Ughmm...Let Me Clear My Throat...

The Initial Evaluation and Management of Hemoptysis

41st Annual Refresher Course for the Family Physician

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I have no personal or financial disclosures to report.

However, I am willing to entertain offers...
Session Objectives

• Be able to define hemoptysis (and its big brother massive hemoptysis).

• Recognize the hemoptysis mimics.

• Develop a method for estimating the extent of hemoptysis.

• Understand the differential for the causes of hemoptysis, which should drive your work-up.

• Become familiar with the initial treatment/management of hemoptysis, regardless of the severity.

• Meld a pinch of entertainment value with a heaping helping of clinically-relevant eduction.
Audience Participation

So, then... Who can define hemoptysis?
Hemoptysis: Defined

The expectoration of blood...

...ranging from blood-streaked sputum to gross blood.
Hemoptysis: Origins

That originates from the tracheobronchial tree*. 

Available at: http://www.netterimages.com/image/58530.htm

* Trachea, bronchi, and bronchioles
Organ of Origin?

When you see this...

How do you know it is from the lungs?

Available at: http://cysticfibrosisinsideout.blogspot.com/2011/07/hemoptysis.html
# Tale of the Tape

<table>
<thead>
<tr>
<th>Hemoptysis</th>
<th>Hematemesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bright red blood</td>
<td>Dark red/brown blood</td>
</tr>
<tr>
<td>(+) sputum present</td>
<td>(+) gastric contents present</td>
</tr>
<tr>
<td>Frothy or clotted appearance</td>
<td>Coffee-ground appearance</td>
</tr>
<tr>
<td>pH &gt; 7</td>
<td>pH &lt; 7</td>
</tr>
<tr>
<td>Associated with asphyxiation</td>
<td>Asphyxiation much less common</td>
</tr>
<tr>
<td>(-) nausea/vomiting</td>
<td>(+) nausea/vomiting</td>
</tr>
</tbody>
</table>

*If all else fails...gastric lavage can rule out a GI source.*
The Other Alternative

There are other sources that can masquerade as “hemoptysis” also...
Pseudohemoptysis

- Technically defined as expectorated blood that does not arise from the lungs or bronchial tubes.

- Consider the following etiologies:
  - Nasopharynx (e.g. posterior epistaxis)
  - Oropharynx (above the level of the larynx)

- ≈ 10% of cases initially thought to be true hemoptysis are actually pseudohemoptysis.

- Ask about recent sinusitis, epistaxis, rhinorrhea, pharyngitis, and/or aspiration.
How Common Is It?

Does true hemoptysis see me more than I am seeing it?
Hemoptysis Epidemiology

- The true incidence is unknown (due to underreporting, not seeking treatment, misdiagnosis, etc.).

- Male to female ratio = 3:2.

- Can be present in all age groups, but it is rare in kids.

- While the incidence varies significantly, there are trends:
  - > 6,000 French patients over 3 years were studied.
  - Peak incidence in the late winter.
  - Incidence reaches its nadir in late summer.

- Risk factors include: male, > 40 years old, and a smoking history.
That Tricky Question

We always ask "how much" blood did you cough up?...
Double Dipping

Recall why the amount of blood produced is so variable...
Built-in Safety Net

• Recall that the lung has a dual blood supply...
  - Bronchial arteries → supply the lung parenchyma
    • ↑ pressure
  - Pulmonary arteries → supply the alveoli
    • ↓ pressure

Available at: http://queenofqalbs.files.wordpress.com/2012/03/20120319-2106111.jpg?w=580
Given this variability, how do you frame the quantity of hemoptysis?
1.5 ounces = 44 mL

Available at: http://barsupplies.com/images/1-oz-barconic-shot-glass.jpg
13 shot glasses (1.5 ounces) x 44 mL = 572 mL
And So..

But does the quantity of hemoptysis matter?
Ah, But Of Course...

• The amount of bleeding does matter, particularly depending on the precise etiology...

