

## **EDITORIAL**

# **Endovascular Intervention – An Innovative Procedure for the Management of Hemoptysis**

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Hemoptysis is a common clinical problem. It is a symptom, not a disease entity. It is a challenging problem for the pulmonologist. Other than respiratory disease, different systemic disease may present with hemoptysis like mitral stenosis, hepatopulmonary syndrome, Wegener's Granulomatosis, heart failure, pulmonary edema etc. but interventional pulmonologist is the focal person for management of massive hemoptysis.

Massive hemoptysis is a frightening and potentially life threatening clinical event. Patient with chronic inflammatory lung disease such as bronchiectasis, sarcoidosis, tuberculosis and cystic fibrosis develop markedly hypertrophied and fragile bronchial artery that may lead to clinically significant hemoptysis. Surgery had been the definitive therapy historically. Unfortunately surgical intervention carries a mortality about 20-40% and conservative management carries mortality >50% and embolization have mortality less than 5%. Furthermore Surgical intervention is hazardous and often impossible in the patient with diffuse parenchymal lung disease. Super selective catheterization of the bronchial arteries feeding the affected areas followed by particulate embolization has proven to be an effective treatment for control of bleeding.

Massive hemoptysis is carries a 50-85% mortality rate when treated conservatively<sup>1</sup>. Death most often due to asphyxiation from the aspirated blood leading to airway obstruction, less commonly death occurs due to exsanguination and acute hypotension<sup>2</sup>. Because of poor outcome associated with conservative therapy alone, many center have institute more aggressive therapeutic maneuvers

The source of bleeding must be defined clearly and hemoptysis must be differentiated from bleeding from the upper airway or alimentary tract. Once hemoptysis has been established, a multidisciplinary approach involving interventional pulmonology, thoracic surgery and interventional radiology should be optimal. All the drug that might contribute to bleeding should be stopped. A coagulation profile should be obtained and a sputum sample sent for culture and sensitivity including bacteria, mycobacteria and fungus.

Chest X-ray is required to identify any acute radiographic changes in the lung fields to localize the site of bleeding and discover other potential cause of bleeding, such as foreign body or cavity with Mycetoma. If no localizing features are present, a review of the recent CT chest might identify area of severe bronchiectasis or new infiltrate, which will help to determine the site. Bronchoscopy might help to identify the site of bleeding but may be non diagnostic in the setting of severe hemoptysis<sup>3</sup>.

### **Bronchial artery anatomy**

The bronchial artery typically arises from the thoracic aorta at the T3 to T8 level and also supply the bronchi, vagus nerve, mediastinum and esophagus. 80% of the artery arises from the T5 to T6 level there are many bronchial artery anatomic variations<sup>4</sup>. The more common combination include a single right intercostobronchial artery with single left bronchial artery, single. Two bronchial arteries can be seen either on the right or in the left. As many as 20% of the bronchial artery have anomalous origin other than aorta. Aberrant origin includes subclavian, thyrocervical, internal mammary, innominate, superior intercostal and inferior

phrenic arteries. Pulmonary parenchyma may receive arterial blood supply from transpleural systemic collateral to the bronchial circulation via intercostals, mammary, phrenic and thyrocervical arteries<sup>5</sup>.

Endovascular management of hemoptysis can be done in acute massive hemoptysis to stop bleeding as well as recurrent hemoptysis. These are safe procedure with minimal complication; the endovascular procedures are –

### **Bronchial Artery Embolization:**

- I) This can be done temporarily or permanent which can be done by different agents like gel foam, glue, and recently developed agents like thombosphere, polyvinyl alcohol. Particulate agent is more preferable than liquid agents because liquid agents are prone to develop tissue ischemia. Larger particulate size like( 350-550µm) are preferable.
- II) Bronchial artery embolization by platinum coil.

