

Bronchial Artery Embolization in Pulmonary Diseases: Current Scenario

Deep Narayan Srivastava, Manisha Jana, Ashu Bhalla, S Thulkar, S Sharma
 Department of Radiodiagnosis, All India Institute of Medical sciences, New Delhi, India.

Abstract: Massive Haemoptysis is an acute emergency in patients and required urgent management. Though surgery definitely is a method of choice for treatment in certain selected conditions like Aspergilloma, Hydatid Cyst, Thoracic Vascular injuries but Endovascular management of haemoptysis has great potential and shown promising results. The Bronchial Artery Embolization in a case of Massive Haemoptysis not only saves lives in emergency conditions but also bridges the time period before definitely elective surgical management can be undertaken. The detail vascular Anatomy, procedure and its possible complications are being highlighted in the present Article.

INTRODUCTION

Endovascular management in bleeding states has established itself as a promising and effective treatment modality. Massive hemoptysis is one of the several hemorrhagic emergencies which has been successfully treated using bronchial artery embolization (BAE). Massive hemoptysis, defined as an expectoration of more than 300 ml of blood in a day,¹ has a very high mortality when left untreated². The management of massive hemoptysis and recurrent non-massive hemoptysis (expectoration of > 100 ml of blood in a day for a few days or weeks) includes surgical and endovascular treatment. Though most of the patients with massive hemoptysis are not surgical candidates, but surgery remains the definitive treatment in some conditions (aspergilloma, hydatid cyst, thoracic vascular injuries). BAE in acute massive hemoptysis not only saves lives in emergency conditions but also bridges the time period before definitive elective surgical treatment can be undertaken in these conditions².

BAE was first described by Remy in 1973³. Since then, the procedure has proven its safety and effectiveness in controlling hemoptysis in diverse lung conditions in different studies⁴⁻⁷. In this article, we describe the anatomy of the bronchial circulation and the non-bronchial systemic collaterals responsible for hemoptysis, imaging, BAE technique, the results and potential complications of this procedure.

PATHOPHYSIOLOGY OF ACUTE HEMOPTYSIS

In most of the conditions causing massive hemoptysis (90%), the bleeding occurs from the bronchial arteries⁸ rather than pulmonary circulation. Other less common causes of massive hemoptysis include bleeding source from aorta (aortobronchial fistula) or non-bronchial systemic collaterals⁹⁻¹¹. In chronic or acute lung conditions, there are obliterative changes in the pulmonary arteriolar level, leading to enlarged bronchial arteries. These high pressure systemic vessels often tend to rupture owing to increased regional blood pressure in an inflamed lung, leading to hemoptysis. The major cause of mortality in massive hemoptysis is asphyxiation due to hemoptysis, not the bleeding itself¹².

ANATOMY

Bronchial arteries have variable anatomic patterns¹³. The most consistently present arterial trunk is the right intercosto-bronchial arterial trunk (ICBT), seen in almost 80% individuals (Figure 1). The other patterns, as described by Cauldwell et al¹⁴ are described in following table.

Bronchial arteries originate from the descending thoracic aorta, between the level of fifth and sixth thoracic vertebrae, around the origin of the left main bronchus. Bronchial arteries can be distinguished by their branching pattern and their anatomical course along the major bronchi. In around 30% of patients, bronchial arterial origin can be aberrant, i.e., outside the normal origin at T5-T6 level^{15,16}. The common sources of aberrant bronchial arteries

Pattern	Description of bronchial arterial anatomy	Incidence
Type I	Two bronchial arteries on the left One ICBT on the right	40.6%
Type II	One artery on the left (Figure 2) One ICBT on the right	21.3%
Type III	Two arteries on the left Two on the right (one ICBT and one bronchial)	20.6%
Type IV	One artery on the left Two artery on the right (one ICBT and one bronchial artery (Figure 3))	9.7%

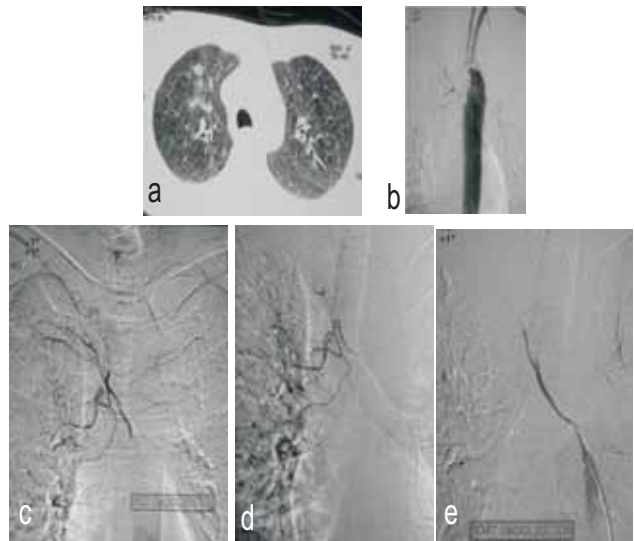


Figure 1 (a-e). Massive hemoptysis in a 50 year male who responded to BAE. Axial CT lung window section reveals ground glass opacity and nodules in right upper lobe (a). Flush aortogram reveals an intercostobronchial trunk (arrow) on the right side (b). Selective catheterization of the ICBT revealed enlargement and tortuosity of the bronchial artery and parenchymal blush (c,d). Embolization was performed using PVA particles (300microns). Post-embolization image revealed complete embolization of the trunk (e).