Case Report

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Difficult intubation using intubating laryngeal mask airway in conjunction with a fiber optic bronchoscope

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When anesthesiologists encounter conditions in which intubation is not possible using a conventional direct laryngoscope, they can consider using other available techniques and devices such as fiber optic bronchoscope (FOB)-guided intubation, a laryngeal mask airway (LMA), intubating LMA (ILMA), a light wand, and the Combitube. FOB-guided intubation is frequently utilized in predicted difficult airway cases and is generally performed when the patient is awake to enable easier access to the trachea. An LMA can be introduced to ventilate the patient with relative ease, while an ILMA can be used for definite endotracheal intubation. However, occasionally, an endotracheal tube (ETT) cannot pass through the larynx, despite successful introduction of a FOB into the trachea and placement of an ILMA by the anesthesiologist. Therefore, we initially introduced an ILMA for emergent ventilation, followed by successful insertion of an ETT under FOB guidance. In this report, we describe three cases of difficult intubation using a FOB and ILMA combination approach.

Key Words: Bronchoscope; Intubation; LMA.

In endotracheal intubation, a fiber optic bronchoscope (FOB) or an intubating laryngeal mask airway (ILMA) is the preferred devices for patients with difficult intubating conditions. Intubation under FOB guidance is generally performed on awake patients rather than on those in a paralyzed condition; this allows the anesthesiologist to observe vocal cord movement as the patient breathes spontaneously and to access the larynx and trachea with greater ease. It is performed via the nasotracheal route instead of the orotracheal route since this allows convenient access to the larynx. The success rate of this technique has been reported at 90-95% [1]. However, awake FOB-guided intubation requires considerable preparation and skilled and experienced operators; furthermore, it can be uncomfortable for the patient.

A laryngeal mask airway (LMA) was designed to cover the larynx and can be introduced with comparative ease, even by inexperienced operators [2]. Recently-developed LMAs, such as I-gel, can be introduced to patients in a variety of surgical positions, and an ILMA allows ventilation prior to definite endotracheal intubation. Endotracheal intubation through an ILMA has been reported to have a 76–80% success rate [3,4].

Unprepared difficult airway is an emerging clinical situation and requires anesthesiologists to attempt best efforts to ventilate and maintain oxygenation. The precise definition of a difficult airway is unclear; however, in practice, it is defined as a clinical situation in which a conventionally-trained anesthesiologist experiences difficulty with facemask ventilation of the upper airway, difficulty with tracheal intubation, or both [5]. Successful facemask ventilation provides anesthesiologists with the time to consider various intubation options. However, in cannot intubate and cannot ventilate conditions, there is little time for lengthy decision-making. Therefore, more

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focused and quicker decisions are essential. We encountered an unexpected cannot intubate condition during general anesthesia induction and intubated the patient successfully using a FOB after ILMA insertion.

CASE REPORT

The first patient was a 57-year-old man (weight: 89 kg, height: 174 cm), with a traumatic cervical herniation of the nucleus pulposus, scheduled for an anterior cervical discectomy and interbody fusion due to weakness in both hands and neck pain. He was an alcoholic and smoker, but did not have any other underlying disease. His neck extension was slightly limited because of the brace and instability, and his Mallampati score was Class III. Therefore, we prepared alternative approaches to intubation such as a FOB. However, we did not perform awake intubation because the patient was very nervous, compliance was poor, and the limitation of neck movement was not severe. Total intravenous anesthesia was administered using remifentanil and propofol for using evoked potential monitoring. We injected 80 mg of 2% lidocaine for reducing propofol injection pain and to control vital sign reactions to intubation. After setting the target effect site concentration of remifentanil at 3.0 ng/ml and that of propofol at 3.0 μg/ml, we initiated anesthetic infusion and administered 10 mg of vecuronium for muscle relaxation.

After the patient lost consciousness and paralyzed, we attempted conventional endotracheal intubation with a direct laryngoscope. However, no part of the uvula was visible and the patient exhibited a traumatic cervical lesion. Since we could not hyperextend the neck drastically, we attempted FOB-guided intubation. However, it was not easy to approach to trachea through both the mouth and nose, and two trials of endotracheal intubation failed, even after the introduction of a FOB into the trachea. There was uncertainty regarding depth sufficiency of the introduced FOB owing to large amounts of secretion and blood, and because it was difficult to distinguish the vocal cords from the carina. The tube was then advanced into the esophagus, instead of the trachea, and we decided to apply an ILMA that was successfully placed after four attempts. Ventilation via ILMA was effective. Following this, a silicone wire-reinforced tracheal tube was inserted via the blind technique; however, it could only be positioned in the esophagus despite several attempts. Finally, we attempted an ILMA and a FOB combination approach. The tip of the FOB was placed into the wire-reinforced ILMA tracheal tube and inserted through the ILMA. It approached the vocal cords with ease, and after arrival at 3 cm above the carina, the tube was railroaded into the trachea. In the process of railroading, we utilized a conventional guide wire stick (e.g. a stylet) instead of an ILMA stabilizer rod. The distance from the external opening of the ILMA to the vocal cord was barely 3–4 cm shorter than the endotracheal tube (ETT). Since, it was unclear if the ETT was in the trachea after removal of the FOB, we had to push the external tip of the ETT deeper using other methods prior to removing the FOB. Furthermore, our stabilizer rod was too short to push the ETT, and immobilization of the ETT when removing the FOB or ILMA was compromised. Therefore, we used a stylet when railroading the ETT (when the FOB was in place) deeper and for maintaining the position of the ETT when removing the FOB.

The second patient was a 74-year-old man (weight: 60 kg, height: 164 cm) scheduled for an external endonasal dacryocystorhinostomy. He did not have any underlying disease, his laboratory findings were all within normal limits, and no abnormalities were found on echocardiogram and chest radiograph examination. Neck extension was sufficient and his Mallampati score was Class II. Pre-anesthetic medication was not administered. After pre-oxygenation, 250 mg pentothal sodium, 50 mg rocuronium, and 100 μg fentanyl was administered. Once the patient lost consciousness, we attempted a conventional endotracheal intubation with a Macintosh blade #3. The epiglottis was slightly visible and could not be raised sufficiently. Two blind intubation attempts were unsuccessful. Tracheal intubation using a gum elastic bougie also failed. After three failed attempts, we prepared a FOB. However, there was some bleeding in the throat that obstructed our field of vision; therefore, we selected a combination of an ILMA and a FOB. ILMA provided an effective airway and allowed sufficient ventilation and oxygenation. We approached the vocal cords with a FOB and the endotracheal tube was railroaded into the trachea with ease.

The third patient was a 64-year-old man (weight: 52 kg, height: 158 cm) with a cervical disc herniation scheduled for an emergent decompressive laminoplasty C3-6 and anterior interbody fusion. Pre-operative evaluation revealed grade III motor weakness of both hands, but there was no other underlying disease or abnormal laboratory findings. Since it was not an elective surgery, the anesthesiologists did not have sufficient patient information, particularly regarding the airway. Pre-oxygenation, induction was performed using 250 mg pentothal sodium, 7 mg vecuronium, and sevoflurane. When we opened his mouth, the opening was barely 4 cm wide and his neck was extremely stiff. In addition, we could not verify the airway anatomy when we lifted his tongue via direct laryngoscopy. Therefore, we decided to use a combination of an ILMA and a FOB immediately. Furthermore, since the operation had to be conducted with the patient in the prone position, we required the establishment of a more definite airway than an ILMA. After placing the ILMA, a FOB was introduced through with ease and an ETT was then advanced along the FOB into the trachea. Sufficient insertion was confirmed by easy bag ventilation and a capnogram, followed by administration of dexamethasone 5 mg to prevent laryngeal edema.

It was unnecessary to prepare for invasive airway access in these three cases that included surgical or percutaneous airway, jet ventilation, and retrograde intubation because facemask ventilation was adequate and a definite airway was created through an ILMA. The three patients were fully informed of the surgery and anesthesia, and all potential complications were disclosed through written consent.

DISCUSSION

When anesthesiologists encounter cases of unexpected difficult airway, there is a variety of ventilation and intubation methods to consider including a FOB, an LMA, the Combitube, and various modified laryngoscopes. In elective and controlled surgical situations, intubation is expected to be difficult in 3% of patients and impossible in 0.5% [6]. The ability to utilize a rescue technique to establish an airway is essential for avoiding severe morbidity and mortality. Therefore, in the second and third cases of the present report, ILMA insertion prior to FOB trials was attempted in order to minimize apneic periods in the paralyzed patients. Even though all these devices were tried, emergent tracheostomy was sometimes required.