• If the bleeding is > 1000 mL per 24 hours:
  • The overall mortality = 58%
  • The mortality ↑ to 80% if a malignancy is present.

• If the bleeding is < 1000 mL per 24 hours:
  • Overall mortality = < 10%
  • Although, if malignancy is present the mortality = 60%.
Things That Make You Go Hmm...

Is there a grading schema for hemoptysis?
**Blood Generalizations**

• It is “easiest” to break things down into groups:

  • Mild hemoptysis = < 50 mL per 24 hours
    • Roughly a shot glass
  
  • Moderate hemoptysis = 50 mL – 200 mL per 24 hours
    • Approximately half a can of pop

  • Massive hemoptysis = > 200 mL per 24 hours

• We will return to this categorization a bit later...
Massively Scary...

The in-hospital mortality for patients with massive hemoptysis = 20% to 25%.

*Massive hemoptysis in this study was defined as ≥ 200 mL/24 hours
Do Something, Please

Untreated massive hemoptysis carries up to an 85% mortality.

*Massive hemoptysis in this study was defined as ≥ 200 mL/24 hours
The First Step...

Recognizing hemoptysis is only the first step...
Running the List

Knowing the underlying cause is critical...
The Hemoptysis Differential

- Acute/Chronic bronchitis
  - Up to 50% of cases are due to this etiology.
The Hemoptysis Differential

- Acute/Chronic bronchitis
- Pneumonia
  - *Staphylococcus*
  - *Legionella*
  - *Pneumococcus*
  - *Klebsiella*
    - *Currant jelly sputum*

The Hemoptysis Differential

- Acute/Chronic bronchitis
- Pneumonia
- Tuberculosis
  - The most common cause worldwide...
  - But only $\approx 8\%$ in the United States.
The Hemoptysis Differential

- Acute/Chronic bronchitis
- Pneumonia
- Tuberculosis
- Viral
  - Influenza
  - Varicella
The Hemoptysis Differential

- Acute/Chronic bronchitis
- Pneumonia
- Tuberculosis
- Viral
- Fungal
  - *Aspergillus*
  - *Coccidioides*
  - *Histoplasma*
  - *Blastomyces*
The Hemoptysis Differential

- Acute/Chronic bronchitis
- Pneumonia
- Tuberculosis
- Viral
- Fungal
- Parasitic

Up to 60% of causes of hemoptysis are infectious...
The Hemoptysis Differential

- Acute/Chronic bronchitis
- Pneumonia
- Tuberculosis
- Viral
- Fungal
- Parasitic
- Neoplasm (23% of cases)
  - Squamous cell
  - Small cell
  - Metastatic disease
  - Bronchial adenoma
  - Carcinoid
The Hemoptysis Differential

- Acute/Chronic bronchitis
- Pneumonia
- Tuberculosis
- Viral
- Fungal
- Parasitic
- Neoplasm
- Vasculitis
  - Wegener granulomatosis
  - Behçet disease
The Hemoptysis Differential

- Acute/Chronic bronchitis
- Pneumonia
- Tuberculosis
- Viral
- Fungal
- Parasitic
- Neoplasm
- Vasculitis
- Cystic fibrosis
- Congestive heart failure
- Arteriotracheobronchial fistula
- Lung abscess
- Pulmonary angiodysplasia
- Pulmonary embolism
- Pulmonary HTN
- Goodpasture syndrome
- Antiplatelet use
- Platelet dysfunction/DIC
- Foreign body aspiration
- Bronchiectasis
- Aortic aneurysm
- Lupus
- Drugs/Chemicals
Gulp...

Alas, up to 30% of cases are idiopathic...
A String of Pearls For You

Here are some historical tidbits that can help in the search for a cause...

