

Anesthetic management of an infant for aortopexy

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Abstract

Tracheomalacia is a rare condition characterized by weakness of tracheobronchial cartilaginous bridges. Severe weakness results in tracheal collapse during inspiration, obstructing normal airflow. Tracheomalacia may also be associated with esophageal atresia, tracheoesophageal fistula, and gastroesophageal reflux. Aortopexy is an established surgical procedure for treatment of severe tracheomalacia. A 2-month-old boy was scheduled for aortopexy. He had already undergone repair of tracheoesophageal fistula and had failed multiple attempts at extubation. Intraoperative flexible fiberoptic bronchoscopy was performed to guide the amount and direction of aortopexy for assuring the most effective tracheal decompression. Since tracheomalacia is best assessed in a spontaneously breathing patient, it was an anesthetic challenge to maintain an adequate depth of anesthesia while allowing the patient to breathe spontaneously. Throughout the intraoperative period, SpO₂ remained ≥96%. Following the procedure, the trachea was extubated and patient was able to breathe normally.

Key words: Aortopexy, anesthesia, management

Introduction

Primary tracheomalacia is a rare congenital condition characterized by weakness of tracheobronchial cartilaginous bridges, resulting in reduced tracheobronchial lumen. Severe weakness results in tracheal collapse during inspiration, obstructing normal airflow. Aortopexy is an established surgical procedure for treatment of severe tracheomalacia.^[1] However, very few published reports describe the anesthetic implications of the procedure. The following case report illustrates the various anesthetic concerns in the management of an infant undergoing aortopexy.

Case Report

A 2-month-old boy, weighing 2180 g, case of severe tracheomalacia was scheduled for aortopexy. The patient,

born at 36 weeks of gestation, had undergone primary repair of tracheoesophageal fistula at 3 h of life, following which he had multiple failed attempts at extubation. Flexible fiberoptic bronchoscopy revealed significant tracheomalacia. Considering the severity of symptoms, aortopexy was planned.

At pre-anesthetic evaluation, all relevant investigations including chest X-ray and echocardiogram (ECHO) were normal. Trachea was already intubated with a size 3.5-mm internal diameter uncuffed tracheal tube with oxygen supplementation via T piece. Respiratory rate was 60/min with nasal flaring and substernal and intercostal retractions. On auscultation, there were no adventitious sounds in the chest.

Patient was nebulized with salbutamol and shifted inside the operating room. A 22-G intravenous cannula was *in situ* in the right basilic vein. After establishing standard monitors [electrocardiogram (ECG), non-invasive blood pressure (NIBP), SpO₂, end-tidal carbon dioxide (EtCO₂)], Injection ranitidine 2.5 mg, metoclopramide 0.3 mg, dexamethasone 1.2 mg, and fentanyl 4 mcg were administered intravenously. Anesthesia was induced with sevoflurane 4% in oxygen and ventilation assisted. Patient's spontaneous respiratory efforts were maintained for dynamic assessment of tracheomalacia. A neonatal flexible fiberoptic bronchoscope (size 2.2 mm) was introduced through the tracheal tube. Oxygen was connected to the bronchoscope. The tracheal tube was then withdrawn over the bronchoscope to allow for assessment of trachea. The anterior tracheal wall near carina was seen to

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collapse with inspiration. Following assessment, the tracheal tube was reinserted into the trachea by railroading over the bronchoscope. Injection atracurium 1.2 mg was given and positive pressure ventilation started. Anesthesia was maintained with sevoflurane 2% in oxygen and Injection atracurium intermittent boluses. Left anterior third intercostal space thoracotomy was done. During dissection, the patient had an episode of hypotension and bradycardia (up to 70/min). Surgeons were requested to immediately relieve compression of the major vessels. A fluid bolus and Injection atropine 0.1 mg were administered. Heart rate and blood pressure returned to normal and surgery was resumed. After the surgical procedure was complete, neuromuscular block was reversed with Injection glycopyrolate 0.02 mg and Injection neostigmine 0.15 mg intravenously. sevoflurane 2% in oxygen was continued. Bronchoscope was re-inserted through the tracheal tube. The anterior tracheal wall no longer collapsed with inspiration. Intercostal and substernal retractions were also absent. Morphine 0.06 mg via caudal route and paracetamol suppository 80 mg were given for postoperative analgesia. Recovery from anesthesia was smooth. Trachea was extubated and patient was able to breathe normally. Throughout the intraoperative period, SpO₂ remained ≥96%.

Discussion

Tracheobronchomalacia is a rare disease characterized by abnormal softness or absence of bronchotracheal cartilaginous bridges, resulting in reduced tracheobronchial lumen.^[2] Primary or congenital tracheomalacia is usually associated with esophageal atresia and tracheoesophageal fistula. Secondary or acquired tracheomalacia usually follows prolonged compression of the trachea by tumors, vascular malformations, or following long-standing intubation or tracheostomy. The disease process may involve the entire length of the trachea or only small segments of the tracheobronchial tree, producing varying degrees of airway obstruction.

In primary tracheomalacia, symptoms typically develop in early infancy but may present later also. While mild cases resolve spontaneously or with conservative measures, severe cases causing life-threatening airway obstruction require surgical intervention. Aortopexy is an accepted and safe procedure for the treatment of severe tracheomalacia in infancy.^[3,4]

Aortopexy may be performed either via a right or left anterior thoracotomy or as minimally invasive thoracoscopic aortopexy. The procedure involves placement of sutures in the adventitia of the ascending aorta and through the posterior periosteum of the sternum, bringing forward the aortic root to the sternum, thus widening the tracheal diameter. The procedure entails several anesthetic concerns. Most patients undergoing this

procedure are infants or children,^[2] with corresponding concerns of pediatric anesthesia.

Tracheomalacia may be associated with esophageal atresia, tracheoesophageal fistula, and gastroesophageal reflux,^[5] which need to be managed appropriately. Intraoperative bronchoscopic monitoring may be required to control the amount and direction of aortopexy for assuring the most effective tracheal decompression.^[2] Since tracheomalacia is best assessed in a spontaneously breathing patient, it is an anesthetic challenge to maintain an adequate depth of anesthesia while allowing the patient to breathe spontaneously. Moreover, the anesthesiologist must ensure adequate oxygenation during bronchoscopy. Introducing the fiberoptic bronchoscope through the tracheal tube and then withdrawing the tracheal tube over the bronchoscope for assessment of the trachea has considerable advantages. First, a flow of oxygen can be connected to the bronchoscope for oxygenation. Secondly, once bronchoscopic assessment is complete, the tracheal tube can be immediately reinserted into the trachea by railroading over the bronchoscope. This decreases the time during which the airway is not secure, as well as the number of airway manipulations.

It is prudent to use steroids for premedication as well as postoperative inhalational steroids^[2] to decrease airway edema and reactivity owing to repeated airway manipulations, especially in infants with already narrow airways.

Dissection around heart and major vessels may lead to hemodynamic compromise. It is imperative to maintain an adequate preload and depth of anesthesia to minimize the occurrence of such episodes. Majority of such episodes terminate on relieving compression of the vascular structures. In addition, fluid boluses and atropine may be required. Although we did not secure an arterial access in this patient, it would be prudent to do so in any such future cases as it can help to monitor the blood gas levels and blood pressure more accurately.

Conclusion

Primary tracheomalacia is a rare disease affecting infants. Patient must be evaluated for other congenital anomalies. Intraoperative bronchoscopic monitoring may be required to guide the direction and amount of aortopexy for assuring the most effective tracheal decompression, during which it is best to maintain spontaneous respiration. Judicious preloading with vigilant intraoperative hemodynamic monitoring should be done. Intravenous and inhalational steroids are warranted in the peri-operative period to reduce airway reactivity and edema. A team approach by surgeon, anesthesiologist, and pediatrician is a must to ensure good outcome.

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