Disposable Laryngeal Mask Airway (Soft Seal) for Endotracheal Intubation: FOB Guidance Technique and Blind Technique

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Objective: *To evaluate disposable LMA for endotracheal intubation using the FOB guidance and blind techniques.*

Material and Method: *The authors included ASA class I-II patients between 15 and 60 years of age, with mouth opening more than 3 cm, scheduled for elective surgery. The authors excluded patients with any history of gastro-esophageal reflux, full stomach or a body weight < 30 kg. All of the patients received standard general anesthesia. After inducing anesthesia, a disposable LMA No. 3 or No. 4 (Soft Seal , Smiths Medical, Portex Inc, USA) was inserted while the patient was in the sniff position. The authors recorded the insertion time, the ease of insertion, the anatomic placement and position. The authors then inserted a flexible endotracheal tube (No. 6.5 for LMA No. 4 and No. 6 for LMA No. 3) and recorded the success rate and the ease of insertion. After three failures, the authors used FOB guidance.*

Results: *Sixty patients were enrolled (32 males). The mean SD age and BMI was 43.2 13.4 years and 22.6 3.9, respectively. Most of the patients had a Mallampati of grade I. The mean SD insertion time was 24.6 16.1 sec. After the FOB evaluation, only 27 patients had an anatomic placement in full view of the glottis. Eighteen patients had vocal cords in the middle part of the opening. The success rate of blind endotracheal intubation was 5 percent (95%CI 1.0-13.9) (3/60); while the success rate with FOB guidance was 85 percent (95%CI 73.4-92.9).*

Conclusion: *A disposable laryngeal mask airway (Soft Seal) for blind endotracheal intubation had a low success rate, but it could be used more successfully with FOB guidance.*

Keywords: *Blind endotracheal intubation, Disposable LMA*

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Hypoxia caused by the inability to ventilate and/or intubate is, unfortunately, not uncommon in anesthesia but many methods are available for preventing its occurrence (*i.e.* gum elastic bougie, light wand, many types of laryngoscope blade, Fiber Optic Bronchoscope (FOB) and Laryngeal Mask Airway (LMA)). The most effective type of LMA for endotracheal intubation is the Intubating Laryngeal Mask Airway (ILMA), which can be used to good effect for both the FOB guidance and blind techniques[1-8]. Though expensive, ILMA can be used with a flexible EndoTracheal Tube (ETT) instead of a silicone tube[9]. Other types of LMA, like the classic LMA, are easy to use with little experience[10-11]. Classic LMA can be used for blind endotracheal intubation (albeit success varies between 20 and 80 percent)[12,13] and FOB guidance for endotracheal intubation. On the downside, classic LMA is costly, has a small lumen and aperture, therefore, it allows passage of only a small ETT. Furthermore, removal of the LMA can be difficult.

The disposable LMA (*e.g.* Soft Seal) is an acceptable alternative to the reusable classic LMA[14], has a larger lumen and aperture, a better shape for endotracheal intubation, and is relatively inexpensive. A disposable LMA was used successfully for blind

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endotracheal intubation in manikins[15]. Thus, the authors wanted to evaluate disposable LMA for endotracheal intubation during both the FOB guidance and blind techniques.

The primary outcome of the present study was the success rate of blind endotracheal intubation. Secondary outcomes included: 1) the ease of LMA insertion; 2) position of LMA; and, 3) the success rate of FOB guidance during endotracheal intubation. A sample size of 60 subjects was estimated to provide approximately 80% power using a 2-sided test (= 0.05).

Material and Method

After receiving approval from Khon Kaen's Research Ethics Board, written informed consent was sought from patients scheduled for elective surgery at Srinagarind Hospital, Khon Kaen University, Thailand. The authors included patients: between 15 and 60 years of age, with an ASA class of I-II, and mouth opening more than 3 cm. The authors excluded patients with a history of gastro-esophageal reflux, full stomach and a body weight < 30 kg.

The authors collected demographic data (*i.e.* sex, weight, height, BMI) and evaluated airway examination (*i.e.* Mallampati classification, mentothyroid distance, mentosternal distance) for all of the patients.

All of the patients received standard general anesthesia with controlled ventilation (*viz.* midazolam 0.05 mg/kg, morphine 0.15 mg/kg, propofol 2 mg/kg and atracurium 0.5 mg/kg maintained with N_2O:O_2: isoflurane and ECG, SpO_2, NIBP, $ETCO_2$ monitoring). After anesthetizing the patients and while they were in the sniff position (flexed neck with 10 cm heighten-pillow and extended head), the authors inserted a disposable LMA No. 3 or No. 4 (Soft Seal , Smiths Medical, Portex Inc, USA). A standard insertion technique was used with the cuff fully inflated, with the deflated rim posterior, using the midline approach[16].

