Postpneumonectomy Syndrome: Anesthetic Considerations for a Right Pneumonectomy in an Infant with Pulmonary Sling

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Background: Postpneumonectomy syndrome (PPS) is a rare postoperative complication whereby mediastinal shift or rotation can lead to larger airway or great vessel obstruction following pneumonectomy. More common after right pneumonectomy, the mediastinum undergoes counterclockwise rotation as it shifts toward the post-surgical void, resulting in the distortion and compression of the left main bronchus between the pulmonary artery anteriorly and the descending aorta posteriorly. Presentations vary widely and include stridor, dyspnea, and recurrent pulmonary infections. We describe an unusual case of an infant at risk for PPS due to an anomalous origin of the right bronchial tree from the esophagus complicated by a left pulmonary artery sling.

Case Presentation: A 4.1kg, Ex-38 week, one-month old male with VACTERL association presented for a right pneumonectomy with subsequent tissue expander placement and ligation of a bronchoesophageal fistula. Pertinent anatomy included complete tracheal rings, an absent carina and right mainstem bronchus, a bronchoesophageal fistula on the right and a bridging bronchus from the left lower lobe to the right lung. TTE revealed left pulmonary sling and a mildly hypoplastic right pulmonary artery.

An inhalational induction was performed and intravenous access obtained. A 3.0 microcuffed tube was placed by direct laryngoscopy into the trachea and the left lung was ventilated. High positive pressures were avoided in the setting of the bridging bronchus. Arterial access and line placement was performed while potential sites for ECMO cannulation were preserved due to the potential risk of left pulmonary artery occlusion. The surgical procedure was performed via a right thoracotomy. Intraoperatively, the infant ventilated and oxygenated adequately. After tissue expander placement, the infant was returned to supine position without detrimental hemodynamic effects. On POD4 he was successfully extubated. On one-month follow-up he remains hemodynamically stable without signs of airway or vascular obstruction.

Summary:
While not unique to the pediatric population, the risk factors related to PPS include young age and female gender. Pediatric patients have more elastic mediastinal tissues, thus being more prone to shifting. The airways are more compliant and prone to compression. Cross-sectional imaging reveals massive mediastinal shift in these patients. Flow volume loops and bronchoscopy are crucial in demonstrating bronchial obstruction. A wide variety of treatment options have been described for these patients, ranging from bronchial stent insertion to aortic division with aortic bypass grafting. However, most agree that definitive treatment involves repositioning of the mediastinum and placement of a prosthesis into the pneumonectomy space to prevent further shifts. This infant, with rare cardiopulmonary anatomy, required careful perioperative planning, heightened intraoperative awareness, and tactful post-operative monitoring to safely navigate his perioperative course.

References: