only had experience with the ILMA on a manikin before using it with the patients.

According to the study by Baskett, et al[15], the learning curve for the highest success rate of operators was around 20 cases. Ferson, et al[10], suggested that operators should have skill to adjust the ILMA in the oropharynx by using the Chandy maneuver to find the optimal position for increasing the success rate of ventilation and blind tracheal intubation.

Second, the size of the ILMA should be selected according to the patient's body weight. There are 3 different sizes of ILMA on the market (#3, #4 and #5); unfortunately, only one (# 4) was available for this study. Most previous studies had access to all 3 sizes and (not coincidentally) reported high success rates. For example, Lu et al[16] allowed the operators to change the size of the ILMA to a smaller or larger one as required, if ventilation was not satisfactory.

Third, the technique of fiberoptic bronchoscopic (FOB) guidance for tracheal intubation through the ILMA is associated with higher success rate than the blind technique[6,7,10]. However, the technique requires more operator skill (than the blind technique). As important, because most of the presented patients had unexpectedly difficult tracheal intubation, FOB was not ready for use.

Table 1. Patients' data

Patient Number	Sex	Age	Weight	Mallampati grading	DL view	Airway problems	Airway patency after ILMA insertion	Tracheal intubation			Notes
								Tube type	Success	Grade	
1	M	45	70	N/A	N/A	C-spine fracture, on soft collar	Acceptable	PS 7	Yes	Moderate	
2	F	51	62	2	3	Failed stylet	Good	PS 7	Yes	Moderate	
3	F	47	57	2	3	Failed stylet and gum elastic bougie	Good	PS 7	Yes	Easy	
4	M	48	87	2	2	Obesity	Good	PF 6	Yes	Easy	
5	M	54	82	2	3	Obesity, difficult mask ventilation	Good	PF 7.5	Yes	Easy	
6	M	52	56	N/A	N/A	Neck mass, SVC obstruction, failed FOB	Good	PF 6.5	Yes	Easy	
7	M	75	55	3	-	Subluxation C 6-7	Good	PF 7	Yes	Easy	
8	F	65	80	2	3	Obesity, difficult mask ventilation	Good	PS 7	Yes	Easy	BMI = 34
9	M	70	64	N/A	2	HNP C4, on soft collar	Good	PF 7.5	Yes	Easy	
10	M	27	65	N/A	2	Fractured C 3-5, on Stryker frame	Good	PF 7	Yes	Easy	
11	F	47	58	2	3	Failed laryngoscopy	Good	PF 7	Yes	Easy	
12	F	54	73	2	1	Cervical stenosis, short neck	Acceptable	N/A	No	Fail	Success with laryngoscopy
13	M	63	76	2	4	Obesity, failed stylet and gum elastic bougie	Acceptable	PS 7	Yes	Easy	BMI = 32
14	M	60	72	3	3	Receeded chin	Good	PF 7.5	Yes	Easy	
15	F	41	60	2	-	HNP C 3-4	Good	PS 7	Yes	Moderate	
16	M	74	51	2	3	Failed stylet	Good	PF 7.5	Yes	Easy	
17	M	51	46	2	3	Failed laryngoscopy	Acceptable	PF 7	Yes	Easy	
18	M	60	N/A	N/A	4	Failed stylet and gum elastic bougie	Good	PS 7	Yes	Easy	Cardiac arrest before intubation
19	M	65	58	2	3	Failed stylet	Good	PF 7	Yes	Moderate	
20	M	72	65	2	4	Failed stylet and gum elastic bougie	Good	PF 7	Yes	Easy	
21	M	45	50	3	4	Failed stylet and gum elastic bougie	Good	PS 7	Yes	Easy	
22	M	37	49	1	1	HNP C 5-6	Acceptable	N/A	No	Fail	Success with laryngoscopy
23	F	28	43	1	4	Limited neck motion	Good	PS 7	Yes	Easy	
24	F	46	56	2	3	Failed gum elastic bougie in first attempt	Unacceptable	N/A	No	Fail	Success with gum elastic bougie
25	M	71	54	2	3	Failed stylet	Good	PF 7	Yes	Easy	
26	F	25	55	2	3	Failed stylet and Combitube	Good	Portex 6.5	Yes	Easy	Accidental extubation during removal of ILMA
27	M	12	83	4	N/A	Morbid obesity	Good	PF7.5	Yes	Moderate	BMI = 33
28	F	39	64	1	4	Failed stylet	Good	PS 7	Yes	Easy	
29	F	69	40	2	4	Failed FOB and gum elastic bougie	Good	PS 7	Yes	Easy	Awake intubation
30	M	27	79	2	N/A	Obesity	Acceptable	PS 7	Yes	Easy	
31	F	65	47	2	3	Failed stylet and McCoy laryngoscopy	Good	PS 7	Yes	Easy	
32	M	48	56	3	N/A	Post cervical laminectomy	Good	PS 7	Yes	Moderate	
33	M	59	72	2	3	Failed stylet and McCoy laryngoscopy	Good	PS 7	Yes	Easy	
34	F	37	65	2	3	History of difficult intubation	Acceptable	PS 7	Yes	Moderate	
35	F	19	94	2	N/A	Obesity	Poor	N/A	No	Fail	Success with laryngoscopy
36	F	27	63	2	N/A	C-Spine injury	Good	PS 7	Yes	Easy	
37	M	32	53	2	3	Failed stylet	Good	PS 7	Yes	Easy	
38	M	54	75	1	3	Failed stylet	Good	PS 7	Yes	Easy	

