

2: Does massive hemoptysis always merit diagnostic bronchoscopy?

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Yes, all patients with massive hemoptysis should undergo diagnostic bronchoscopy. The procedure plays an important role in protecting the airway, maintaining ventilation, finding the site and underlying cause of the bleeding, and in some cases stopping the bleeding, either temporarily or definitively.

Bronchoscopy enables procedures to control bleeding until the patient can undergo a definitive procedure

Frightening to patients, massive hemoptysis is a medical emergency and demands immediate attention by an experienced pulmonary team.¹ Hemoptysis can be the initial presentation of an underlying infectious, autoimmune, or malignant disorder (TABLE 1).² Fortunately, most cases of hemoptysis are not massive or life-threatening.¹

WHAT IS 'MASSIVE' HEMOPTYSIS?

Numerous studies have defined massive hemoptysis on the basis of the volume of blood lost over time, eg, more than 1 L in 24 hours or more than 400 mL in 6 hours.

Ibrahim³ has proposed that we move away from using the word "massive," which is not useful, and instead think in terms of "lifethreatening" hemoptysis, defined as any of the following:

• More than 100 mL of blood lost in 24 hours (a low number, but blood loss is hard to estimate accurately)

- Causing abnormal gas exchange due to airway obstruction
- Causing hemodynamic instability. In this article, we use the traditional "massive" terminology.

BRONCHOSCOPY IS SUPERIOR TO IMAGING FOR DIAGNOSIS

Radiography can help identify the side or the site of bleeding in 33% to 82% of patients, and computed tomography can in 70% to 88.5%.⁴ Magnetic resonance imaging may also have a role; one study found it useful in cases of thoracic endometriosis during the quiescent stage.⁵ However, transferring a patient who is actively bleeding out of the intensive care unit for imaging can be challenging.

Flexible bronchoscopy is superior to radiographic imaging in evaluating massive hemoptysis: it can be performed at the bedside and can include therapeutic procedures to control the bleeding until the patient can undergo a definitive therapeutic procedure.⁶ It has been found helpful in identifying the side of bleeding in 73% to 93% of cases of massive hemoptysis.⁶

However, one should consider starting the procedure with a rigid bronchoscope, which protects the airway better and allows for better ventilation during the procedure than a flexible one. One can use it to isolate the nonbleeding lung and to apply pressure to the bleeding site if it is in the main bronchus.⁷ Measuring 12 mm in diameter, a rigid scope cannot go as far into the lung as a flexible bronchoscope (measuring 6.4 mm), but a flexible bronchoscope can be introduced through the rigid bronchoscope to go further in.

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ALRAIYES AND COLLEAGUES

TABLE 1

Causes of massive hemoptysis

Pulmonary

Bronchiectasis Pulmonary embolism Cystic fibrosis Bullous emphysema

latrogenic

Bronchoscopy (transbronchial biopsy) Swan-Ganz catheter—induced infarction Pulmonary artery rupture Transtracheal aspiration Lymphangiography

Vascular

Pulmonary hypertension Arteriovenous malformation Aortic aneurysm

Drugs or toxins

Anticoagulants Penicillamine Trimellitic anhydride Solvents Crack cocaine Aspirin Thrombolytic agents

Hematologic

Coagulopathy Disseminated intravascular coagulation Thrombocytopenia Platelet dysfunction von Willebrand disease

Infectious

Lung abscess Mycetoma Necrotizing pneumonia Parasitic Fungal or tuberculous Viral

Neoplastic

Bronchial adenoma Bronchogenic carcinoma Metastatic cancer

Traumatic

Blunt or penetrating chest injury Ruptured bronchus Fat embolism Tracheo-innominate artery fistula

Systemic diseases

Goodpasture syndrome Granulomatosis with polyangiitis Systemic lupus erythematosus Vasculitis Behçet disease Idiopathic pulmonary hemosiderosis

MANAGEMENT OPTIONS

The management team should include an anesthesiologist, an intensivist, a thoracic surgeon, an interventional radiologist, and an interventional pulmonologist.

In the intensive care unit, the patient should be placed in the lateral decubitus position on the bleeding side. To maintain ventilation, the nonbleeding lung should be intubated with a large-bore endotracheal tube (internal diameter 8.5–9.0 mm) or, ideally, with a rigid bronchoscope.⁶ Meanwhile, the patient's circulatory status should be stabilized with adequate fluid resuscitation and transfusion of blood products, with close monitoring.

Once the bleeding site is found, a bronchoscopic treatment is selected based on the cause of the bleeding. Massive hemoptysis usually arises from high-pressure bronchial



FIGURE 1. Flexible blonchoscopic views showing: A, clot dessication using argon plasma coagulation; B, a frozen clot using cryotherapy; and C, hemostastis achieved by neodymium-yttrium-aluminum perovskite laser.



FIGURE 2. An endobronchial blocker is placed via the flexible bronchoscope.

vessels (90%) or, less commonly, from nonbronchial vessels or capillaries (10%).⁸ A variety of agents (eg, cold saline lavage, epinephrine 1:20,000) can be instilled through the bronchoscope to slow the bleeding and offer better visualization of the airway.⁶

If a bleeding intrabronchial lesion is identified, such as a malignant tracheobronchial tumor, local coagulation therapy can be applied through the bronchoscope. Op-

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tions include laser treatment, argon plasma coagulation, cryotherapy, and electrocautery (**FIGURE 1**).^{9,10}

If the bleeding persists or cannot be localized to a particular subsegment, an endobronchial balloon plug can be placed proximally (**FIGURE 2**). This can be left in place to isolate the bleeding and apply tamponade until a definitive procedure can be performed, such as bronchial artery embolization, radiation therapy, or surgery.

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