

DEFINITIONS:

Hemoptysis = bleeding from below vocal cords
Pseudo-hemoptysis = upper respiratory tract (e.g. epistaxis) or GI bleeding (mimics hemoptysis)
Massive hemoptysis = life threatening bleeding, not necessarily defined by the amount (100-1000ml) or rate of bleeding (>100 ml/hr) but has potential to cause death by asphyxia or blood loss.

"Enough bleeding to make you nervous is probably massive"

APPROACH:

- Management is patient and disease specific
- TB is the most common cause worldwide. Bronchiectasis, necrotizing pneumonia & lung cancer are most common in the US.

WORKUP

- LABS**
- CBC, BMP, LFT, PT/PTT/INR, Type & screen
 - Consider Thromboelastography (TEG) (faster, identifies multiple abnormalities)
 - Also consider infectious workup & autoimmune labs (ANA, anti-GBM, etc)
- CXR**
- Poor sensitivity to detect bleeding site but a useful first step

- CHEST CT**
- Best if PE suspected. Complementary to bronchoscopy. Helps identify bronchial artery anatomy. Limited utility in unstable patient (consider airway prior to scanning)

- D/Dx: BATTLECAMP**
- B** – Bronchitis / **Bronchiectasis**
 - A** – Aspergilloma / AV Malformation
 - T** – Tuberculosis
 - T** – Tracheal-innominate Fistula
 - L** – Lung Cancer/metastasis or Abscess
 - E** – Pulmonary Embolism
 - C** – Cocaine / Coagulopathy / Catemenial / Cystic Fibrosis
 - A** – Autoimmune (SLE, vasculitis)
 - A** – Alveolar Hemorrhage (DAH)
 - M** – Mitral Stenosis
 - P** – Pneumonia / Paragonimiasis + Iatrogenic (PAC, TBBx, TI fistula, etc) + Cryptogenic (up to 18% of cases)

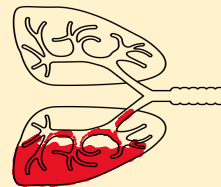
90% of bleeds arise from the high-pressure Bronchial Artery circulation (not the pulmonary arteries)

GENERAL MANAGEMENT

- CORRECT COAGULOPATHY**
- Reverse anticoagulants (FFP, Cryo, Vit K)
 - Treat platelet dysfunction (ddAVP)
- TRANSFUSE IF NECESSARY**
- No exact cutoff defined in literature
 - Highly Recommended if Hgb < 10 mg/dL and actively bleeding
 - Increased mortality if transfusion needed
- NEBULIZED TXA (500 MG/5ML TID)**
- Reduces need for invasive procedures

AIRWAY MANAGEMENT & POSITIONING

ROTATE BLEEDING SIDE DOWN
 Rotation partially isolates blood to the dependent side; however it may be difficult to identify the side with bleeding using clinical exam or even imaging.



PROTECT AIRWAY
 An effective cough and preserved airway reflexes may be the best way to protect the airway. If the patient is unable to clear hemoptysis, or if hypoxemia or altered mental status are present intubation may be necessary. When intubating consider:

- Call for help (high risk for difficult airway) & verbalize airway plan
- Entire team should wear full PPE
- Try to minimize risk of losing visibility: head-up positioning; use of DL instead of VL; have two large suctions ± meconium aspirator
- Consider the choice of ETT; weight **the pros/cons of each:**

STANDARD ETT → MAINSTEM ETT → BRONCHIAL BLOCKER → RIGID BRONCHOSCOPY

STANDARD ETT

- Readily available
- Does *not* isolate bleeding
- Does ventilate both lungs
- If possible, use larger size ETT (8.0) to facilitate suctioning & bronchoscopy

Airway protected but blood can spread from the site of bleeding & impair gas exchange bilaterally

MAINSTEM ETT

- May isolate bleeding to one lung
- Only ventilates one lung; must **decrease TV** if using VC ventilation.

