Perioperative Management of a patient with an Anterior Mediastinal Mass

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Objectives

- To describe the mediastinal mass syndrome
- To discuss preoperative evaluation and risk assessment of a patient with a mediastinal mass
- To discuss triage and transfer criteria
- To discuss perioperative management



A Case

- 56 year old white male
- Presents for bronchoscopy with biopsy of a mediastinal mass
- On CT, tracheal CSA is reduced, but > 50%.
- Pt is audibly wheezing at rest, with minimal improvement with bronchodilators.
- Pt is unable to lie supine.



Anatomy of the mediastinum

- Between the pleural cavities; contains the heart and other thoracic viscera except the lungs
- Superior above the thoracic plane at the level of the sternal angle
- Anterior in front of the pericardium
- Middle pericardium and its contents
- Posterior behind the pericardium



Divisions of Mediastinum

Anterior Mediastinum

Lies ant. to pericardium
 Soundaries:

Anterior: body of sternum
 Posterior: pericardium
 superior: imaginary line
 separating sup. &
 inf.mediastinum
 Infreior: diaphragm
 Lateral: mediastinal pleura



- Masses in the anterior mediastinum
 - Lymphoma
 - Thymoma
 - Germ cell tumor (Teratoma)
 - Metastatic lesions
 - Bronchogenic mass
 - Thyroid mass

Lymphoma



Lymphoma is the most common cause of an anterior mediastinal mass in children and the second most common cause of an anterior mediastinal mass in adults.

Mediastinal Mass Syndrome (MMS)

 Clinical syndrome resulting from compression of vital structures by a mediastinal mass

- Trachea or main bronchi
- Heart possibly with associated pericardial effusion
- SVC
- Esophagus
- Recurrent laryngeal nerve

Respiratory decompensation in MMS (under anesthesia)

- Mechanical compression of the trachea and main bronchi
- Supine position
 - → in AP diameter of thorax and cephalad displacement of the diaphragm → ↓ of 500-1000 ml of thoracic volume
 - ↑ in central blood volume → ↑ in the size of well-vascularized mediastinal tumors
- Relaxation of bronchial smooth muscles → ↑ in compressibility of bronchi and trachea
- If mechanical ventilation, preferential ventilation of the anterior thorax → V/Q mismatch with dorsal atelectasis
- Non-laminar, turbulent post-stenotic airflow

Hemodynamic decompensation in MMS

- SVC compression (frequent) $\rightarrow \downarrow$ in RV filling $\rightarrow \downarrow CO \rightarrow$ cardiac arrest
- PA compression (uncommon) → ↑ in RV afterload → RV failure, impaired pulmonary perfusion and hypoxemia
- Heart compression (rare) → arrhythmias or tamponade





Preoperative assessment (I)

- Examine for S/Sx of SVC compression.
 - Edema of head/neck and airway

ixp.

TLC

Fixed Obstruction

tra or Extra thoracia

- Check for changes in Sx with position changes
 - Erect
 - Supine
 - Lateral
 - Determine optimal

• PFT's

RV

- Flow volume loops in sitting and recumbent positions
- Expiratory plateau
- MEF₅₀/MIF₅₀ < 1



Preoperative assessment (2)

- Bechard P et al (2004, Anesthesiology)
- 98 adult patients with mediastinal mass

- PFT's predicted perioperative complications
 - Obstructive OR 7.7
 - Mixed
 obstructive/restrictive –
 OR 69
 - Indicates not only compression of the major airway, but also of the lung parenchyma

Preoperative assessment (3)

- CT scan predictors
 - Tracheal
 compression > 50%
 (OR 4.3)
 - Concomitant
 compression of main
 bronchi
 - Pericardial effusion (OR 7.8)
 - Pleural effusion –
 OR 4.2



Preoperative assessment (4)

- Measure BP both upright and supine
- Paradoxical ↓ in BP upon assuming a supine position may indicate significant obstruction to RV filling or ejection.
- Or, pericardial effusion seen on CT?

• Then, obtain TEE or TTE – recumbent, lateral



Grading symptoms in MMS

Asymptomatic	Can lie supine without symptoms
Mild	Can lie supine with some
	cough/pressure sensation
Moderate	Can lie supine for short periods, but not indefinitely
Severe	Cannot tolerate supine position



Anesthetic risk classification

Safe	Asymptomatic adults with negative results on CT and dynamic evaluation
Uncertain	 Adults with moderate clinical symptoms Asymptomatic adults with obstruction of tracheobronchial tree (CT diameter < 50% of normal) Asymptomatic adults with abnormal dynamic evaluation
Unsafe	Symptomatic adults (MMS clinical signs present and positive diagnostic evaluation); pericardial effusion, SVC syndrome



Triage of a patient with MM (1)

- All patients with a mediastinal mass must have a preoperative assessment in PAT, to include
 - History and Physical examination SVC syndrome, dynamic evaluation with position changes
 - PFT's (erect, supine) regular, flow-volume loops
 - -CT
 - Echo, when indicated

Triage of a patient with MM (2)

- Close consultation with pulmonology, radiology, and possibly ENT.
- Histological verification using CT- or ultrasound-guided percutaneous needle biopsy under local anesthesia may be considered.
- Any extra-thoracic tissue diagnosis (such as pleural effusion or palpable LN) may be considered under local anesthesia.

Triage of a patient with MM (3)

- Classify the patient according to the risk scale.
- If "unsafe" or "uncertain", the patient may require CT surgery and perfusion service either on standby or actively with institution of femofemoral bypass under local anesthesia preoperatively.
- I.e., the patient should be transferred to a higher level facility.



Perioperative management of a "safe" patient with MM (1)

- Maintain the patient in Fowler's position (elevated upper body) as much as possible.
- A large bore IV in the lower extremity, esp. if there is a question of SVC compression. A CVL in the femoral vein should be strongly considered.
- An a-line may be used.



Perioperative management of a "safe" patient with MM (2)

- Use an OR table that readily allows prompt changes to the patient's optimal position.
- May require fiberoptic bronchoscopic intubation with spiral reinforced ETT while maintaining spontaneous ventilation.
- Avoid muscle relaxation as much as possible.
- Use short-acting medications e.g., remifentanil



If respiratory or hemodynamic compromise occurs in the OR ...

- Stop the procedure.
- Change to the patient's "optimal" position may be upright, lateral, or even prone
- Attempt to advance the ETT past the point of obstruction.
- If the point of obstruction is further distal, use a rigid bronchoscope with jet ventilation.
- Improve RV filling with volume expansion; use vasopressors as needed.
- Wake up the patient, if possible.