Awake FOB-guided intubation can be uncomfortable and stressful for the patient, and requires expertise. Furthermore, airway edema or anomaly, bleeding, excessive secretion, cervical brace, and inexperienced operators prevent successful completion of the procedure. In our first case, we attempted FOB-guided intubation after initial intubation failure with a direct laryngoscope. Despite successfully introducing the FOB into the trachea, we experienced difficulties due to the presence of slight edema and bleeding. The patient was already paralyzed and had not been prepared for FOB-guided intubation (e.g, anticholinergics administration, topical nasopharyngeal analgesia and vasoconstriction, superior laryngeal nerve block, etc.). Furthermore, we had to stop ventilation during the procedure, limiting the time available. Therefore, we selected an ILMA since we believed that is it better to choose simpler and safer methods in critical situations. This device was developed for either blind or FOB-guided tracheal intubation in patients with both expected and unexpected difficult airways [2]. It can be placed quickly, provides adequate ventilation, and can be used as a conduit for tracheal intubation [7]. Furthermore, it has a success rate close to 100% [8]. We did not experience any difficulties when placing the ILMA in all three cases and believe that it was a reliable rescue device in these circumstances.

In situations where intubation fails but facemask ventilation is adequate, alternative approaches to intubation such as insertion of the supraglottic airway (e.g., LMA or ILMA) is the next recommended step, according to the American Society of Anesthesiologists guidelines for management of the difficult airways [5]. Furthermore, the European Resuscitation Council guidelines recommend insertion of a supraglottic airway as an alternative to tracheal intubation during advanced life support [9]. These guidelines also state that blind tracheal intubation through an ILMA is not a suitable technique to perform in the hands of inexperienced operators; failures and complications, including esophageal perforation, have been previously described [10]. In addition, the success rate of first-attempt blind tracheal intubation through an ILMA has been reported to vary between 76% and 80% [3,4]. Although endotracheal intubation via an ILMA has unsuccessful, the device can still provide an airway while surgical intervention is undertaken. Some case reports have emphasized the advantages of an ILMA in patients with neck trauma or upper airway cancer undergoing radiation therapy, who may have anatomical modifications. An ILMA is also a useful device in patients with facial trauma or obesity.

Anesthesiologist are requested to perform endotracheal intubation due to surgical necessity or for longer durations of ventilator care in the intensive care unit. Therefore, after failed blind tracheal intubation through an ILMA, introducing an ETT under fiber optic bronchoscope guidance can be the next step. The advantage of this technique is that, if the connector tip separates, any type of ETT can be utilized, although the success rate varies depending on ETT type [11]. In addition, once the ETT is inserted into the trachea through an ILMA, the proximal end of the ETT tends to disappear into the airway tube of the ILMA. Therefore, when a tracheal intubation is performed through an ILMA, the greatest challenge is the removal of the ILMA after successful intubation without dislodging the ETT from the trachea [6]. During the management of difficult airways, dislodgement of the ETT from the trachea during removal of the ILMA can, not only result in failed intubation, but may also put the patient at a risk of loss of airway control again. This risk is relatively high during oral or nasal FOB-guided intubation without the use of a supraglottic conduit [12]. In our cases, we utilized the conventional ETT stylet that allowed the tube to be railroaded into the trachea naturally. Most intubation failures using ILMAs were due to esophageal intubation. While placement of the ILMAs was simple and uneventful, ETTs could not be advanced into the glottis after multiple attempts. During the placement of ILMAs, down-folding of the epiglottis is possible, leading to partial obstruction of the glottis. A recent study suggested that the down-folding of the epiglottis may be the most common reason for difficult ventilation during the placement of ILMAs [13]. On two occasions in the first case, we also experienced difficult esophageal intubation through an ILMA; we attributed this to a down-folded epiglottis. Although the use of a lightwand over a FOB may potentially facilitate tracheal intubation through an ILMA, its role in the management of difficult airway patients has not yet been established.

Video laryngoscopes (e.g., Glidescope, Mcgrath) have recently started to be utilized; however, not every center is equipped with such equipment, including our center. To the best of our knowledge, no study to date has directly compared an ILMA with a video laryngoscope. However, in the USA, FOB-guided intubation has been shown to require more intubation attempts than video laryngoscopy [14].

We conclude that, while both FOB-guided intubation and blind tracheal intubation through an ILMA alone is successful, they are more effective when used in combination, particularly in failed attempt situations or in paralyzed patients. The advantages of this combined approach include ease of access to the trachea and reduced apnea time. However, the role of FOB-guided intubation through an ILMA in the management of patients with potentially difficult airways is currently undetermined.

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