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Case Report

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Anesthesia management of an infant with laryngomalacia*

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ABSTRACT

Potential complications in the pediatric airway are significantly more frequent and diverse compared to adults. The underlying reasons include not only anatomical and physiological differences but also the higher prevalence of congenital anomalies affecting the airway in the pediatric population. Among these anomalies, the most common is laryngomalacia, characterized by the collapse of supraglottic structures during inspiration. Congenital laryngomalacia typically presents with stridor within the first 15 days of life, follows a self-limiting course, and tends to resolve by 24 months of age. In this report, we present our experience with difficult airway management and anesthesia in a 3.5-month-old, 5 kg patient diagnosed with laryngomalacia during surgery.

Keywords: Anesthesia, children, laryngomalacia, difficult airway

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INTRODUCTION

Laryngomalacia is the most common congenital laryngeal anomaly and represents the leading cause of stridor in neonates.[1] Although it may be present at birth, it typically manifests after the first four weeks of life with progressively worsening inspiratory stridor. The stridor is exacerbated by feeding, exertion, or the supine position, while it tends to improve with neck extension or prone positioning. Crying is usually normal, and no signs of lower respiratory tract involvement or cyanosis are observed. Clinical manifestations generally begin shortly after birth, increase in severity until the eighth month, plateau around the ninth month, and gradually resolve by 24 months of age.[2]

Pediatric difficult airway remains a major challenge for anesthesiologists and is recognized as one of the principal causes of perioperative respiratory complications.[3] A multicenter study conducted in the United States estimated the incidence of difficult airway in pediatric anesthesia to be between 2–5% per 1,000 cases. Moreover, approximately 20% of children requiring difficult airway management experienced complications.[4] In addition to the challenges encountered during endotracheal intubation, the limited time available for airway manipulation in children compared with adults further complicates management. Children diagnosed with laryngomalacia are therefore considered at increased risk for difficult airway management. In this report, we aim to present our experience in the anesthetic management of an infant with laryngomalacia.

CASE

Our patient was a 3.5-month-old male infant, weighing 5 kg and measuring 61 cm in length. He was referred to our department by the pediatric surgery clinic for preoperative evaluation prior to laparoscopic unilateral inguinal hernia repair and circumcision. His medical history revealed that he was born at 38 weeks of gestation with a birth weight of 1800 g and was diagnosed with low birth weight. Postnatally, he had persistent grunting respirations, for which he was evaluated by the pediatric clinic and diagnosed with laryngomalacia. Since no cyanosis or respiratory distress was observed at rest and oral intake was normal, close follow-up without medical intervention was recommended due to his mild symptoms.

Preoperative examinations and clinical evaluation revealed no signs of respiratory distress. According to the American Society of Anesthesiologists (ASA) classification, the patient was classified as ASA II. The infant, who was breastfed, was brought to the operating room after a 4-hour preoperative fasting period (**Figure 1**).

