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Mediastinal Masses in Pediatric Patient with Ewing's Sarcoma

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Case Description

9yoM ASA 4 with history of Ewing's sarcoma involving T11-L1 now 18mo off chemotherapy presenting with multiple large mediastinal, hilar, and pleural masses concerning for metastasis found on surveillance imaging. CT scan revealed mass effect (compression & shift) on the trachea and left pulmonary vein secondary to 6x4x3cm paratracheal mass. Additional mediastinal masses were noted and associated with right bronchial compression and large right pleural effusion.

Preoperative Course

PreOp Vitals: 106/46, HR 103, RR 20, SpO2 100%. TTE accomplished and revealed normal biventricular systolic function, no outflow tract obstruction. Peripheral IVs x2 placed by PICC team the night prior. OR prepped with rigid bronchoscopy tray and general surgeon in room at induction in the event an emergent rigid bronchoscopy is required.

Anesthetic Management

Pt taken to OR for Inhalational Induction and LMA placement. Pt maintained on sevoflurane while breathing spontaneously. Pt taken to MRI for scan. After MRI the pt returned back to OR still under general anesthesia, breathing spontaneously. Additional peripheral IVs was placed and pre-procedure arterial line placed for hemodynamic monitoring. Laryngoscopy was performed and ETT 5.5 placed to secure airway with surgeons present and rigid bronchoscopy tray available. Spontaneous ventilation maintained throughout and general anesthesia maintained with propofol infusion, dexmedetomidine, ketamine, and volatile anesthetic. Anesthesiologist vigilance and preparation prevented potential airway obstruction and cardiovascular collapse.

Mediastinal Mass Obstruction Physiology

- 4 Compartments of Mediastinum: Anterior, Middle (visceral), Posterior (Paravertebral), Superior
- Most common masses in the anterior mediastinum are the four "T"s
 - Thymoma, Teratoma, Thyroid carcinoma and Terrible lymphoma.
- Anatomic Effects of Mediastinal Mass
 - Compression of cardiac structures- rhythm disturbances, diastolic filling reduction
 - Compression of vascular structures- compression of SVC or outflow tracts
 - Compression and collapse of airway structures

Pitfalls on Anesthetic Induction

- Lung volumes reduced to 500-1500cc- Decrease in tracheobronchial diameter
- Bronchial smooth muscle relaxation for easier compressibility
- Paralysis eliminates the normal trans-pleural pressure gradient causing enhanced extrinsic compression and decreased airway diameter.

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Mediastinal Mass Pre-Operative Workup

- **Assessment and Grading of symptoms-** Related to patients tolerance to lay supine
 - Asymptomatic
 - Mild- Supine with some cough/pressure sensation
 - Moderate- Supine for short periods
 - Severe- Cannot tolerate supine

CT scan and determination of symptoms- patients are deemed safe, unsafe, or uncertain for anesthesia as follows:

- **Safe**
 - Asymptomatic adult; CT < 50% tracheobronchial obstruction
- **Unsafe**
 - Severely symptomatic adult or child
 - Children with CT tracheobronchial obstruction > 50%, regardless of symptoms
- **Uncertain**
 - Mild/moderate symptomatic adult
 - Mild/moderate symptomatic child with CT tracheobronchial obstruction < 50%
 - Mild/moderate symptomatic adult with CT tracheobronchial obstruction > 50%
 - Adult or child unable to give history

Mediastinal Mass Operative Management

- Cannulate femoral vessels for possible need for Cardio-Pulmonary Bypass in unsafe and uncertain category
- Adjust patient position- elevated head of bed and partial or full right lateral decubitus position to maintain airway patency and reduce cardiac and vascular compression
- Invasive arterial monitoring- potential cardiovascular instability
- Maintain spontaneous ventilation if possible
 - Awake fiber-optic intubation
- Inhalational induction
 - Secure airway beyond stenosis if possible
 - PEEP may help with maintaining functional residual capacity
 - Short acting anesthetics and paralytics (avoid if able)
 - Rigid bronchoscopy and surgeon available at induction

Emergency Response to Airway Compression

- **Repositioning** of patient- best position to be determined prior to induction
- **Rigid Bronchoscopy-** bronchoscopist and equipment must be in room
- **Femoro-Femoral Cardio Pulmonary Bypass-** realistically and option only if the patient has cannulas in prior to general anesthesia

Pediatric vs Adult

- Anesthetic deaths mainly reported in children
- More compressible cartilaginous structure of the airway
- Underestimation of severity of symptoms due to obtaining a clear history
- Awake fiberoptic intubation to obtain distal airway is not an option in most children
- Children with 50% or greater tracheo-bronchial compression have a greater likelihood of severe complications with general anesthesia.

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