During the insertion, the authors recorded the length of insertion time (from beginning to completion), the ease of insertion for the inserter: 1) 'easy' (once and smooth); 2) 'fair' (once but requiring some repositioning); and, 3) 'difficult' (requiring repositioning). After insertion, and until the accepted position was attained, the FOB (BF type PE2, Olympus, Japan) was inserted via the lumen of the disposable LMA to evaluate the position of the disposable LMA. The anatomic placement[17] was: 1) in full view of the glottis; 2) in partial view of the glottis; 3) view of the epiglottis only; or, 4) view of another structure. The position of the vocal cords by FOB view (anterior or posterior part) was recorded. No further repositioning of the LMA was done after the FOB evaluation.

The authors inserted a flexible endotracheal tube lubricated with KJ jelly (Johnson Johnson Inc, France). The authors used a flexible ETT No. 6.5 (Safety Flex , Mallinckrodt Inc, Ireland) for the disposable LMA No. 4 (50-70 kg), and a flexible ETT No. 6 (Safety Flex , Mallinckrodt Inc, Ireland) for the disposable LMA No. 3 (30-50 kg). The authors recorded the success rate and the ease of insertion: 1) easy; 2) fair; and, 3) difficult. After three failures, the authors used FOB guidance with the same endotracheal tube. Descriptive statistics mean and standard deviation were presented.

Results

The authors enrolled 60 patients in the present study (32 male; 28 female). The mean $\pm$ SD age was 43.2 $\pm$ 13.4 years of age. The mean $\pm$ SD weight was 59.6 $\pm$ 11.7 kg. The mean $\pm$ SD height was 164.2 $\pm$ 7.8 cm. The mean $\pm$ SD BMI was 22.6 $\pm$ 3.9. According to the Mallampati grading 48 patients were grade I and 12 were grade II. Twenty-seven and 33 patients had a mentothyroid distance of < 7 and ≥ 7 cm, respectively. Nineteen and 51 patients had a mentosternal distance < 14 and ≥ 14 cm, respectively. Difficult intubation was not predicted for any of the patients.

Results of the disposable LMA insertion were: 1) a mean $\pm$ SD insertion time of 24.6 $\pm$ 16.1 sec; and, 2) an ease of LMA insertion of 48 in the 'easy' group, 9 in the 'fair' group and 3 in the 'difficult' group. After the FOB evaluation, the anatomic placement was 27 in full view of the glottis, 27 with a partial view of the glottis and 6 epiglottises only. The position of the vocal cords was anterior in 39 cases and posterior in 21.

The success rate of flexible ETT insertion using the blind technique was 5 percent (95%CI 1.0-13.9) (3/60). The FOB guidance technique had a success rate of 85 percent (95% CI 73.4-92.9). Nine cases failed because of improper positioning of the disposable LMA (*i.e.* could not pass the FOB through the vocal cords without repositioning). After the surgery, none of the patients had any serious complications during anesthesia (*i.e.* airway trauma (abrasion with bloody content), severe sore throat, hypoxia ($SpO_2 < 95\%$) or pulmonary aspiration).

Discussion

The authors found the disposable LMA simple to insert and it allowed passage of the FOB guidance technique, but it failed for use with a flexible ETT during the blind technique. Although the position

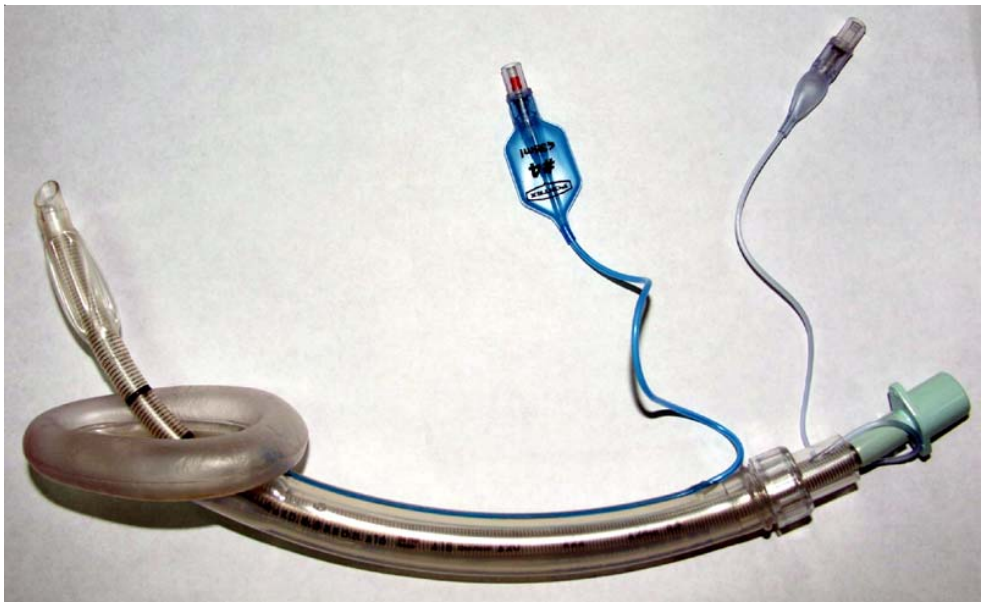

Fig. 1 Insertion of a flexible ETT through a disposable LMA

of the aperture of the disposable LMA was suitable for ventilation, the authors found that a flexible ETT could not pass through the trachea perhaps because of the anatomical positioning as the vocal cords were mostly anterior.

The three patients successfully intubated using flexible ETT insertion were two males, weighing between 50-62 kg, between 159 and 176 cm tall, with a mentothyroid distance of between 6 and 8 cm, a mentosternal distance of between 12 and 15 cm and in full view of the vocal anatomic position and the posterior part of the vocal cords.

A disposable LMA has less curvature and flexibility so the LMA was likely to pass posteriorly. Thus, the flexible ETT passes through the LMA lumen and at the end of the LMA, it passes posterior to the esophageal opening. Its success rate may be improved by shifting the vocal cord posteriorly or moving the flexible ETT anteriorly. A gum elastic bougie or a flexible stylet might be used to help the ETT to move to the anterior part. The ILMA success rate for blind endotracheal intubation increases when a full or partial view is available[3]. The aperture of the ILMA forces the ETT to the anterior.

A disposable LMA can be used without serious complications and it is easy to use for ventilation. The ease of insertion, quick insertion time, high success rate and good airway sealing pressure are as good as the classic LMA[18,19]. The insertion success rate of the disposable LMA was as high as classic LMA[18,19]. It can be used in emergency situations as well as the classic LMA, and it is less expensive.

However, because there are many types of disposable LMA, the choice is difficult (*i.e.* LMA Unique , Soft Seal , Wire reinforced LMA , AMBU laryngeal mask). The different models may influence the ease of insertion which would be significant during blind endotracheal intubation. A more flexible and small aperture seems to be correlated with a better success rate for blind intubation. Post-operative sore throat after LMA was between 13 and 29 percent[20,21]. There was no incidence of sore throat in the present study, this might have been due to the short duration of usage and/or that it was made from soft PVC.

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References

1. Joo HS, Rose DK. The intubating laryngeal mask airway with and without fiberoptic guidance. Anesth Analg 1999; 88: 662-6.
2. Baskett PJ, Parr MJ, Nolan JP. The intubating laryngeal mask. Results of a multicentre trial with experience of 500 cases. Anaesthesia 1998; 53: 1174-9.

3. Kapila A, Addy EV, Verghese C, Brain AI. The intubating laryngeal mask airway: an initial assessment of performance. Br J Anaesth 1997; 79: 710-3.
4. Capnonas G. Intubating laryngeal mask airway: review. Anaesth Intens Care 2002; 30: 551-69.
5. Brain AI, Verghese C, Addy EV, Kapila A, Brimacombe J. The intubating laryngeal mask: a preliminary clinical report of a new means of intubating the tracheal. Br J Anaesth 1997; 79: 704-9.
6. Chan YW, Kong CF, Kong CS, Hwang NC, IP-Yam PC.The intubating laryngeal mask airway: initial experience in Singapore. Br J Anaesth 1998; 81: 610-1.
7. Agro F, Brimacombe J, Carassiti M, Marchionni L, Morelli A, Cataldo R. The intubating laryngeal mask. Clinical appraisal of ventilation and blind tracheal intubation in 110 patients. Anaesthesia 1998; 53: 1084-90.
8. Thienthong S, Horatanaruang D, Wongswadiwat M, Boonmak P, Chinachoti T, Simajareuk S. An experience with intubating laryngeal mask airway for difficult airway management: report on 38 Cases. J Med Assoc Thai 2004; 87: 1234-8.
9. Thienthong S, Krisanaprakornkit W, Boonmak P, Simajareuk S, Tantanatewin W. Insertion of preformed flexible endotracheal tubes through the intubating LMA on a manikin. Srinagarind Med J 2000; 17: 95-8.
10. Thienthong S, Krisanaprakornkit W, Simajareuk S. Comparison of using laryngeal mask airway and standard face mask by nurse anesthetist trainees. Thai J Anesthesiol 1997; 23: 94-100.
11. Thienthong S, Horatanaruang D, Simajareuk S. Comparison of laryngeal mask airway insertion and endotracheal intubation by nurse anesthetist trainees. Thai J Anesthesiol 1998; 24: 1-6.
12. Lim SL, Tay DHB, Thomas E. A comparison of three types of tracheal tube for use in laryngeal mask assisted blind orotracheal intubation. Anaesthesia 1994; 49: 255-7.
13. Heath ML. Endotracheal intubation through the laryngeal mask-helpful when laryngoscopy is difficult or dangerous. Eur J Anaesthesiol 1991; 4: 41-5
14. Van Zundert AA, Fonck K, Al-Shaikh B, Mortier E. Comparison of the LMA-classic with the new disposable soft seal laryngeal mask in spontaneously breathing adult patients. Anesthesiology 2003; 99: 1066-71.
15. Boonmak P, Boonmak S. Disposable laryngeal mask airway for blind oral endotracheal intubation in manikin. Thai J Anesthesiol 2003; 29: 212-6.
16. Brimacombe J, Berry A. Insertion of the laryngeal mask airway- a prospective study of four techniques. Anaesth Intens Care 1993; 21: 89-92.
17. Walker RWM. The laryngeal mask airway in the difficult paediatric airway: an assessment of positioning and use in fiberoptic intubation. Paediatr Anaesth 2000; 10: 53-8.
18. Verghese C, Berlet J, Kapila A, Pollard R. Clinical assessment of the single use laryngeal mask airway - the LMA unique. Br J Anaesth 1998; 80: 677-9.
19. Brimacombe J, Keller C, Morris R, Mecklem D. A comparison of the disposable versus the reusable laryngeal mask airway in paralyzed adult patients. Anesth Analg 1998; 87: 921-4.
20. Splinter WM, Smallman B, Rhine EJ, Komocar L. Postoperative sore throat in children and the laryngeal mask airway. Can J Anaesth 1994; 41: 1081-3.
21. Figueredo E, Vivar-Diago M, Munoz-Blanco F. Laryngo-pharyngeal complaints after use of the laryngeal mask airway. Can J Anaesth 1999; 46: 220-5.