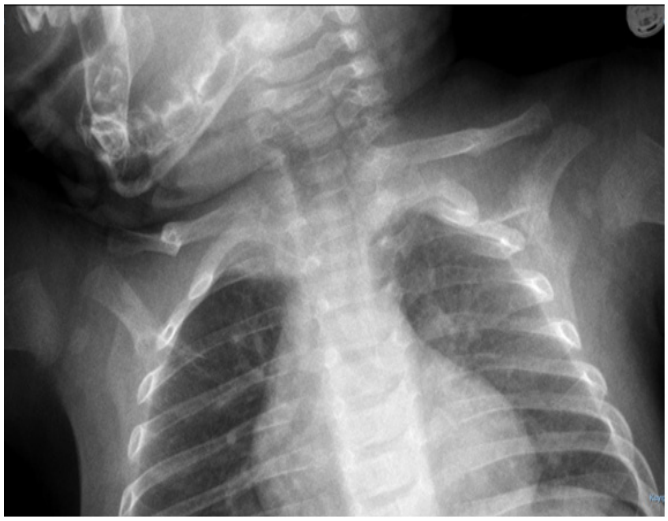

Figure 1. Chest X-ray

Anesthesia Management

Standard monitoring (heart rate, blood pressure, and SpO_2) was applied. Induction was initiated with 8% sevoflurane. After establishing peripheral intravenous access, 0.8 mcg/kg fentanyl and 1 mg/kg rocuronium were administered intravenously. Mask ventilation was easily achieved. Airway evaluation with a size 1 Miller laryngoscope revealed a difficult airway classified as Cormack–Lehane grade III. The first attempt at endotracheal intubation was unsuccessful; however, the patient was successfully intubated on the second attempt by an experienced anesthesiologist using a videolaryngoscope and a 3.0-mm uncuffed endotracheal tube. A 10 Fr orogastric tube was inserted.

The patient was then positioned laterally for caudal anesthesia. Following sterilization, a 25-gauge, 30-mm caudal needle was advanced through the sacral hiatus, and a caudal block was performed with 3 ml of 0.25% bupivacaine. Anesthesia was maintained with 2% sevoflurane in a 50% oxygen–air mixture. The surgical procedure lasted 67 minutes, during which intraoperative hemodynamic parameters remained stable.

For postoperative analgesia, in addition to the caudal block, 10 mg/kg intravenous paracetamol was administered. At emergence, 4 mg/kg sugammadex was given to reverse neuromuscular blockade, and the patient was successfully extubated without complications (**Figure 2**).

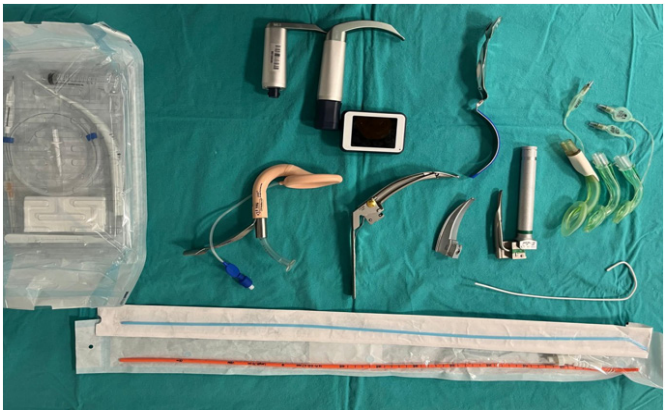

Figure 2. Preoperative airway preparation

Following surgery, the patient was transferred to the recovery room and closely monitored for approximately 40 minutes. As no signs of respiratory distress were observed, he was transferred to the pediatric surgery ward under nurse supervision.

DISCUSSION

Although the etiology of laryngomalacia has not yet been fully elucidated, several theories have been proposed regarding its pathogenesis. The most widely accepted hypothesis suggests that laryngomalacia results from inadequate neuromuscular maturation, which leads to supraglottic hypotonia and relaxation of these structures during inhalational anesthesia.[5]

Laryngomalacia is the most common cause of stridor in children, accounting for 65-75% of all cases.[6] It develops as a result of the inability to maintain laryngeal lumen patency during inspiration and occurs approximately twice as often in males compared with females. It is typically characterized by inspiratory stridor that spontaneously regresses within the first 24 months of life.[5] However, in approximately 10% of cases, severe airway obstruction may lead to marked dyspnea, dysphagia, growth retardation, and obstructive sleep apnea, requiring surgical intervention.[6] In our case, the patient was male and presented with inspiratory stridor, but did not exhibit symptoms severe enough to necessitate surgery (**Figure 1**).

The diagnosis of laryngomalacia is based on the clinical and epidemiological history of neonates and infants presenting with inspiratory stridor, which worsens with agitation or crying and improves during sleep. Direct laryngoscopy is considered the gold standard for definitive diagnosis.[7-9] In children with congenital or acquired airway pathology, airway management is of critical importance due to the risk of difficult intubation, difficult extubation, and the potential need for reintubation.[10] Children diagnosed with laryngomalacia are therefore at increased risk for difficult airway management. Most airway assessment methods and scoring systems validated in adults have not been confirmed in children. Nevertheless, children at risk for a difficult airway can be identified through a detailed medical history and comprehensive physical examination. In pediatric difficult airway scenarios, careful preparation and implementation of an appropriate anesthetic plan contribute to effective management and increase the likelihood of successful outcomes.[11]

A review of the literature highlights four main anesthetic techniques in the management of children with laryngomalacia and difficult airways: general anesthesia with intravenous maintenance, inhalational induction, high-frequency jet ventilation, and regional anesthesia (caudal or spinal) combined with sedation.[12] In our patient, general anesthesia was deemed necessary to ensure optimal surgical conditions, as the procedure was planned as a laparoscopic inguinal hernia repair.

When a difficult airway is anticipated, it is recommended to have advanced airway management techniques available, including videolaryngoscopy, supraglottic airway devices,

fiberoptic bronchoscopy, and needle cricothyrotomy. Placement of a laryngeal mask airway (LMA) has been reported to cause injuries to the uvula, pharyngeal mucosa, epiglottis, and other laryngeal structures.[13] These injuries may occur due to forceful insertion or as a result of downward folding of the epiglottis during placement. In our case, all necessary preparations—including readiness for emergency tracheostomy—were made, and the operation was initiated with full preparation for foreseeable risks (**Figure 2**). Following successful mask ventilation, difficult intubation was encountered; however, tracheal intubation was easily achieved on the second attempt using videolaryngoscopy with a smaller endotracheal tube. In cases of unexpectedly difficult tracheal intubation, repeated attempts should be avoided; instead, airway patency must be maintained, assistance sought, and alternative techniques capable of providing apneic oxygenation, along with appropriately sized intubation devices such as videolaryngoscopes, fiberoptic bronchoscopes, or supraglottic airway devices (with the use of a stylet or bougie if necessary), should be readily available. At this stage, tracheal intubation is recommended to be performed using alternative tools such as a videolaryngoscope or a fiberoptic bronchoscope.[14]

Videolaryngoscopy is particularly valuable in difficult airway management because of its potential to improve the success rate of tracheal intubation. Previous reports have demonstrated that the use of videolaryngoscopes significantly increases the first-pass success rate in children with difficult airways, including neonates and infants.[15] However, the effectiveness of videolaryngoscopy in small children may be less pronounced compared to that reported in older children and adults. Conversely, fiberoptic bronchoscope–guided intubation in neonates and infants with difficult airways has been shown to markedly increase first-pass success rates.[16] Nevertheless, it should be noted that fiberoptic bronchoscopes with an external diameter of <3 mm may not be readily available in every clinical setting.

In neonates with low birth weight, another important anesthetic goal is to minimize the risks of postoperative complications. In this patient population, the most frequent causes of postoperative airway obstruction include laryngospasm, laryngeal edema, and apnea, which is particularly common.[17] In our patient, all necessary preparations were undertaken, and the perioperative plan was meticulously executed. As a result of this cautious approach, no complications were encountered.

CONCLUSION

As a result, comprehensive preoperative evaluation and careful planning of anesthetic management are crucial in pediatric patients with anticipated difficult airways. Anticipating potential risks, implementing appropriate strategies, and ensuring the presence of an experienced anesthesiologist working in coordination with a skilled team play a key role in minimizing possible complications.

ETHICAL DECLARATIONS

Informed Consent

Informed consent was obtained from the legal guardians of the pediatric patient described in this report. Where developmentally appropriate, assent was also sought from the child. The inclusion of vulnerable populations in this study adhered to national and international ethical guidelines. Extra care was taken to ensure voluntary participation, understanding, and protection of participant dignity and autonomy.

Peer Review Process

This report underwent external peer review.

Conflict of Interest

The authors declare no conflicts of interest.

Financial Disclosure

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Author Contributions

Concept: AD, CY, YAŞ; Design: AD, ESS; Control/Supervision: MK; Data Collection and/or Processing: AD, YAŞ; Analysis and/or Interpretation: CY, YAŞ; Literature Review: AD, ESS; Article Writing: AD, ESS, MK; Critical Review: All Authors.

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