"Why am I coughing up blood?"

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Hemoptysis, the spitting or coughing of blood, is an alarming occurrence for both patients and their caregivers. Even a small amount of blood can seem like a lot, and massive hemoptysis can be life-threatening. Furthermore, hemoptysis may be a marker of significant underlying disease. The amount and persistence of hemoptysis, in combination with patient characteristics (such as risk for malignancy) can guide the sequence and urgency of further investigations.

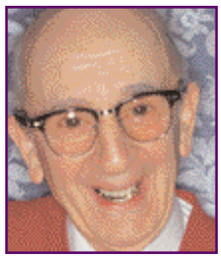
Why does it happen?

There are many causes of hemoptysis described in the literature (Table 1). Primary bronchogenic carcinoma and inflammatory airway lesions, such as tuberculosis, bronchiectasis, lung abscess, and mycetoma are the most common causes of large volume hemoptysis. The relative contribution of these causes may vary depending on the age, geographic location, and referral characteristics of the patient.[1]

Acute infectious bronchitis is likely the most common cause of minor hemoptysis worldwide. These patients are less likely to be captured in case series of hemoptysis, as the events are minor, may not be reported, and are self-limited.

Chronic inflammatory airway abnormalities, such as bronchiectasis, result in hypertrophy of the surrounding bronchial arteries. Thus, 90% of hemoptysis is thought to be of bronchial arterial origin. The pulmonary arterial system, which receives the entire cardiac output with each systole, is under much lower pressure, and is thought to be the origin of bleeding in only about 5% of cases.[2]

Raymond's hemoptysis



Raymond, 82, has advanced chronic obstructive pulmonary disease (COPD) and coronary artery disease. He presented with several episodes of scant hemoptysis, which seemed to be associated with an acute COPD exacerbation. The hemoptysis resolved following treatment with a course of antibiotics and prednisone, but subsequently recurred.

Neither chest X-ray (Figure 1) nor computed tomography scan of the chest demonstrated any cause for the bleeding. At bronchoscopy, however, he was found to have a tumour partially obstructing the right lower lobe bronchus (Figure 2). Cytology brushing revealed non-small cell carcinoma of the lung. Because of his advanced lung disease, he was not a candidate for surgical resection, and underwent external beam radiation therapy with good result.

Figure 1. Raymond's chest X-ray.

How is it investigated?

The first step is to consider the potential for a confounding upper respiratory tract or gastrointestinal source. Blood of pulmonary origin is usually bright red and frothy or mixed in with sputum, and is a potent trigger for cough.[1] Obvious clues to a non-pulmonary cause may be a history of epistaxis or vomiting, but this can sometimes be difficult to clarify on history, especially if there is a language barrier. Occasionally, gastroscopy or nasopharyngoscopy may be required if detailed pulmonary investigations do not yield an explanation for bleeding. The cause of hemoptysis may remain obscure in 5% to 10% of patients with hemoptysis.[2]

If a lower respiratory tract source for hemoptysis cannot be confidently ruled out, then the amount and persistence of bleeding can be used to guide management (Figure 3). It should be noted that the guidelines that follow are not truly evidence-based, as large, prospective case series with long term follow-up of ambulatory and hospitalized patients with hemoptysis do not exist.

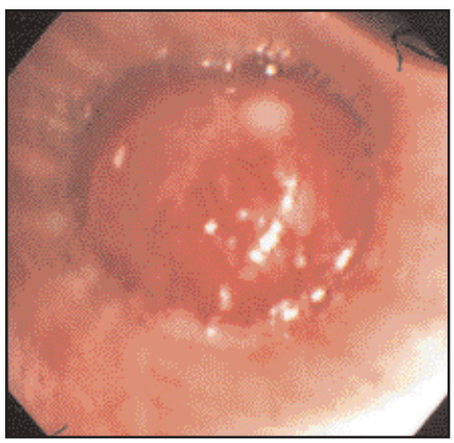


Figure 2. Tumour partially obstructing right lower-lobe bronchus.

What to do about small-volume hemoptysis?

Isolated small volume hemoptysis (limited to blood streaking in sputum, or < 5 mL expectorated blood), when associated with an acute bronchitis, is usually benign and self-limited. In a young person (< 40) who is a non-smoker, with an isolated episode of scant hemoptysis during a respiratory tract infection, the chance of malignancy is very low.[2,3] A chest X-ray should be done to rule out active pulmonary tuberculosis or an unexpected underlying pulmonary lesion, but no further investigation is required if hemoptysis does not recur and the X-ray is normal.

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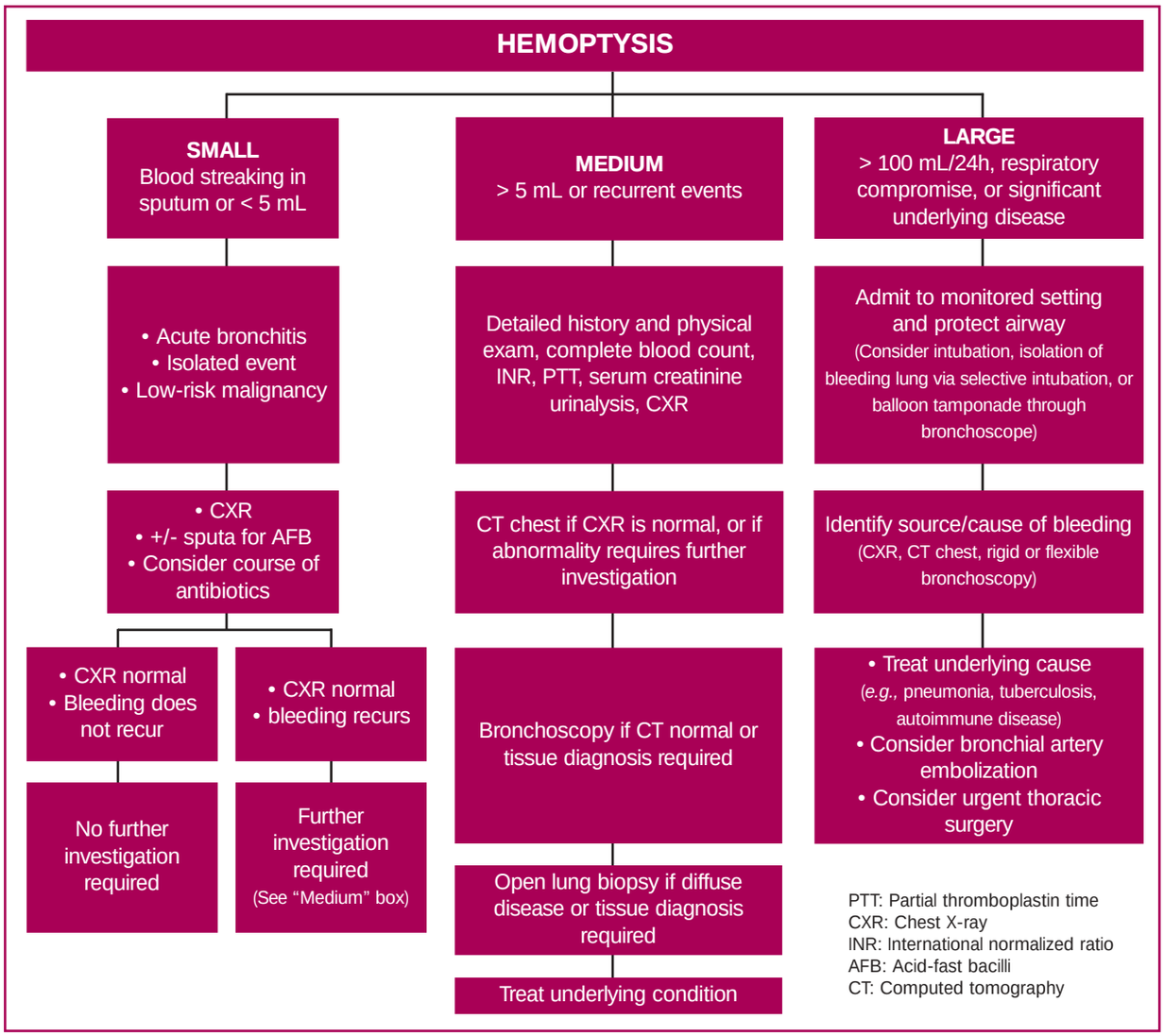

Figure 3. An approach to hemoptysis: small, medium, and large.

What about moderate or recurrent hemoptysis?

If even scant hemoptysis persists or occurs in the absence of a clear history of acute bronchitis, or if a patient coughs up more than about 5 mL of blood at any time (especially when not mixed with sputum), further investigations to evaluate for underlying disease are mandatory. Referral to a respirologist or internist with expertise in respiratory disease and bronchoscopy is entirely appropriate at this time. Any patient who is coughing significant amounts of blood, has underlying pulmonary, cardiac, hepatic, renal, or hematologic disease, or who has any sign of respiratory compromise, should be admitted to the hospital for further evaluation. All patients managed in an outpatient setting must be instructed to go to the nearest emergency department immediately if the bleeding increases in severity.

The investigation of recurrent or moderate volume hemoptysis begins with a detailed history and physical examination. Symptoms, such as fever, weight loss, chronic cough, or nagging chest discomfort, are nonspecific, but may point to a chronic infection (such as tuberculosis, mycetoma, or pulmonary malignancy). A history of epistaxis or nasal crusting and pain suggest Wegener's granulomatosis. Pleuritic chest pain or leg swelling raise the possibility of pulmonary embolism. A history of chest trauma, or a family history of epistaxis and the finding of oral telangiectasia on exam make pulmonary arterio-venous malformation a consideration.