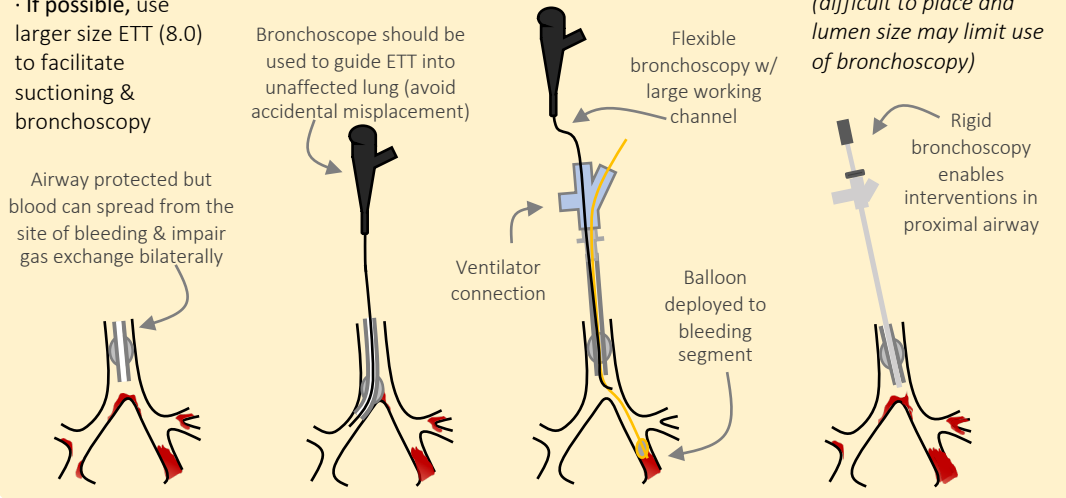
Bronchoscope should be used to guide ETT into unaffected lung (avoid accidental misplacement)

BRONCHIAL BLOCKER

- Bronchoscopically deployed balloon isolates bleeding to a single lobe or segment
- Can be placed through an ETT ≥ 7.5 (not a dual lumen)

RIGID BRONCHOSCOPY

- If bleeding from central airway lesion, rigid bronchoscopy may be beneficial if available
- Avoid Dual Lumen ETT** (difficult to place and lumen size may limit use of bronchoscopy)



BLEEDING LOCALIZATION & INTERVENTIONS

BRONCHOSCOPY

- Diagnostic & therapeutic; best in life-threatening bleeding
- Rigid preferred but requires expertise & not always readily available

BRONCHOSCOPIC INTERVENTIONS

COLD SALINE (50 CC NS BOLUSES)

- Temporarily effective until further medical or surgical stabilization

EPINEPHRINE (1:100,000 5ML)

- Risk of Ventricular Arrhythmias
- Effectiveness limited by dilution

TOPICAL TXA (500 – 1000 MG)

- Minimal to no short-term recurrence
- Studies show ↓ bleeding by 2nd day

BRONCHIAL BLOCKERS

- Fogarty balloon catheter effective temporizing measure in first 48-72 hrs
- Inflate to 30-50 mmHg

ABLATION, CAUTERY, CRYO

- Limited anecdotal evidence for cautery
- No role for cryotherapy in massive hemoptysis due to delayed effect

ARGON PLASMA

- Effective electrocautery if the bleeding site can be adequately visualized

INTERVENTIONAL RADIOLOGY

BRONCHIAL ARTERY EMBOLIZATION

- High success rates (60-90%) with BAE
- Risk of off target embolization (spinal artery, esophagus)
- Very effective for Pulmonary AVMs
- Recurrent bleeding likely for TB, aspergilloma, bronchiectasis and bronchogenic carcinoma
- Complications such as chest pain and dysphagia are usually self-limiting

SURGICAL MANAGEMENT

- May be particularly useful for PA ruptures, leaking aortic aneurysm, AV malformations, traumatic injuries & trachea-innominate bleeds, etc