A New Technique for Laryngeal Mask Airway Insertion in a Newborn with Pierre-Robin Syndrome: A Case Report

Pierre-Robin Sendromlu bir Yenidoğanda Laringeal Maskeyi Yerleştirmek İçin Yeni bir Teknik: Olgu Sunumu

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Abstract

Babies with Pierre Robin syndrome have serious life-threatening risks because of acute respiratory distress and difficult airway management. It is difficult to perform endotracheal intubation in these babies for general anesthesia. We present successful insertion of laryngeal mask airway in a neonate with typical clinical features of Pierre-Robin syndrome using a size 1 laryngeal mask airway for a ventriculoperitoneal shunt operation. The patient had micrognathia, glossoptosis with cleft palate, and partial trismus. His mouth opening was restricted to 0.6 cm. Anesthesia was deepened with sevoflurane, maintaining spontaneous ventilation, but laryngoscopy was impossible because of the limited mouth opening. After unsuccessful attempts to insert an LMA by standard and rotational techniques, it was inserted using a novel modified rotational LMA insertion technique, which we have termed the 'squeezing technique'.

Keywords: Pierre-Robin syndrome, Difficult endotracheal intubation, Laryngeal mask airway


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Introduction

Pierre-Robin syndrome (PRS) is characterized by glossoptosis and micrognathia and is often accompanied by cleft palate. In PRS, babies have serious life-threatening risks because of acute respiratory distress and difficult airway management. It is difficult to perform endotracheal intubation (ET) in babies with PRS for general anesthesia. For this reason, the laryngeal mask airway (LMA) is widely used in these babies. Standard LMA placement may be difficult or even impossible in the presence of certain additional factors (mouth opening limitations, etc.)[1].

Here, we presented a newborn baby intubated with LMA for a ventriculoperitoneal shunt operation. We describe a new modified method to perform LMA in a newborn baby with PRS who had experienced difficulty with LMA insertion by standard and rotational procedures.

Case Report

A seven-day-old male SGA (small for gestational age) baby admitted to the NICU (neonatal intensive care unit) because of mild central cyanosis, a cleft palate, a large head, and poor feeding. He was born to a 23-year-old primigravida after 39 weeks of gestation. There was no history of consanguinity, drug or teratogen exposure. His birth weight was 2000 grams and his height 48 centimeters. On initial examination, his mouth opening was limited to 0.6 centimeters (Figure 1). PRS with partial trismus was diagnosed in our patient. Hydrocephalus was confirmed by cranial ultrasonography. The prosthesis implant in his soft palate for cleft palate was implanted in the NICU. A ventriculoperitoneal shunt operation was planned for hydrocephalus and written informed consent was approved by his parents.

The diagnoses of patent foramen ovale and pulmonary hypertension were based on an echocardiographic study by a pediatric cardiologist. In his routine monitorization in operation room, arterial oxygen saturation was 85%. Anesthesia induction was made with 8% sevoflurane using a facemask during spontaneous breathing. After sufficient anesthesia depth was obtained, direct laryngoscopy failed due to the lack of a 0 Macintosh blade. Once patient ventilation via facemask was easily achieved, 0.5 mg/kg atracurium was administered and nitrous oxide in O2 was added to sevoflurane. Number 1 LMA was fully deflated. Endotracheal intubation (ET) and conventional LMA insertion could not be performed. It was not possible to insert the LMA because the patient’s mouth opening was limited, that is, his mouth opening was narrower than the diameter of the cuff shaft junction region, which is the largest region of the LMA (0.6 and 1.3 cm, respectively). A second attempt, using a rotational LMA insertion technique, was also unsuccessful. We attempted to insert the LMA using a novel modified rotational technique (squeezing technique), which is first described here. In this technique, the LMA is inserted back-to-front like a Guedel airway, and the cuff shaft junction is squeezed by the first and second fingers to allow the LMA to pass through the restricted mouth opening (Figures 2a and 2b). After passing through the mouth opening, the LMA was rotated 180° as it was pushed into the hypopharynx. The LMA was successfully inserted by this technique. The cuff was then inflated. The correct position of the LMA was confirmed by observing the capnography curve, auscultation and synchronous movements of the chest and the reservoir bag of the anesthetic circuit. The intraoperative course of anesthesia and surgery was uneventful. After the surgery was complete, the LMA was deflated and pushed back until the cuff shaft junction drew near the mouth opening. We used a clamp to squeeze the cuff shaft junction of the LMA, after which the LMA was removed easily.

Discussion

Airway management of neonates with cranio-facial and mandibulo-facial anomalies presents a challenge for neonatologists and anesthesiologists. Because neonates with this condition are usually at risk for life-threatening respiratory problems, difficult intubation conditions must generally be expected[1].

Pierre-Robin syndrome is one of the most important cranio-facial abnormalities. The clinical triad of PRS is cleft palate, micrognathia, and airway obstruction. In most cases, upper airway obstruction is mild and can be handled conservatively by placing the patient in a prone/lateral position. In some patients with airway obstruction, however, difficult ET may result in respiratory failure and death[1].