PS = preformed silicone tube, PF = preformed flexible tube, Portex = standard polyvinyl tube, DL = Direct laryngoscope, BMI = body mass index, SVC = superior vena cava, FOB = fiberoptic bronchoscopy, HNP = herniated nucleus pulposus

Tracheal intubation grading[8]: easy = tracheal intubation was achieved without any manipulation, moderate = intubation was achieved after 1-2 manipulation (s), difficult = intubation was achieved after 3-8 manipulation (s), failed = intubation was not achieved

Airway patency after ILMA insertion[8]: good = clinically clear airway, acceptable = clinically acceptable airway, although it was not clear, unacceptable = clinically unacceptable airway

Although the authors were unable to intubate 4 cases, the ILMA still provided good ventilation even in those whom muscle relaxation was given or in the one case with awake intubation.

Regarding the types of endotracheal tubes, the pre-formed flexible tubes were used in 41 percent of cases *vs*. 55 percent for the pre-formed silicone tubes. Although not widely used in clinical practice, this data confirms that the pre-formed flexible tubes can be used with the ILMA.

The success rate of tracheal intubation through the ILMA increases with the operators' experience[15]. However, the success rate in the present study is still high even with inexperienced operators. Therefore, the ILMA is a good alternative device for difficult airway management in both expected and unexpected conditions.

Conclusion

The authors reported the use of ILMA in 38 patients with known or unsuspected difficult airway management. Insertion of the ILMA was successful in all patients. The success of intubation through it was 90 percent. The authors' experience confirms the reported safety and efficacy of the ILMA, now for use in Thai patients.

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ประสบการณ์การใช้หน้ากากครอบลาริงซ์ช่วยใส่ท่อหายใจในกรณีใส่ท่อหายใจยาก: รายงานผู้ป่วย 38 ราย

สมบูรณ์ เทียนทอง, เดือนเพ็ญ ห่อรัตนาเรือง, มาลินี วงศ์สวัสดิวัฒน์, พลพันธ์ บุญมาก, ฐิติมา ชินะโชติ, สุธันนี สิมะจารึก

ทำการศึกษาย้อนหลังในผู้ป่วยทั้งหมดจำนวน 38 ราย ที่ได้รับการใส่ intubating laryngeal mask airway (ILMA) ในกรณีใส่ท่อหายใจยาก ที่โรงพยาบาลศรีนครินทร์และโรงพยาบาลศิริราช ในปี พ.ศ. 2546 เป็นผู้ชาย 23 ราย ผู้หญิง 15 ราย อายุ ระหว่าง 12-75 ปี น้ำหนักตัว ระหว่าง 40-94 กก. โดยที่ผู้ป่วย 17 ราย ได้คาดการณ์ล่วงหน้าว่าการใส่ท่อหายใจจะทำได้ยาก ส่วนอีก 21 รายทราบภายหลังจากที่ผู้ป่วยได้รับยาสลบแล้ว และใส่ท่อหายใจไม่ได้ด้วยวิธีปกติ

สามารถใส่ ILMA ได้ทุกราย โดยทำการช่วยหายใจได้ดีและพอใช้ 36 ราย (94.7%) ส่วนผู้ป่วยอีก 2 ราย ทำการช่วยหายใจได้ไม่ดีนักแต่ก็ยังสามารถรักษาระดับ oxygen saturation ได้ สูงกว่า 95 เปอร์เซ็นต์ตลอดเวลา สามารถใส่ท่อช่วยหายใจผ่าน ILMA ได้สำเร็จ 34 ราย (89.5%) โดยสามารถใส่ได้ง่าย 27 ราย (79.4%) ที่เหลือ 7 ราย ต้องใส่ 2 –5 ครั้ง จึงสามารถใส่ได้สำเร็จ ส่วนชนิดของท่อหายใจที่ใช้ ประกอบด้วยท่อชนิด pre-formed silicone 55.9 เปอร์เซ็นต์ pre-formed flexible 41.2 เปอร์เซ็นต์ และ standard polyvinyl 2.9 เปอร์เซ็นต์ ผู้ป่วย 4 ราย ที่ไม่สามารถใส่ท่อหายใจผ่าน ILMA ได้นั้น ในที่สุดสามารถใส่ได้สำเร็จโดยใช้ standard laryngoscope 3 ราย และใช้ gum elastic bougie 1 ราย การศึกษานี้ไม่พบภาวะแทรกซ้อนที่รุนแรงจากการใส่ท่อหายใจผ่าน ILMA

ดังนั้น ILMA จึงเป็นอุปกรณ์ช่วยใส่ท่อหายใจอีกชนิดหนึ่งที่มีประโยชน์มากสำหรับผู้ป่วยที่การใส่ท่อหายใจทำได้ยาก อีกทั้งใช้ได้ง่ายและมีความปลอดภัยสูง