การใช้ disposable laryngeal mask airway (Soft Seal) ในการใส่ท่อหายใจโดยวิธี FOB guidance และวิธี blind

สุหัทยา บุญมาก, พลพันธ์ บุญมาก, ปิยะพร บุญแสงเจริญ, สมยงค์ ศรีชัยปัญหา

วัตถุประสงค์: เพื่อศึกษาการใช้ disposable LMA ช่วยใส่ท่อหายใจโดยใช้วิธี FOB guidance และวิธี blind
วัสดุและวิธีการ: ทำการศึกษาในผู้ป่วยที่มารับการผ่าตัดแบบไม่ฉุกเฉิน ASA physical status I-II อายุระหว่าง 15-60 ปี น้ำหนักมากกว่า 30 กิโลกรัมและสามารถอ้าปากได้มากกว่า 3 เซนติเมตร ยกเว้นผู้ป่วยที่มีความเสี่ยงในการสำลักเศษอาหาร ผู้ป่วยทุกคนได้รับการวางยาระงับความรู้สึกตามมาตรฐาน โดยใส่ disposable LMA No. 3 or No. 4 (Soft Seal , Smiths Medical, Portex Inc, USA) ในท่า sniff บันทึกระยะเวลาและความยากง่ายในการใส่ตำแหน่งของ LMA จากนั้นใส่ท่อช่วยหายใจชนิด flexible (เบอร์ 6.5 สำหรับ LMA เบอร์ 4 และ เบอร์ 6 สำหรับ LMA เบอร์ 3) บันทึก ความสำเร็จและความยากง่ายในการใส่ หลังจากไม่สำเร็จ 3 ครั้งจึงใส่ท่อหายใจโดยวิธี FOB guidance
ผลการศึกษา: ผู้ป่วย 60 ราย (เพศชาย 32 ราย) ค่า mean $\pm$ SD ของอายุ และBMI เท่ากับ 43.2 $\pm$ 13.4 ปี และ 22.6 $\pm$ 3.9 ตามลำดับ ผู้ป่วยส่วนใหญ่มี Mallampati class I ค่า mean $\pm$ SD ของระยะเวลาใส่ LMA 24.6 $\pm$ 16.1 วินาที การใช้ FOB ตรวจสอบพบว่าผู้ป่วย 27 รายมี anatomic placement ของ LMA ที่เห็น full view ของกล่องเสียง ผู้ป่วย 18 รายที่สายเสียงอยู่กลางของรูเปิดของ LMA อัตราความสำเร็จในการใส่โดยวิธี blind เท่ากับ 5 เปอร์เซ็นต์ (95%CI 1.0-13.9) และอัตราความสำเร็จในการใส่โดยวิธี FOB guidance เท่ากับ 85 เปอร์เซ็นต์ (95%CI 73.4-92.9)
สรุป: การใช้ disposable LMA (Soft Seal) ในการใส่ท่อหายใจโดยวิธี blind มีอัตราสำเร็จต่ำ แต่สามารถใช้ได้ดีในการใส่ท่อหายใจโดยวิธี FOB guidance และการช่วยหายใจ