Bronchoscopy

TSDA Boot Camp
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Chapel Hill, NC
Bronchoscopy/Mediastinoscopy Faculty

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Goals

– Laryngeal and Airway Anatomy

– Flexible Bronchoscopy
  • Basics
  • Indications/ Contraindications

– Rigid Bronchoscopy
  • Basics
  • Indications/ Contraindications
The Larynx

Epiglottis

To the Esophagus

Aryepiglottic fold

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 6\textsuperscript{th} 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
Tracheobronchial Anatomy
The Carina

posterior

From front of patient
Lobar and Segmental Anatomy

Left

Right
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>Jackson-Huber</th>
<th>Boyden</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Left upper lobe</strong></td>
<td></td>
</tr>
<tr>
<td>Upper division</td>
<td></td>
</tr>
<tr>
<td>Apical-posterior</td>
<td>B&lt;sub&gt;1 &amp; 3&lt;/sub&gt;</td>
</tr>
<tr>
<td>Anterior</td>
<td>B&lt;sub&gt;2&lt;/sub&gt;</td>
</tr>
<tr>
<td><strong>Lingular/division</strong></td>
<td></td>
</tr>
<tr>
<td>Superior</td>
<td>B&lt;sub&gt;4&lt;/sub&gt;</td>
</tr>
<tr>
<td>Inferior</td>
<td>B&lt;sub&gt;5&lt;/sub&gt;</td>
</tr>
<tr>
<td><strong>Left lower lobe</strong></td>
<td></td>
</tr>
<tr>
<td>Superior</td>
<td>B&lt;sub&gt;6&lt;/sub&gt;</td>
</tr>
<tr>
<td>Anteromedial</td>
<td>B&lt;sub&gt;7&amp;8&lt;/sub&gt;</td>
</tr>
<tr>
<td>Lateral basal</td>
<td>B&lt;sub&gt;9&lt;/sub&gt;</td>
</tr>
<tr>
<td>Posterior basal</td>
<td>B&lt;sub&gt;10&lt;/sub&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>
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<tbody>
<tr>
<td>Cartilagenous</td>
<td>Membranous</td>
</tr>
<tr>
<td>Trachea</td>
<td>Bronchioles</td>
</tr>
<tr>
<td>No alveoli</td>
<td>Terminal Respiratory Unit</td>
</tr>
<tr>
<td></td>
<td>R. Bronchioles</td>
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<tr>
<td>Generation 0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>11-13</td>
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<td></td>
<td>17-19</td>
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<td>20</td>
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<td>24</td>
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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
Rigid Bronchoscopy

• **Contraindication**
  – Unstable CV status
  – Refractory hypoxemia
  – Maxillo-facial trauma
  – Limited ROM of head and neck
  – C-spine instability
  – Inexperience