Glossoptosis resulting from a small retrognathic mandible, prominent maxilla and cleft palate plays an important role in the pathogenesis of difficult laryngoscopy and/or ET and airway obstruction in PRS. Neuromuscular impairment of the genioglos-
sus and other parapharyngeal muscles may contribute to airway obstruction [2]. In our case, there were two additional factors that directly affected airway management. The first factor was the limitation of the mouth opening due to partial trismus. An implant in our patient’s mouth for conservative treatment of cleft palate was the second factor. In addition to these factors, anatomic abnormalities due to PRS in the baby complicated laryngoscopy via an appropriate blade.

Endotracheal intubation of patients with limited mouth openings is a real challenge for practitioners. In most cases, blind intubation can be frustrating and unsuccessful. Tracheostomy, even under ideal conditions, can cause serious complications [3].

Endotracheal intubation through a fiber optic bronchoscope (FB) (fiber optic-guided tracheal intubation) has revolutionized airway management. Particularly, FB has also started a revolution in the intubation of patients with trismus [3]. The use of FB seems to be the safest and easiest method compared to the alternative methods of elective ET evaluated as difficult or impossible with conventional laryngoscopy [4]. However, fiber optic endotracheal intubation (FEI) may fail due to narrow anatomic conditions, which sometimes makes advancement of the tracheal tube extremely difficult or even impossible. In children who are awake, oral/nasal FEI may be a challenge because of the lack of cooperation. Thus, this procedure should be performed under sedation. However, FEI has been used in a child with Pierre Robin syndrome in which the mouth opening was limited to 1 cm. Although FEI is very valuable in difficult intubations, this procedure is not cheap and takes extra time, about 20 min. [4]. The use of FEI also requires that staff become proficient in a new technique. Moreover, this equipment may not available in most hospitals in developing countries.

In our case, FB was absent at the time of the event and we had to use alternative techniques. The LMA is used as a routine airway device in general anesthesia and as a conduit in difficult intubation in patients; consequently, it can be placed into the ASA difficult airway algorithm.

The LMA has been used in neonates for resuscitation at birth, interhospital transfer, airway rescue in the special care baby unit, fiber optic-guided tracheal intubation, tracheostomy, bronchoscopy, and respiratory support following failed ET [5].

The LMA has been used in patients with PRS for resuscitation and facilitating ET [6], but so far, difficulty in placement of the LMA into the mouth has not been reported in a patient with PRS. In earlier reports, the LMA has been easily inserted into the mouth; moreover, no report has made statements with respect to difficulties in passing through the mouth opening.

The LMA may be easily inserted into patients by Brain’s standard technique. On occasion, however, placement can be difficult. In these situations, some authors recommend alternative insertion techniques. One such technique is that the LMA is partially inflated to improve the ease of insertion [7]. Another is the rotational technique (reverse technique where the LMA is inserted back-to-front like a Guedel airway and then turned 180° while it is pushed into the hypopharynx). In this maneuver, the cuff of the LMA is partially inflated. It has been suggested as first choice to insert the LMA in pediatric patients [8]. We combined a rotational technique with our modified technique to insert the LMA in this case. We called this combination the squeezing technique or ‘rotational or reverse modified technique’. In our rotational modified technique, we fully deflated the LMA cuff like in Brain’s standard method, but unlike the rotational technique. To the best of our knowledge, this technique had not been described or used before this time.

After LMA insertion, anesthesia may be maintained alone via the LMA or a tracheal tube, which can be inserted across the laryngeal airway by blind intubation or by ET using FB [9]. We thought that anesthesia could be maintained by LMA because surgery was intended to be short. We did not observe any problems because we checked the correct position of LMA by observing the capnography curve, auscultation and synchronous movements of the chest and the reservoir bag of the anesthetic circuit. During the operation, we had the chance to recheck.

After placing the LMA and inflating the cuff in the correct position, the LMA is confirmed by observing the capnography curve, auscultation, synchronous movements of the chest and the reservoir bag of the anesthetic circuit. Presence of a gas leak, determined by squeezing the reservoir bag for 10 s for each pressure at an airway pressure of 18 cm H2O, is considered to indicate poor LMA placement, and the mask is removed. We make three consecutive replacement attempts of the LMA in our unit. If these three attempts fail, the procedure is accepted to be unsuccessful. The patient is transferred to another center where there is an FB. If intraoperative displacement of the LMA occurs, surgery is immediately stopped and the LMA is replaced.

If laryngospasm occurs intraoperatively, then the following algorithm for laryngospasm is administrated according to our unit’s protocol: (a) a jaw-thrust maneuver applied with pressure on the ‘laryngospasm notch’, [10] application of positive airway pressure and deepening of anesthesia if symptoms persist; (b) administration of 1 mg/kg lidocaine if symptoms still persist; and (c) administration of 1 mg/kg succinylcholine. In clinical practice, we do not expect laryngospasm if we give muscular relaxant in sufficient amounts and the patient is in deep anesthesia.

In conclusion, the squeezing or modified rotational LMA insertion technique, first described here, may be an alternative method for difficult intubation conditions. We recommend this technique for babies with PRS and other cranio-facial anomalies.
Conflict interest statement The authors declare that they have no conflict of interest to the publication of this article.

References


in which the mouth opening varies from 0.6 cm to 1.3 cm.