Anesthetic Management of Infants for Endoscopic Laryngeal Cleft Repair

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Introduction:
Laryngeal clefts are rare congenital malformations that occur due to developmental failure of the tracheoesophageal septum. Symptoms include aspiration, respiratory distress, stridor and recurrent pneumonia, often necessitating surgical repair. The authors present a case series of the anesthetic management of 3 patients who underwent endoscopic repair, focusing on the achievement of an adequate depth of anesthesia by utilizing a high dose propofol infusion, dexmedetomidine bolus, and the avoidance of opioids.

Methods:
Patient A is a 2-year-old male with a history of dysphagia and aspiration, requiring hospitalization for pneumonia. Patient B is a 3-year-old female with a history of dysphagia, chronic cough, and cyanosis. Patient C is a 2-year-old male with history of dysphagia and aspiration, requiring gastrostomy tube placement. All three patients had Type 1 clefts, in which there is a deficiency in the posterior cricoid mound.

All 3 patients underwent endoscopic repair of the laryngeal cleft defect with recreation of the posterior cricoid mound utilizing a similar anesthetic approach. Upon entering the operating room, standard ASA monitors were applied. All patients were mask induced using a mixture of sevoflurane, nitrous oxide and oxygen. Upon achieving an adequate depth of anesthesia, an IV catheter was placed. All three patients were given a dexmedetomidine bolus dose of 0.5mcg/kg. The gas mixture was discontinued and a high dose propofol infusion was initially started at 200 mcg/kg/min to maintain anesthesia and unconsciousness. The propofol infusion was titrated to maintain spontaneous ventilation (up to 325 mcg/kg/min), while the surgeons placed the patients into laryngeal suspension. Emergent intubation equipment was prepared and immediately available if necessary. Each patient received a nasal cannula with end tidal CO2 monitoring. Due to difficulties in maintenance of end tidal CO2 monitoring during unprotected airway cases, each patient’s chest was exposed to visualize adequate chest rise as an additional method of confirming spontaneous ventilation. Each patient was given acetaminophen IV at 15mg/kg and dexamethasone IV 4mg. Patients A and B received no opioids throughout the duration of the case, patient C received a one time bolus dose of fentanyl at 1mcg/kg.

Results:
All three patients had a successful repair of the laryngeal cleft without any rescue intervention from the anesthesiologist. Spontaneous ventilation was maintained throughout the duration of the repair without periods of apnea. Postoperatively, the infants exhibited appropriate analgesia.
Discussion:

Laryngeal clefts are congenital malformations between the laryngotraqueal and pharyngoesophageal systems that occur due to a lack of separation between the trachea and esophagus (1). They occur with an incidence of about 1/10000 to 1/20000 live births (2). This posterior laryngeal wall defect can lead to symptoms such as dysphagia, aspiration, respiratory distress, and cyanotic episodes. Laryngeal clefts are classified into 4 subtypes based on the length of the cleft. Type 1 is a supraglottic interarytenoid cleft that extends as far inferior as the vocal cords. Type 2 cleft extends below the true vocal cords into the upper cricoid lamina. Type 3 cleft extends completely through the cricoid cartilage and may reach the cervical trachea. Type 4 cleft extends into the thoracic trachea and possibly as far as the carina (1,3).

The gold standard for the diagnosis of laryngeal cleft is microlaryngoscopy under general anesthesia but a high index of suspicion based on clinical presentation is also necessary (2). Unlike gastroesophageal reflux or bronchiolitis, which usually resolve by 2 years of age, the symptoms of laryngeal cleft generally persist and worsen despite treatment for reflux and asthma (1). Initial management of laryngeal clefts generally involves medical interventions with thickened feeds and antireflux medications. If medical management fails, however, surgical repair is indicated via an open or minimally invasive endoscopic approach.

The endoscopic approach to surgical repair offers several advantages over the open approach. Benefits include decreased wound complications, less airway instability, lower risk of nerve injury, avoidance of tracheal intubation or tracheostomy, and a shorter hospital stay. If the endoscopic approach is being considered, adequate posterior glottic exposure and spontaneous ventilation are required (3). The use of an endotracheal tube is generally not warranted as the tube obstructs the surgical field and poses a risk of damaging the suture line during the post-operative period (1).

Maintaining spontaneous ventilation with adequate oxygenation and ventilation for the duration of surgical time (average 60–90 minutes) poses unique challenges for laryngeal cleft repairs compared to other endoscopic otolaryngology procedures. For this reason, the authors recommend utilizing an approach that minimizes the risk of apnea by avoiding or limiting the use of opioids and administering dexmedetomidine and acetaminophen. Although the authors did not experience a need for emergent intubation or airway intervention in any of these cases, the anesthesiologist should always be prepared to intervene in conjunction with the surgeon if necessary.

Conclusion:

Endoscopic laryngeal cleft repair has become a frequently performed procedure. The anesthetic approach should involve maintaining spontaneous ventilation and avoiding periods of apnea. Utilizing high dose propofol infusions, in conjunction with dexmedetomidine and limiting opioids has been shown to be a safe and effective strategy.

References: