Bronchoscopy
TSDA Boot Camp
September 17-20, 2015
Chapel Hill, NC
Bronchoscopy/Mediastinoscopy
Faculty

- Carolyn Jones, MD, Course Leader
- Manjit Bains, MD
- Sean Kwon, MD
- Ryan Macke, MD
- Joe Miller, MD
- Lana Schumacher, MD
- Walter Wolfe, MD
- Faculty support: Mark Adams, RDCS
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

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

From front of patient

posterior
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
<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>( B^1 )</td>
</tr>
<tr>
<td>Anterior</td>
<td>( B^2 )</td>
</tr>
<tr>
<td>Posterior</td>
<td>( B_3 )</td>
</tr>
<tr>
<td><strong>Right middle lobe</strong></td>
<td></td>
</tr>
<tr>
<td>Lateral</td>
<td>( B^4 )</td>
</tr>
<tr>
<td>Medial</td>
<td>( B^5 )</td>
</tr>
<tr>
<td><strong>Right lower lobe</strong></td>
<td></td>
</tr>
<tr>
<td>Superior</td>
<td>( B^6 )</td>
</tr>
<tr>
<td>Medial basal</td>
<td>( B^7 )</td>
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<tr>
<td>Anterior basal</td>
<td>( B^8 )</td>
</tr>
<tr>
<td>Lateral basal</td>
<td>( B^9 )</td>
</tr>
<tr>
<td>Posterior basal</td>
<td>( B^{10} )</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>Left upper lobe</th>
<th>JACKSON-HUBER</th>
<th>BOYDEN</th>
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</thead>
<tbody>
<tr>
<td>Upper division</td>
<td></td>
<td></td>
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<tr>
<td>Apical-posterior</td>
<td></td>
<td>B1 &amp; 3</td>
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<tr>
<td>Anterior</td>
<td></td>
<td>B2</td>
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<table>
<thead>
<tr>
<th>Lingular/division</th>
<th>JACKSON-HUBER</th>
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<tbody>
<tr>
<td>Superior</td>
<td></td>
<td>B4</td>
</tr>
<tr>
<td>Inferior</td>
<td></td>
<td>B5</td>
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</table>

<table>
<thead>
<tr>
<th>Left lower lobe</th>
<th>JACKSON-HUBER</th>
<th>BOYDEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superior</td>
<td></td>
<td>B6</td>
</tr>
<tr>
<td>Anteromedial</td>
<td></td>
<td>B7 &amp; 8</td>
</tr>
<tr>
<td>Lateral basal</td>
<td></td>
<td>B9</td>
</tr>
<tr>
<td>Posterior basal</td>
<td></td>
<td>B10</td>
</tr>
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Flexible Bronchoscopy

Courtesy of Robert Garland RRT
How deep can you go?

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

<table>
<thead>
<tr>
<th>Conducting Airways</th>
<th>Gas Exchange Airway</th>
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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></td>
<td>A. Ducts</td>
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<tr>
<td></td>
<td>A. Sacs</td>
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<tr>
<td></td>
<td>Alveoli</td>
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</table>

<table>
<thead>
<tr>
<th>Generation</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>10</th>
<th>11-13</th>
<th>16</th>
<th>17-19</th>
<th>20</th>
<th>22</th>
<th>23</th>
<th>24</th>
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</table>
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 photoresection
    • 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
  - Inexperienced