Hemoptysis: Diagnosis and Management

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Hemoptysis is the expectoration of blood or blood-tinged sputum from the lower respiratory tract. While it is usually a self-limiting process from a benign cause, the seriousness and the exact source of the bleeding can rarely be determined from the initial presentation and physical examination. Today the acute, overall mortality of hemoptysis is relatively low, while the underlying etiology remains the most important determinant of long-term survival. We review the possible causes of hemoptysis, the diagnostic work-up and therapeutic options.

ETIOLOGY

According to the American Thoracic Society, there are more than 100 documented causes of hemoptysis. The more common causes have changed over time. Before the widespread use of antimycobacterial chemotherapy and the rise in prevalence of cigarette smoking and related pulmonary malignancies, hemoptysis was nearly synonymous with pulmonary tuberculosis. As exemplified by the Hippocratic aphorism, “The spitting of pus follows the spitting of blood and consumption follows the spitting of this and death follows consumption.” Epidemiological studies conducted between 1930 and 1960 found that tuberculosis accounted for most cases of hemoptysis (5% to 46%), followed by bronchiectasis (7% to 28%), and carcinoma (2% to 19%). Following the widespread use of antituberculous drugs, antibiotics, and vaccination against whooping cough, the incidence of hemoptysis due to tuberculosis and bronchiectasis declined, while that caused by bronchitis and bronchogenic carcinoma rose, presumably due to the increased incidence of smoking. More recent epidemiological studies reflect these changes. While many different causes of hemoptysis are described in these reports, the majority of patients bleed from either infection, bronchogenic carcinoma, or bronchiectasis.

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Causes of massive hemoptysis, on the other hand, have not changed over time and include tuberculosis, bronchiectasis, lung abscess and lung cancer. Table 2 contains a summary of the more frequent underlying etiologies of hemoptysis.

**DIAGNOSTIC EVALUATION: THE QUESTION OF URGENCY**

The most important factor shown to correlate with mortality is the rate of blood loss, while both the amount and duration of bleeding are unreliable indicators of underlying disease severity. For this reason, hemoptysis is usually classified according to the rate of bleeding. Most authors consider hemoptysis to be mild if the amount of blood expectorated in 24 hours is less than 20 mL, moderate if between 20 and 600 mL, and massive if more than 600 mL. Others rely more on the magnitude of clinical effect resulting from the bleeding, and define massive hemoptysis as the volume of expectorated blood that is life-threatening by virtue of airway obstruction, hypotension, or blood loss. In most series massive hemoptysis accounts for less than 10% of all cases, but associated mortality may be as high as 85%. The assessment of hemoptysis is similar regardless of the rate of bleeding, but the urgency of the evaluation is related to the expected mortality. Unfortunately, the rate of bleeding will not predict outcome accurately in all cases. In one study of 123 patients with hemoptysis, eight patients who had been stable while awaiting further work-up died of sudden, catastrophic hemorrhage.

**DIAGNOSTIC EVALUATION: INITIAL ASSESSMENT**

Hemoptysis is a frightening symptom for the patient, who may describe the event in much the same way whether the blood is coughed up from the lungs, aspirated and then coughed up, or swallowed and subsequently vomited. The first step in the diagnostic process, therefore, is to establish that the source of bleeding is the lower respiratory tract. Inspection of the expectorated blood, together with some simple diagnostic tests may help determine whether the source of bleeding is the lung or the gastrointestinal tract. Hematemesis is characterized by darker blood that may contain partially digested food with usually an acidic pH. History of frequent nosebleeds or a tendency for hemoptysis to worsen in the supine position and upon awakening may point to a nasopharyngeal origin, a source of bleeding in up to 10% of patients. Other possible causes of pseudohemoptysis include infection with *Serratia marcescens* which produces a red pigment, and the use of isoetharine, an infrequently prescribed bronchodilator that may appear red when oxidized.

Once the diagnosis of true hemoptysis is established, the evaluation should begin with a thorough investigation of the patient’s medical history for underlying pulmonary and cardiovascular diseases, risk factors for bronchogenic carcinoma, bleeding diathesis or anticoagulant therapy, recent trauma to the chest wall, and occupational exposure. Prior history of cavitary or bullous disease such as tuberculosis, sarcoidosis, or fibrosis increases the risk of aspergillosis formation. Patients with known pulmonary tuberculosis may bleed from Rasmussen aneurysm caused by erosion of blood vessels deprived of lateral support or by bronchopulmonary anastomosis within the wall of old cavities. A history of congestive heart failure due to mitral stenosis, deep vein thrombosis, or foreign body aspiration may lead to a specific etiology. Travelers to Asia, the Middle East, and South America may experi-