

SPECIAL ARTICLE ON THE OCCASION OF IDOR 2013*

RADIOLOGY AND HEMOPTYSIS: KEY POINTS

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Haemoptysis can be life-threatening and requires immediate investigation and management. Conservative management of massive haemoptysis carries a mortality rate of 50-100% (1). In the past surgery was considered as the treatment of choice. The mortality rate for surgery ranges from 7.1 to 18.2% (2). Mortality can exceed 40% when surgery is done as an emergency procedure (2). However many patients are not candidates suitable for surgery due to pre-existing comorbidities and poor pulmonary function. Haemoptysis is defined as an externalisation of blood through the mouth from the subglottic region. This is a bleeding from the bronchi and not from alveoli. There is no place for embolization for an alveolar bleeding. Haemoptysis may come from the systemic circulation (bronchial or not) or pulmonary arterial circulation.

80% of bronchial arteries arise from the anterior side of the descending thoracic aorta facing the left main bronchus most commonly between the level of T5 and T6 vertebrae (3). Each bronchial artery gives three branches: upper, medium and lower. The size of the arteries at their origin is 1.5 mm and the lobar level from 0.50 to 0.75 mm (4). Their anatomy is very variable and has been extensively published and commented (5), but the most common variant was observed only in 27% of patients (6).

One of the difficulties of embolization is the presence of broncho-bronchial anastomoses not always visible early in the intervention but which imposes a not too proximal embolization. The most dangerous ones are the systemic anastomoses especially in the vertebral or subclavian territories because they can lead to non-target embolization. It should also be reminded that the collateral branches, the anterior spinal artery and the

artery of the lower esophagus that cannot be embolized. For a non-bronchial systemic vascularisation, the prerequisite is a pleural symphysis in case of chronic lung disease. All arteries of the chest wall can under these conditions participate to bronchial vascularisation.

For the etiologic diagnosis and localization, endoscopy and CT angiography are complementary. They allow localization of bleeding in 90-95% of cases (7). In the acute phase, endoscopy must be done carefully and perhaps avoided because it can cause haemoptysis.

The angio-CT has an essential role in the management of haemoptysis. It allows to locate the site of bleeding, to determine the mechanism or etiology, to visualize the anatomy of the systemic arteries and to assess the severity of disease.

The CT signs of bleeding are ground glass appearance, alveolar opacity, atelectasis on clot, systemo-pulmonary shunt or endobronchial extravasation of contrast medium.

The main causes of haemoptysis are: Takayasu's disease, TB cavity, excavated cancer, Behcet's disease, aspergillosis, and catheters.

Less than 5% of haemoptyses have a pulmonary arterial origin. The most common cause of bleeding from the pulmonary circulation is Rasmussen's aneurysm, which is a pseudoaneurysm due to erosion of a peripheral pulmonary artery by chronic inflammation. For patients with recurrent haemoptysis after systemic arterial embolization, it is useful to perform pulmonary angiography in particular in case of tuberculosis.

The essential and even mandatory indication is the presence of a necrotic process.

Bronchial artery embolisation should be carried out in a dedicated vascular interventional suite by ex-

perienced interventional radiologists familiar with the embolization techniques. A variety of shaped catheters can be used for the selective catheterization of the bronchial arteries (Cobra, Simmons, Shepherd's hook, Headhunter, Sidewinder,...). Coaxial micro catheters are more often useful to achieve a secure position as far as possible, in particular to avoid non-target embolization of the anterior spinal branch.

Although extravasation of contrast medium is considered a specific sign of bronchial bleeding, this finding is rarely seen and its reported prevalence ranges from 3.6% to 10.7% (8, 9). So the target vessel should be identified before the procedure.

The coils are usually avoided because embolization may be too proximal and prevent further embolization. The coils are used in a particular situation, as large bronchial systemic anastomosis, pulmonary AVM, aneurysms pulmonary arteries.

The first choice for embolization material is microparticules.

Experimental study has demonstrated a bronchopulmonary anastomosis of 325 μ m in the human lung (10). So the most frequently particles used worldwide have 350 to 500 μ m diameter. Gelatin sponge should be avoided too due to its resolvability that can lead to recanalization and re-bleeding.

Since the first report by Remy et al in 1973, the efficacy and safety of bronchial and not bronchial artery embolisation have been well documented. Embolisation can provide an immediate control of haemoptysis in 73%-99% of patients (2, 11, 12, 13), but recurrence is not uncommon occurring in 10%-55,3% (2, 11, 12, 13, 14).

One should not forget that embolization is a palliative treatment of haemoptysis but does not address the causal pathology.

As any interventional process, bronchial embolization complicate. The most common complication is chest pain and dysphagia due to ischemic phenomenon but more often they are transient, reported respectively in 24%-91% and 0,7%-18,2% (14, 15, 16). The most serious

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complication is the spinal cord ischemia due to not-targeted embolisation. Supraselective embolisation using microcatheter reduces the risk of inadvertent embolisation of the anterior medullary artery (17).

Other rare complications are aortic and bronchial necrosis, bronchooesophageal fistula, non target organ embolisation, pulmonary infarction, referred pain to the ipsilateral forehead and orbit and transient cortical blindness.

Hemoptysis constitutes a significant and often life-threatening respiratory emergency. Assessment with bronchoscopy and CT is useful in localizing the bleeding site and diagnosing the underlying cause.

The LC has become essential for the management of hemoptysis allowing a precise study of the lung parenchyma and pulmonary vasculature

Bronchial and nonbronchial systemic artery embolization is a proven safe and effective treatment for massive and recurrent hemoptysis, but recurrent bleeding is not uncommon and can also be treated with a new embolization.

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