Available at: http://images5.fanpop.com/image/photos/29800000/White-Pearls-gemology-29862495-400-300.jpg
Can’t Miss Questions

• Any prior lung, renal, or valvular disease?
• History of cigarette smoking?
• Chemical/Asbestos exposure?
• Travel history (TB, parasitic, or fungal exposure)?
• Aspirin, NSAID, and/or anticoagulant use?
• Any hematuria (Goodpasture syndrome)…
Can’t Miss Questions

• Any prior lung, renal, or valvular disease?
• History of cigarette smoking?
• Chemical/Asbestos exposure?
• Travel history (TB, parasitic, or fungal exposure)?
• Aspirin, NSAID, and/or anticoagulant use?
• Any hematuria (Goodpasture syndrome)?
• Previous episodes (AVM, cystic fibrosis, or bronchiectasis)?
Adding to The Necklace

The physical examination can offer a few additional clues as well...
Finger Clubbing

Chronic inflammatory lung disease

Available at: http://upload.wikimedia.org/wikipedia/commons/c/cd/Acopaquia.jpg
Finger Clubbing

...or Primary Lung Malignancy
Cutaneous ecchymosis

Blood dyscrasias/anticoagulant use
Nasal Septal Perforation

Wegener Granulomatosis
Gingival Hyperplasia

Wegener Granulomatosis
Unilateral Leg Swelling

DVT and/or Pulmonary Embolism

Hyperpigmentation

Bronchogenic/Small Cell Lung Cancer
Let’s Get To Work

How do you begin working-up these patients?
Finding The Bloody Cause

- Secure the airway immediately, if necessary.
  - In massive hemoptysis the threat is asphyxiation, not exsanguination,
  - Selective intubation may be necessary...

- The most useful test will likely be a chest radiograph.
  - 80% – 90% of neoplastic causes will be seen.
  - Up to 20% of chest radiographs are normal.
    - Usually the result of bronchitis...
Basic Laboratory Tests

- Consider ordering (based on context):
  - CBC with differential
  - Coagulation studies (PT/INR, PTT)
  - Urinalysis
  - D-Dimer
  - Blood/Sputum cultures with Gram stain

- Massive hemoptysis warrants consideration of:
  - Type and cross
  - Electrolytes
  - Liver function tests
  - Fibrin/FDP → DIC
The Age Old Debate

Bronchoscopy versus CT

**Bronchoscopy**
- Direct visualization
- Good for identifying luminal lesions
- Allows for biopsy/securing bronchial secretions
- Enables selective ventilation
- Low-yield in bronchial stenosis/lesions outside the bronchial wall

**CT**
- Non-invasive; readily available
- Gold standard for bronchiectasis
- Ideal for stable patients
- Can predict active TB
- Higher sensitivity for peripheral tumors
Oh What To Do?...

• Mild hemoptysis → Neither are necessary (unless the hemoptysis is recurrent).

• Moderate hemoptysis → a normal or non-localizing chest radiograph warrants bronchoscopy.

• Evidence of parenchymal disease warrants a CT (Class C).

• A suspected mass points toward bronchoscopy (Class C).
Moderate hemoptysis: recurrent hemoptysis and mortality according to bronchial artery embolization

Myoung Kyu Lee, Sang-Ha Kim, Suk Joong Yong, Kye Chul Shin, Hyun Sik Kim, Tae-Sun Yu, Eun Hee Choi, Won-Yeon Lee

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Authorship and contributorship
Myoung Kyu Lee designed this investigation and wrote the manuscript. Sang-Ha Kim, Suk Joong Yong and Kye Chul Shin contributed to study design. Hyun Sik Kim and Tae-Sun Yu collected and analyzed the data. Eun Hee Choi conducted statistical analysis and revision of the manuscript. Won-Yeon Lee designed this investigation and reviewed the manuscript.

Ethics
Research is based on administrative data treated anonymously in the analysis. Research was approved by the Institutional Review Board of Seoul National University Hospital.
Worst Case Scenario

In massive hemoptysis, CT is more efficient but patients undergo both...
Worst Case Scenario

After the patient is stabilized, of course.
Managing Hemoptysis

• Acute, mild hemoptysis → chest radiograph.
  • Recurrent hemoptysis warrants a referral.

