Bronchoscopy

TSDA Boot Camp
September 22-25, 2016
Chapel Hill, NC
Bronchoscopy/Mediastinoscopy Faculty

- Carolyn Jones, MD, Course Leader
- Mark Adams, RDCS
- Manjit Bains, MD
- Lisa Brown, MD
- DuyKhanh Pham (Mimi) Ceppa, MD
- Jon D’Cunha, MD
- Ryan Macke, MD
- Joe Miller, MD
- Lana Schumacher, MD
Goals

– Laryngeal and Airway Anatomy

– Flexible Bronchoscopy
  • Basics
  • Indications/ Contraindications

– Rigid Bronchoscopy
  • Basics
  • Indications/ Contraindications
The Larynx

- Epiglottis
- Aryepiglottic fold
- To the Esophagus
- Cuneiform and corniculate cartilage
The Larynx: Anatomy

- Structural rigidity provided by: The epiglottis, Thyroid cartilage and Cricoid cartilage
The Larynx II

- True Vocal Cords
- False Vocal Cords
- Tracheal Cartilaginous Rings
Epiglottis

The Larynx
open for inspiration and closed for swallowing
The Adult Trachea

- Length: 9-15 cm
- Internal diameter: 12-18 mm
- Outer diameter: 21-27 mm
- 18-22 cartilaginous rings
- Becomes intrathoracic at 6th cartilaginous ring
Tracheal dimensions – adult male

• Average cross-sectional area is 2.8 cm²

• Upper limits of normal Transverse diameter of 25 mm and AP diameter of 27 mm

• The lower limit of normal for both diameters is about 13 mm
The Carina

posterior

From front of patient

LMB

RMB
Lobar and Segmental Anatomy
Right Bronchial Anatomy

• Right main bronchus
  – 2cm long, I.D. 10-16mm
  • Right upper lobe
  • Bronchus intermedius
    – Middle lobe
    – Lower lobe
# The Right Bronchial Tree: Classification

<table>
<thead>
<tr>
<th>JACKSON-HUBER</th>
<th>BOYDEN</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Right Upper lobe</strong></td>
<td></td>
</tr>
<tr>
<td>Apical</td>
<td>B₁</td>
</tr>
<tr>
<td>Anterior</td>
<td>B²</td>
</tr>
<tr>
<td>Posterior</td>
<td>B₃</td>
</tr>
<tr>
<td><strong>Right middle lobe</strong></td>
<td></td>
</tr>
<tr>
<td>Lateral</td>
<td>B₄</td>
</tr>
<tr>
<td>Medial</td>
<td>B⁵</td>
</tr>
<tr>
<td><strong>Right lower lobe</strong></td>
<td></td>
</tr>
<tr>
<td>Superior</td>
<td>B₆</td>
</tr>
<tr>
<td>Medial basal</td>
<td>B₇</td>
</tr>
<tr>
<td>Anterior basal</td>
<td>B₈</td>
</tr>
<tr>
<td>Lateral basal</td>
<td>B₉</td>
</tr>
<tr>
<td>Posterior basal</td>
<td>B¹⁰</td>
</tr>
</tbody>
</table>
Left bronchial anatomy

• Left main bronchus
  - 4-5cm long, slightly smaller than right (I.D. 8-14mm)
    • Left upper lobe and Lingula
    • Left lower lobe
# Left Bronchial Tree- nomenclatures

<table>
<thead>
<tr>
<th></th>
<th>Jackson-Huber</th>
<th>Boyden</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Left upper lobe</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper division</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apical-posterior</td>
<td></td>
<td>B&lt;sup&gt;1&lt;/sup&gt; &amp; B&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>Anterior</td>
<td></td>
<td>B&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Lingular/division</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superior</td>
<td></td>
<td>B&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>Inferior</td>
<td></td>
<td>B&lt;sup&gt;5&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Left lower lobe</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superior</td>
<td></td>
<td>B&lt;sup&gt;6&lt;/sup&gt;</td>
</tr>
<tr>
<td>Anteromedial</td>
<td></td>
<td>B&lt;sup&gt;7&lt;/sup&gt;&amp;B&lt;sup&gt;8&lt;/sup&gt;</td>
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<tr>
<td>Lateral basal</td>
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<td>B&lt;sup&gt;9&lt;/sup&gt;</td>
</tr>
<tr>
<td>Posterior basal</td>
<td></td>
<td>B&lt;sup&gt;10&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
Flexible Bronchoscopy

Courtesy of Robert Garland RRT
How deep can you go?

<table>
<thead>
<tr>
<th>Conducting Airways</th>
<th>Gas Exchange Airway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cartilagenous</td>
<td>Membranous</td>
</tr>
<tr>
<td>Trachea</td>
<td>Bronchioles</td>
</tr>
<tr>
<td>Bronchi</td>
<td>R. Bronchioles</td>
</tr>
<tr>
<td>No alveoli</td>
<td>A. Ducts</td>
</tr>
<tr>
<td></td>
<td>A. Sacs</td>
</tr>
<tr>
<td></td>
<td>Alveoli</td>
</tr>
</tbody>
</table>

Current Limit of Flexible bronchoscopy – 4/5 th order bronchi
Flexible Bronchoscopy - Indications

**Diagnostic**
- Non massive hemoptysis
- Stridor / Localized wheeze
- Suspected TEF
- Chest trauma
- Pulmonary nodule / mass
- Mediastinal / hilar Lymphadenopathy
- Pneumonia
  - Immunocompromised
  - Nosocomial
  - Non-resolving
- Evaluation rejection

**Therapeutic**
- Central Airway Obstruction
  - Laser photo resection
  - Electrocautery
  - Argon plasma coagulation
  - Brachytherapy
  - Photodynamic therapy
- FB removal
- Balloon Dilatation
- Pulmonary toilet
- Endotracheal Intubation
- Percutaneous dilatational tracheostomy
- Metallic Stent placement
Flexible Bronchoscopy - Contraindications

• **Inspection**
  – Life-threatening arrhythmia
  – Refractory Hypoxemia
  – Inability to cooperate with procedure
  – Recent MI or unstable angina

• **Biopsy**
  – Serum creatinine >3
  – Platelets <50,000
  – Uncorrected coagulopathy
  – Pulmonary HTN
  – SVC syndrome
Rigid Bronchoscopy

Courtesy of Robert Garland RRT
Rigid Bronchoscopy

- **Indications**
  - FB removal
  - Hemoptysis
  - Central airway obstruction
    - Treatment
      - Benign/ Malignant
      - Laser, EC, Cryotherapy, APC, Dilatation, Microdebrider
    - **Stent placement**
      - Hybrid
      - Silicone
Contraindication

- Unstable CV status
- Refractory hypoxemia
- Maxilo-facial trauma
- Limited ROM of head and neck
- C-spine instability
- Inexperience