ANESTHESIA for THORACIC & MEDIASTINAL SURGERY

Jason W. Gatling MD
Assistant Professor
CardioThoracic Anesthesia

Thoracic Surgery Categories

- Endoscopy
- Mediastinoscopy
- Open Thoracotomy

Thoracic Disease States

1. Lung Tumors
2. Esophageal Disease
3. Mediastinal Tumors
4. Infection
5. Bronchiectasis
6. Thoracic Aneurysms

Endoscopy

- Flexible bronchoscopy – MAC vs. GETA
- Rigid bronchoscopy – GETA
  1. Hypercapnea
  2. Hypoxemia
  3. Air Leaks
  4. Anesthesia machines vs. Jet Ventilation (HFJV)
  5. Side-arm ventilation port
  6. Sanders Bronchoscopes (Venturi effect w/jet vent)

Endoscopy - Complications

1. Facial, dental, laryngeal injury
2. Airway rupture, pneumothorax
3. Hemorrhage
4. Airway obstruction – blood, FB, edema

Anesthesia Considerations - Endoscopy

1. Small ETT vs. Double-lumen tube
2. Laser tube and laser precautions
3. Short-acting hypnotic agent
4. Inhaled agents vs. TIVA
5. Short-acting narcotics
6. Short-acting muscle relaxant
7. Local anesthetic for post-op pain control

Anesthesia Technique - Mediastinscopy Procedures

- Standard maintenance is GETA with paralytic
- Talk with surgeon before hand about is they would like lung isolation determining standard ETT vs. Double-lumen tube
- COMPLICATIONS:
  - #1: Rupture / laceration to major vessels
  - #2: Pneumo (Hemo)-thorax
  - **Intermittent occlusion of Right innominate artery**
    - hence Left radial A-line
  - Tracheal collapse, tension pneumomediastinum, mediastinitis, chylotorax

Open Thoracic Surgery

- **<u>OPEN THORAX PROCEDURES:</u>**

1. Lung Biopsy / Sclerosing
2. Lung Resection
3. Lung Cysts and Bullae
4. Intrapulmonary Hemorrage
5. Esophageal Surgery
6. Tracheal Resection
7. Lung Transplantation
8. Bronchopleural Fistula & Empyema
9. Typical Anesthetic Plan
10. Post-Op Complication
11. Post-Op Pain Management
12. Highlights

Indications for Lung Isolation

1. Control of Foreign material
   - Lung abscess, Bronchiectasis, Hemoptysis
2. Airway Control
   - Bronchopleural-cutaneous (B-p) fistula
3. Surgical exposure
   - Lung resection
   - Esophageal surgery
   - Vascular (aortic) surgery
   - Video Assisted Thoracic Surgery (VATS)
4. Special procedures
   - Lung lavage
   - Differential ventilation

Monitoring for Open Thorax

- Standard ASA Monitors
- Radial arterial line (Left vs. Right radial)
  - Lateral decubitus position: A-line in dependent arm
  - Mediastinoscopy: A-line left arm
- PA Catheter / Central Line
  - Non-dependent side of neck
  - Pressure readings may be affected by open chest, lateral position, surgical manipulation

Anesthetic techniques

- GETA combined with thoracic epidural
- May start case with bronchoscopy via single lumen ETT
- Induction agents & relaxants per procedure
- Pro's and Con's of inhaled agents vs. TIVA
- Epidural analgesia reduces volatile anesthetic agent requirements but epidural anesthesia may create sympathetic blockade and hypotension

Anesthetic Complications

- Complications in open thoracic surgery
  1. Opening chest produces pneumothorax
  2. Manipulation of lung, heart, and major vessels may interfere with ventilatory exchange and cardiovascular stability intra-op and post-op
  3. Lateral decubitus position changes the distribution of blood flow and pattern of ventilation and exposes lower lung to danger of contamination by secretions, blood, or fluids.

Patient Positioning: Lateral position and flexed table

- Secure tubes and lines, take command of turning procedures
- Proper padding and assessment of pressure points essential
- Head, neck, eyes neutral position
- Padding of axilla and lower extremities
- Reassess breath sounds, vital signs, monitors, arterial and PA lines, IV’s

Intra-Op

- Anesthetic technique
  - Combined epidural and inhalational agent
  - OLV techniques for surgical exposure and minimal damage to operative lung
  - Maintain oxygenation in patients (FiO_2 and O_2 sat)
  - Ensure the patient is comfortable, warm, and “awake” at end of surgery

Intra-Op

- Preinduction
  - Place lumbar or thoracic epidural catheter
  - Admin test dose 3 ml Lidocaine (1.5%) w/ Epi 1:200,000
  - If no hypotension
  - Confirm functioning epidural catheter

Intra-Op

- Induction
  - Standard IV induction
  - Intubate with SLT > 8mm
    - will be replaced with DLT after bronchoscopy
- Maintenance
  - O_2 and Isoflurane (1.0-1.5%)
    - less if using epidural
  - Avoid N_2O, especially during OLV
  - FiO_2 => 100%
  - Lidocaine 10 ml via lumbar epidural every 45 min or place on PCEA pump per regimen

Intra-Op

- Blood and fluid requirements
  - Access: 2 large bore IV's
  - Central line +/-
  - **Gentle restriction of IV fluids**
    - administer 1000 - 1500 ml NS / LR total
  - +/- 1 unit autologous blood if available
  - Use vasopressors if hypotensive
    - Ephedrine 5-10 mg IV bolus
    - Phenylephrine 50-100 mcg IV bolus
    - Cautious administration of other inotropes and vasopressors

Intra-Op

- Lung isolation
  - Separate lungs to prevent contralateral contamination
  - Allow selective ventilation
  - CPAP for the non-dependent (upper) operative lung
  - PEEP for the dependent (lower) ventilating lung

Emergence

- Prior to chest closure – inflate lungs to 30-40 cm H_2O to reinflate atelectactic areas and to check for air leaks
- Chest tube insertion to drain pleural cavity and aid lung re-expansion
- Patient is extubated in OR; or DLT is exchanged for single lumen ETT if patient is to remain intubated
- Chest tubes to water seal and 20 cm H_2O suction (except in pneumonectomy => water seal only)
- Patient transferred in 30^o head elevated position to ICU on monitors and non-rebreathing mask O_2

Open Thorax Surgery Risks

1. Dysrhythmias
2. DVT
3. PE
4. MI
5. Bronchopleural fistula
6. Chylothorax
7. Subcutaneous emphysema
8. Phrenic nerve injury
9. Recurrent laryngeal nerve injury
10. Major vascular injury