Management of Hemoptysis: Bronchial Artery Embolization

Steven M. Zangan, MD

OBJECTIVES

- To review the most common causes of hemoptysis
- To review the treatment algorithms for hemoptysis
- To discuss the technique of bronchial artery embolization
- To review outcomes of bronchial artery embolization for hemoptysis

CAUSES OF HEMOPTYSIS

- Bronchiectasis 31.9%
- Tuberculosis 18.5%
- Chronic bronchitis 14.9%
- Suppurative processes 7.3%
- Lung carcinoma 3.2%
- Aspergillosis 2.6%
- Other tumors 2.5%
- Cystic fibrosis 2.5%
- Chronic pleural inflammation 1.9%
- Hydatid cyst 1.9%
- Pulmonary fibrosis (idiopathic) 1.5%
- Pneumocystis 1.4%
- AVM 1.4%
- LESS THAN 1%
  - Bronchitis
  - Lung biopsy
  - Tracheal intubation
  - Ruptured aortic aneurysm
  - Bronchopulmonary sequestration
  - Rasmussen’s aneurysm
  - Swan-Ganz catheter manipulation
  - Aortobronchial fistula after radiotherapy
  - Left coronary bypass

“MASSIVE HEMOPTYSIS”

- Exact definition varies in the literature
- Typically a volume of >300 mL over 24 hours is cited
- Mortality results from asphyxiation rather than exsanguination and hemorrhagic shock
- With only supportive care, mortality rate of 50-85%

HEMOPTYSIS MANAGEMENT

- When unstable, patients are intubated and bronchoscopy is performed
- When stable, complimentary studies such as HRCT or bronchoscopy can be obtained to localize the site and/or cause
- CTA is useful to evaluate bronchial artery anatomy and variants and to exclude AVMs or Rasmussen’s aneurysms as etiologies

HEMOPTYSIS MANAGEMENT

- Bronchial balloon occlusion catheters
- Iced saline lavage
- Topical medications
- Laser therapy
- Electrocautery
- Embolotherapy
BRONCHIAL ARTERY ANATOMY

• **TYPE I**
  - Solitary right bronchial (off intercostobronchial trunk) and 2 separate left bronchials

• **TYPE II**
  - Solitary right bronchial (off intercostobronchial trunk) and 1 separate left bronchial

• **TYPE III**
  - 2 right bronchials (one off an intercostobronchial trunk) and 2 separate left bronchials

• **TYPE IV**
  - 2 right bronchials (one off an intercostobronchial trunk) and 1 separate left bronchial

ANGIOGRAPHY

• Bronchial arteries can typically be catheterized with a 5 F endhole catheter
• More distal access is then obtained through a 3 F coaxial microcatheter
• Frank extravasation is typically not seen
• Abnormal hypertrophied arteries with tortuosity and hypervascularity are seen

ANGIOGRAPHY

• Aneurysms are rarely present
• Angiogram should include a venous phase
  - Pulmonary veins drain the majority of the bronchial circulation, though drainage through the vena cava and azygos may be present
  - Early rapid filling of focal pulmonary veins suggests a shunt and impacts the choice of embolic used

ANTERIOR SPINAL ARTERY

• Anterior spinal artery has a classic "hairpin" configuration and courses along the ventral cord
  - Up to 8 contributing branches may supply it
  - Largest anterior medullary branch is called the artery of Adamkiewicz and usually arises between T8 and L1
  - Right intercostobronchial trunk may supply the anterior spinal artery in up to 10% of cases

EMBOLIZATION

• Goal of embolization is durable occlusion without affecting the capillary bed of the bronchus
• No single embolic agent has shown clear superiority though particulate embolics have been well documented
• Metallic coils should be avoided as these provide only proximal occlusion and collateral pathways develop
• Use of Gelfoam and liquid embolics has also been reported

NONSYSTEMIC BRONCHIAL FEEDERS

• Transpleural angiogenesis can result in systemic supply
  - Internal mammary artery
  - Branches of the subclavian artery
  - Inferior phrenic artery
RESULTS

• Technical success >90%
• Clinical success in 73-99%
• Recurrent hemoptysis can occur in almost 50% of cases

COMPLICATIONS OF BAE

• CNS complications in 0.6%
  • Usually self limited
  • Spinal cord infarct, transverse myelitis, and stroke have been reported
• Chest pain
• Dysphagia
• Dissection