• If the radiograph is normal and the patient is low-risk...
  • The diagnosis is most likely bronchitis.
  • Consider outpatient treatments, including antibiotics if appropriate.

• If the hemoptysis persists, refer to Pulmonology.
  • 5% to 20% of patients will have occult neoplasms.
Airway Considerations

• If the hemoptysis warrants intubation:
  • Aim for an size 8.0 ETT (allows for bronchoscopy and suctioning).

• If possible, position the patient with the bleeding lung ↓.
  • A prone, head down position has been proposed.

• Isolate the normal, non-bleeding lung for ventilation.
More Management Tips

• Give FFP and/or platelets as indicated.

• Endobronchial tamponade with a Foley or catheter (< 4 Fr) may be necessary...

• Consider tranexamic acid...
  • An antifibrinolytic that competitively inhibits the activation of plasminogen to plasmin.
  • Has been shown to ↓ the duration and volume of bleeding.
  • And...It is dirt cheap.
The End of the Road

• Bronchial artery angiography may be necessary.

• The ultimate treatment is catheter-directed bronchial artery embolization (BAE).
  • 90% of the hemoptysis requiring BAE stem from the bronchial circulation.
  • For massive hemoptysis only?...
The End of the Road

• Bronchial artery angiography may be necessary.

• The ultimate treatment is catheter-directed bronchial artery embolization (BAE).
  • 90% of the hemoptysis requiring BAE stem from the bronchial circulation.
  • For massive hemoptysis only?...
Original Article

Moderate hemoptysis: recurrent hemoptysis and mortality according to bronchial artery embolization

Myoung Kyu Lee¹, Sang-Ha Kim¹, Suk Joong Yong¹, Kye Chul Shin¹, Hyun Sik Kim¹, Tae-Sun Yu¹, Eun Hee Choi², Won-Yeon Lee¹.

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The End of the Road

- Bronchial artery angiography may be necessary.

- The ultimate treatment is catheter-directed bronchial artery embolization (BAE).
  - 90% of the hemoptysis requiring BAE stem from the bronchial circulation.
  - Not necessarily for massive hemoptysis only.
  - Up to 98% effective in stopping hemoptysis.
    - 20% recurrence of bleeding, however.

- A lobectomy or pneumonectomy may prove necessary (e.g. trauma, etc.).
HEMOPTYSIS

- Signs and symptoms of pulmonary embolism
  - Directed appropriate evaluation and therapy
  - Nonpulmonary source of hemoptyasis

- Stable patient nonmassive hemoptyasis
  - Access source
  - Check sputum
  - Pulmonary source of hemoptyasis

- Massive hemoptyasis
  - Airway compromised
  - Unstable vital signs
  - High flow oxygen
  - Close monitoring
  - Pulse oximetry
  - IV access
  - Airway control
  - Type and cross match
  - Portable CXR
  - Hematology studies
  - Coagulation studies
  - ICU admission
  - Pulmonologist/Thoracic Surgeon consultation
  - Selective intubation
  - Bronchoscopy

Chest radiograph

- Abnormal (localizing or nonlocalizing)
  - Consultation for CT chest and/or FOB
  - ? Admission

- Normal
  - High risk for neoplasm
    - Expeditious outpatient evaluation and referral
  - Low risk for neoplasm
    - Discharge
    - Treat bronchitis
    - Outpatient follow up

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Key Points Reviewed

• Hemoptysis consists of expectorated blood from the tracheobronchial tree.
• It is important to distinguish hemoptysis from gastric causes and pseudo-hemoptysis (upper airway).
• Use the cutoffs of 50 mL and 200 mL to differentiate mild, moderate, and massive hemoptysis.
• Managing the airway is the most critical step in treating massive hemoptysis.
• Bronchoscopy and CT scans have their role in evaluating the cause; your working diagnosis and the extent of bleeding should guide your selection.
• Moderate and massive hemoptysis patients benefit from bronchial artery embolization.
Questions?
Thank You!
**References**


References