Initial laboratory investigations should include:

- A complete blood count and peripheral smear to evaluate for anemia or thrombocytopenia;
- An international normalized ratio and partial thromboplastin time to rule out a coagulopathy;
- A serum creatinine and urinalysis to evaluate for pulmonary renal syndromes; and
- A sputum sample submitted for bacterial, fungal, and mycobacterial smear and culture.

A chest X-ray should be done promptly, but may fail to localize the cause in up to nearly 50% of cases.[2]

If the chest X-ray is normal, or if an abnormality is seen which requires further characterization, a computed tomography (CT) scan of the chest should be performed. This scan should be requested in consultation with the radiologist, to determine optimal scan technique, and whether intravenous contrast is required. The higher resolution of a CT scan can detect abnormalities, such as bronchiectasis or small lesions, which may not be seen on chest X-ray.[4,5]

Fibre-optic bronchoscopy is of relatively low yield in the setting of a normal CT scan, but can detect airway or mucosal lesions not seen on CT scanning,[4] and can also visualize the upper airway and vocal cords. Tissue samples for pathology, cytology, and microbiology can be obtained, and, if done promptly, the site of bleeding can be identified.[6] In the setting of diffuse lung disease, open lung biopsy may be required for diagnosis.

If no cause is found, the patient should have a followup chest X-ray done in six months to ensure no previously occult lesion has appeared.[1,7]

What about massive hemoptysis?

Massive hemoptysis, which is variously defined as ranging from 100 mL to 600 mL (or more) per 24 hours,[2,8] is a potentially life-threatening condition. Patients with massive hemoptysis can die from asphyxiation (rather than exsanguination), and should be managed in a closely monitored setting such as an intensive care unit. An in-depth discussion of the management of massive hemoptysis is beyond the scope of this article, but readers are referred to

Frequently Asked Questions

1. Should every patient presenting with even minor hemoptysis have a chest X-ray?

Yes. Tuberculosis and unexpected pulmonary lesions can occur even in young, apparently healthy individuals.

2. When should I order a CT scan of the chest?

A CT scan of the chest should be done in any patient in whom hemoptysis is not associated with an acute respiratory tract infection, in the setting of larger volumes (> 5 mL) or in whom hemoptysis recurs, unless a clear-cut explanation for the bleeding is found on history, chest X-ray, or sputum examination.

3. Is bronchoscopy necessary if the CT scan is normal?

A CT scan of the chest can sometimes miss mucosal or airway lesions. Therefore, a bronchoscopy, although of low yield, should be done in any patient with recurrent hemoptysis of unknown etiology.

4. When should I consider transfer to a tertiary care setting?

Any patient with massive hemoptysis should ideally be managed in a centre where interventional radiology and thoracic surgery are available. Transport to such a centre should be facilitated once the patient is stabilized.

5. If no cause is found for hemoptysis, what followup should be done?

A followup chest X-ray should be done six months after the event to ensure no lesion has arisen in the interval.

several excellent reviews of this topic.[2,8-10] Optimal care requires a team approach, and may involve the expertise of anesthetists, intensivists, respirologists, thoracic surgeons, and interventional radiologists.

Table 1
Causes of hemoptysis

Inflammatory airway lesions
- Bronchiectasis
- Acute bronchitis

Neoplastic
- Bronchogenic carcinoma
- Endobronchial metastases
- Carcinoid tumours

Infectious
- Pneumonia
- Tuberculosis
- Mycetoma/aspergilloma
- Lung abscess

Vascular abnormalities
- Pulmonary embolism
- Arteriovenous malformation
- Vasculitis/capillaritis
- Elevated pulmonary venous pressures (usually due to cardiac disease and elevated left atrial pressure)
- Arterio-tracheal/pulmonary fistula

Traumatic/Iatrogenic
- Airway injury
- Pulmonary contusion
- Aspirated foreign body
- Pulmonary artery catheter-related injury
- Post-transbronchial or percutaneous lung biopsy

Miscellaneous
- Catamenial hemoptysis
- Cocaine inhalation
- Coagulopathy

Bronchial artery embolization is becoming a mainstay of management of significant bleeding. Performed by interventional radiologists, this is an effective and safe way to control bleeding in patients who may not be surgical candidates, and may negate the need for urgent surgery.[2,11] CME

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Take-home message

- All patients who present with hemoptysis should have a chest X-ray.
- All but scant hemoptyses associated with an acute bronchitis in a young person at low risk for malignancy require further investigation.
- The amount of hemoptysis guides the urgency of investigations. Any patient at risk for respiratory compromise or with significant underlying disease should be hospitalized.

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Net Readings

1. Pulmonology Channel
   www.pulmonologychannel.com/hemoptysis
2. Virtual Hospital
   www.vh.org
3. Postgraduate Medicine Online
   www.postgradmed.com/issues/2002/10_02/johnson.htm