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Intubation through a Laryngeal Mask Airway by Fiberoptic Bronchoscope in an Infant with a Mass at the Base of the Tongue

— A case report —

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Failed or difficult tracheal intubation remains an important cause of mortality and morbidity during anesthesia, especially in infants with anatomical or pathological abnormalities of the airway. We report on a 4.1 kg, 85-day-male infant with a thyroglossal duct cyst at the tongue base who could not be conventionally ventilated and intubated in the supine position. The infant was intubated with a 3-mm endotracheal tube through the laryngeal mask airway (LMA) with guidance of a fiberoptic bronchoscope (FOB). However, the pilot balloon did not pass through the 1.5-mm LMA conduit. After cutting the pilot balloon, we removed the LMA and inserted a central venous catheter guide-wire through the endotracheal tube to increase the endotracheal tube to 3.5 mm. This maneuver allowed us to secure the airway without further problems. **(Korean J Anesthesiol 2008; 54: S 43～6)**

Key Words: fiberoptic bronchoscope, infant, intubation, laryngeal mask airway, thyroglossal duct cyst.

Failed or difficult tracheal intubation is an important cause of mortality and morbidity during anesthesia.[1-3] Difficulties are more frequent in pediatric patients because of their anatomical variations.[4] Tracheal intubation of infants with various anatomical and pathological abnormalities of the airway can be a challenging task in anesthesia.

There are several case reports of intubation through an laryngeal mask airway (LMA) in small infants with mucopolysaccharidoses, Freeman-Sheldon syndrome, Pierre Robin syndrome and Beckwith-Wiedemann syndrome.[5,6] Almost international failed intubation guidelines include recourse to a classic LMA to maintain airway patency, oxygenation and inhalational anaesthesia.[2,7] And several reports have been recently published about the use of an LMA as a conduit for successful fiberoptic bronchoscope (FOB) guided intubation under general anesthesia in children, which appears to be an excellent choice for this age group with precisely documented mild to moderate airway abnormalities or limitations for conventional laryngoscopy.[8]

In the present report, we describe the successful intubation with LMA and FOB under the aid of central venous catheter guide wire in a 4.1 kg, 85-day-male infant, who could not be conventionally ventilated and intubated.

CASE REPORT

A 4.1 kg, 85-day-male infant was admitted to the emergency room due to respiratory distress. He had a history of milk feeding failure and seizure. Chest radiograph showed aspiration pneumonia and preoperative cervical MRI revealed a thyroglossal duct cyst (Fig. 1). We decided emergency operation to remove thyroglossal duct cyst at the tongue base.

The infant was brought to the operating room with oxygen saturation from 80 to 95% in spite of the O_2 10 L/min insufflations via face mask. After electrocardiogram, pulse oximetry and noninvasive blood pressure were applied, anesthesia was induced with sevoflurane in 100% oxygen while keeping the patency of the airway by assisted manual mask ventilation and observing chest excursions, oxygen saturation and capnogram. Because of difficult mask ventilation and about 90% oxygen saturation, intubation with a 3 mm cuffed

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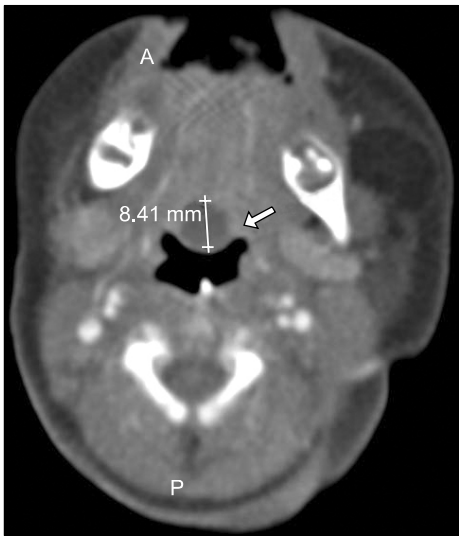

Fig. 1. Preoperative cervical magnetic resonance imaging horizontal view shows thyroglossal duct cyst (arrow). A: anterior, P: posterior.

