Management of Massive Hemoptysis: #Winning

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Chair & Program Director

Objectives

• Review optimal intubation strategies including when to consider a surgical airway.
• Discuss methods of selective lung intubation and single lung ventilation, as well as optimal positioning of your patient.
• Discuss the role of management options including medications, endovascular techniques, and surgical intervention.
EMS has just unloaded a 52 year old guy in obvious distress, coughing up a significant amount of blood. EMS reports “he says he takes a blood thinner and may have cancer. He coughed up a ton of blood of blood in route, you should see the truck! He still sating OK, and his pressure is holding, but I’m just glad we got here. He’s all yours doc...”
Definitions

• Suggested volumes range from 100 mL to more than 1000 mL.

• Origin is bronchial circulation in 95%, and pulmonary circulation in 5%.

• Alveolar hemorrhage rarely causes massive hemoptysis

Causes

• Bronchiectasis
• TB
• Lung Malignancies
• Iatrogenic
• Trauma
When to Intubate?

Localize

• History
• Pulmonary, GI, ENT??
• Chest X-ray
The Setup

- PPE!!
- Go big
- Suction x 2
- Bougie
- Single lumen tube
- Sitting up!
- Bleeding side down

Two investigators each inserted a bougie under video laryngoscope guidance. After passing the vocal cords, the intubator would be randomized to turn the bougie 90° clockwise (for right mainstem intubation) or 90° counterclockwise (for left mainstem intubation).
Although DLTs are easier and quicker to place for lung isolation than BBs, they are associated with more adverse effects. However, there is no significant difference in the quality of lung isolation that the 2 devices provide, and both techniques have advantages in specific clinical situations.
Bronchial Blockers

https://youtu.be/6L535eUxqA
AC & SIMV

- Settings
  - TV 4-6ml/kg IBW
  - $P_{\text{plat}} < 30\text{cm/H}_2\text{O}$
  - High PEEP

Options....
Management

• Bronchoscopy
  – Balloon tamponade
  – Iced saline lavage
  – Vasoconstrictors
  – Cryotherapy/Laser

<table>
<thead>
<tr>
<th></th>
<th>6.0 mm*</th>
<th>7.0 mm</th>
<th>8.0 mm</th>
<th>9.0 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-sectional area of tube without bronchoscope; mm²</td>
<td>28.3</td>
<td>38.5</td>
<td>50.3</td>
<td>63.6</td>
</tr>
<tr>
<td>Remaining tube area with bronchoscope in situ; mm²</td>
<td>6.8</td>
<td>17.0</td>
<td>28.7</td>
<td>42.1</td>
</tr>
<tr>
<td>Proportion of tube cross-section area obstructed</td>
<td>76.0%</td>
<td>55.8%</td>
<td>42.9%</td>
<td>33.8%</td>
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Arteriography

A significant amount of anatomic variability in the number and location of the bronchial arteries is common.

Bronchial arteries usually arise from the aorta, but sometimes they originate from the intercostal arteries.
Two Circulations in the Lung

- **Bronchial Circulation**
  - Arises from the aorta.
  - Part of systemic circulation.
  - Receives about 2% of left ventricular output.
- **Pulmonary Circulation**
  - Arises from Right Ventricle.
  - Receives 100% of blood flow.

<table>
<thead>
<tr>
<th>PULMONARY CIRCULATION</th>
<th>BRONCHIAL CIRCULATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW-PRESSURE, HIGH-FLOW CIRCULATION</td>
<td>HIGH-PRESSURE, LOW-FLOW CIRCULATION</td>
</tr>
<tr>
<td>CONTAIN 100% CARDIAC OUTPUT</td>
<td>CONTAIN 1-3% CARDIAC OUTPUT</td>
</tr>
<tr>
<td>SUPPLIES RESPIRATORY BRONCHIOLs TO ALVEOLI</td>
<td>SUPPLIES BRONCHI TO TERMINAL BRONCHIOLs</td>
</tr>
<tr>
<td>ARIES FROM HEART</td>
<td>ARIES FROM AORTA</td>
</tr>
<tr>
<td>EXCEPTION ARTERY CARRY DEOXYGENETED BLOOD</td>
<td>SHUNT(COMMON)</td>
</tr>
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Surgery?

• Patients with unilateral, uncontrollable bleeding.

• Expedite surgical intervention later if the bleeding remains brisk despite measures to control it.

• Mortality benefit?

Take Home Points

• Ensure gas exchange
• Reverse coagulation abnormalities
• Positioning
• Call for help
• Control the bleeding