### **Angiographic and embolization technique:**

Prior to the procedure a brief systemic and general examination should be performed to establish the baseline. A preliminary descending thoracic aortogram can be performed as a roadmap to the bronchial arteries but selective catheterization can be done if the patient does not have the history of prior embolization procedure. Five or six French sheath are commonly used, through which selective catheter is placed, reverse curve catheters (Mikael son, Simons, SOS, Omni) are initially used. Forward looking catheters can also be effective. Typically 4, 5 or 5.5 Fry catheters are used routinely<sup>6</sup>.

The left main stem bronchus serves as a convenient fluoroscopic land mark for the general location of the bronchial arteries. the catheter is directed laterally or anterolaterally for the right bronchus and more anterior for the left. A selective bronchial arteriogram must be performed prior to any embolization. One must be sure not to occlude the artery during the selective injection, especially on the right, because this may result in spinal cord ischemia if spinal artery branch is present. Bronchial artery will have branch that follow the course of

the main stem bronchus, where as the intercostal artery will travel laterally along the under surface of the rib. Abnormal angiographic appearances that support a site of bleeding include – tortuosity, hypertrophy, hyper vascularity, aneurism, extravasation and bronchial artery to pulmonary artery or vein shunting<sup>7</sup>. The bronchial artery injection may elicit a cough response although this is far less common with the use of newer nonionic and isoosmolar contrast agent. If the site of hemorrhage is known, all abnormal bronchial arteries to that region should be embolized. However if the site of bleeding cannot be localized, any abnormal bronchial artery should be treated. If the abnormal bronchial artery cannot be identified, a continued search for additional bronchial artery and nonbronchial system must be performed. The presence of hypertrophied nonbronchial systemic collateral is particularly common in patients having undergone prior embolization procedures.

A stable catheter position is required for any embolization. There are many new available micro catheters that will easily exit a 0.038-in taper diagnostic catheter.

Ideally, distal embolization should be performed. Particulate greater than 200 to 250µm should be used to avoid tissue ischemia and neurologic damage. Currently polyvinyl alcohol (PVA) particulate size ranges 300 to 500µm are commonly used with good result. Other embolic agent s used includes gel foam, pledgets (1-2mm), gel foam slurry, thrombin and Glue<sup>8</sup>. Proximal occlusion with large particles or coil should be avoided if possible. Proximal occlusion Provides very temporary relief because collateral pathways readily develop. Very small particles less than 200µm or liquid embolic agent should always be avoided because these causes tissue infarction. Care should be taken for initial diagnostic arteriogram for the presence of bronchial artery to pulmonary artery or vein shunt. Particulates which traverse shunt into the pulmonary artery circulation will cause small pulmonary emboli and those that enter the pulmonary venous circulation can result in catastrophic systemic emboli. In those cases larger particles should be chosen, and in the case of very large shunt coil may be indicated.

### Complication

Major complication is rare and immediate clinical success defined as cessation of hemorrhage ranges from 85-100% with recurrence rate about 10%. Spinal cord ischemia and transverse myelitis are the most feared and recognized complication. They are fortunately very rare. The use of nonionic contrast agents has significantly reduced the risk of transverse myelitis. With the current use of nonionic contrast media, particulate agent greater than 200 $\mu$ m and modern micro catheter or micro guide wire, nontarget embolization is quite rare. Chest pain and dysphagia commonly occur with selective embolization within the first week following procedure. These symptoms are secondary to the interruption of the blood supply to the posterior mediastinum and mid portion of the esophagus. This is less common when distal super selective catheterization is used<sup>9</sup>.

### Conclusion;

Major hemoptysis is life threatening complication of variety of chronic inflammation of the lung. The development of bronchial artery embolization technique has revolutionized the approach to these patients. Recurrent hemoptysis is due to continued presence of acute on chronic inflammation and the recanalization of an embolized bronchial artery or bleeding from a site supplied by non-embolized systemic collaterals. Recurrent hemoptysis also can be successfully controlled with embolization. Therefore, despite a prior history of bleeding and prior embolization procedures, no patient should be denied the opportunity for additional trans catheter therapy.

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