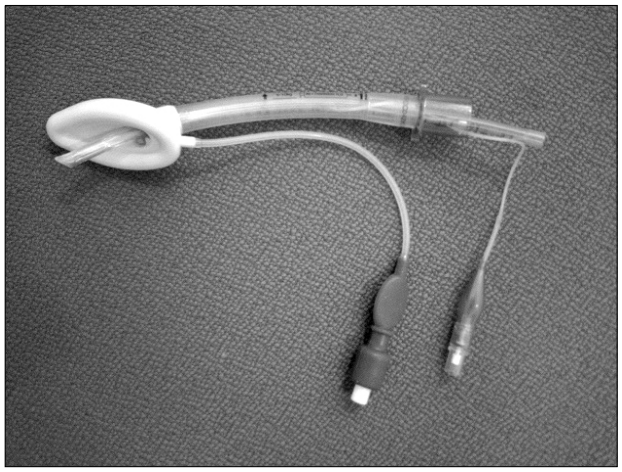

Fig. 2. The 3 mm internal diameter endotracheal tube can enter the 1.5 laryngeal mask airway (LMA), but the pilot balloon of 3 mm internal diameter cuffed endotracheal tube cannot pass through the 1.5 LMA.

Table 1. Recommended Laryngeal Mask Airway Size, Largest Endotracheal Tube Size and Fiberoptic Bronchoscope Size

Patient age/Size	LMA	Largest ET (ID)	Largest FOB (OD)
Neonate (< 5 kg)	1	3.0	2.8
Infant (< 10 kg)	1.5	3.5	2.8
Child (10−20 kg)	2	4.5	3.6
Child (20−30 kg)	2.5	5.5	3.6
Small adult (≥ 30 kg)	3	6.0 cuffed	5.0
Adult	4	6.5 cuffed	5.0

Recommended laryngeal mask airway size, tracheal tube and fiberoptic bronchoscope size are expressed with laryngeal mask airway number, internal diameter and outer diameter, respectively. LMA: laryngeal mask airway, ET: endotracheal tube and FOB: fiberoptic bronchoscope, ID: internal diameter, OD: outer diameter.

endotracheal tube was attempted initially. Although we tried 3 mm intubation tube instead of 3.5 mm tube considering emergency operation and importance of success of intubation in first trial, but failed because of the bulging tongue base mass of 8.5 mm in diameter obscuring the glottis. A size 1.5 LMA was inserted promptly and the cuff was inflated with 5 ml of air. Ventilation was achieved with a good and regular capnography waveform. After then atracurium 2 mg and dexamethasone 1 mg were administered intravenously.

In order to provide surgical procedure, we decided to intubate 3 mm intubation tube without tube connector through the LMA with guidance of FOB (Olympus LF-P, Olympus Optical Company, Tokyo, Japan) (Table 1). No other pathological finding was noted down to the level of the trachea. The fiberoptic bronchoscope was carefully removed after 3 mm cuffed endotracheal tube was placed 1.5 cm above the carina. We tried to remove the LMA, but pilot balloon did not pass 1.5 size LMA conduit (Fig. 2). After pilot balloon was cut, the LMA was removed and the tracheal tube was connected to the breathing circuit.

Exhaled tidal volume was only 15 ml in spite of 40 ml inspired tidal volume and capnogram wave form was changed because of air leakage. Therefore, we decided to change the tracheal tube with the aid of central venous catheter guide-wire instead of large tube exchanger. The tracheal tube without pilot balloon was removed while guide wire remained in trachea, and a 3.5 mm cuffed endotracheal tube was inserted to the vocal cord over the guide wire and connected to the breathing circuit.

The thyroglossal duct cyst was successfully excised. The infant was sent to the intensive care unit with intubated for possibility of airway edema. Three days after, he was transferred to the ward and discharged hospital without any complications.

DISCUSSION

A thyroglossal duct cyst is defined as a thyroglossal duct remnant present as a midline cystic neck lesion at any point along the path from the foramen caecum to the pyramidal lobe

of the thyroid gland. Usually the signs and symptoms of thyroglossal duct cysts are secondary to upper airway obstruction and comprise intermittent or continuous stridor, coarse breath sounds, accessory muscle retractions and dyspnea. In infants and children with thyroglossal duct cysts, morphological abnormalities like a high palatal arch with reduced mouth opening and a reduced submandibular space with little possibility to displace the tongue increase potential for a difficult intubation.[9)]

The LMA was introduced as a supraglottic device in anesthesia for routine use in healthy adult and pediatric populations. Its insertion is easy, atraumatic, and allows either spontaneous or mechanical ventilation. Its use is also widely described as an alternative airway device in the difficult airway for routine endotracheal intubation. Because the distal end of a properly placed LMA faces the laryngeal inlet, this device can be used as a guide intubation with a 3 mm endotracheal tube in addition to maintaining airway patency through the LMA on behalf of appropriate oxygenation and the continuation of anesthesia. Several reports have indicated the successful intubation by using LMA in children.

FOB via LMA in children with different kinds of respiratory diseases was performed with success and no complications occurred. That can be used safely.[10)] As well as examination, FOB provides laryngoscope-assisted fiberoptic guided intubation. But, the use of FOB to assist in the passage of small pediatric endotracheal tubes typically requires a small pediatric FOB that can be passed through the tube. Problems may occur in newborns and infants requiring endotracheal tubes size 3.0 or lower. In these patients, very small diameter FOB should be used, but such FOBS are not available in all hospital, especially in emergency situations. Furthermore, most of them don't provide a working channel for the application of topical anesthesia, continuous oxygen flow or suction.

For the classic LMA, no commercial tools are available for removing the LMA over the intubation tube. The pilot balloon of a cuffed intubation tube does not pass the internal lumen of pediatric LMA 1 to 2.5 and in larger LMA the intubation tube cuff line may be too short, so that the pilot balloon of the intubation tube becomes stuck within the LMA. To overcome this problem a variety of techniques and equipment have been reported for children and adults. Simple solutions are leaving the LMA in place,[11)] splitting the LMA,[12)] cutting and shortening the LMA[13)] or use of longer tubes.[14)] In this case, we selected to cut the pilot balloon of a intubation tube.

Central venous catheter guide-wire intubation technique is likely to be valuable when a small pediatric FOB is not available. And even when pediatric FOB is available, it facilitates removal of the laryngeal mask airway better than pediatric FOB. Similar techniques, such as passing the endotracheal tube directly over the guide-wire or ureteral dilator, have been reported.[15,16)] In this report, we used central venous catheter guide-wire to guide intubation tube through the LMA. Of course, a flexible guide-wire seems to be an unreliable guide to the endotracheal tube, which is difficult to oxygenate the patient while inserting the endotracheal tube. The ability to provide supplemental oxygen through the tube exchanger directly into the trachea during re-intubation diminishes the potential for hypoxia while maintaining the ability to re-intubate the trachea. But, in the emergency situation, the guide-wire should be considered as a realistic alternative.

The suggested benefits of cuffed endotracheal tube are a low tracheal tube exchange rate and a sealed airway without the use of over-sized uncuffed endotracheal tubes.[17)] Also, recent studies have shown that the use of cuffed tubes is not associated with a higher incidence of respiratory complications in young children or infants.[18,19)]

In the present report, we used a 3 mm cuffed endotracheal tube in first trial considering emergency operation and importance of success of intubation. But, in second trial, we inserted a 3.5 mm cuffed endotracheal tube. That is because we could check the cavity for the passage of a endotracheal tube through the FOB in spite of the bulging tongue base mass obscuring the glottis.

Different approaches to difficult intubation in children have been proposed such as invasive procedures like retrograde-intubation, tracheotomy and jet ventilation. But jet ventilation should not be used in cases in which outflow from the airway is obstructed and may result barotrauma. The production of a shorter pediatric LMA or a longer sized pediatric endotracheal tube may help to optimize this technique of intubation.

The importance of managing unexpected failed intubation is highlighted by the prominence given to this situation in the current Difficult Airway Society guidelines.[3)] And the optimal choice for airway management depends on the availability of the equipment and the experience of the practitioner.

In conclusion, the LMA can be used as a conduit for FOB and central venous catheter guide-wire guided intubation in infants with large upper airway mass.

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