Section: General Medicine

Original Research Article

STUDY OF EFFECTIVENESS AND COMPLICATIONS OF BRONCHIAL ARTERY EMBOLISM IN RECURRENT HAEMOPTYSIS IN TELANGANA POPULATION

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Abstract

Background: If haemoptysis is severe, it becomes life-threatening. Hence, the ideal way to manage haemoptysis is bronchial artery embolism. **Materials & Methods:** 65 patients aged between 18 to 65 with haemoptysis were studied. Patients were embolised with Gel foam particles or PVA (polyvinyl alcohol). Under all aseptic precautions, the right femoral arterial access was taken with a 5F catheter, a selective bronchial artery angiogram was done with a cobra catheter, and blush was noted as indicating bleeding. Blood investigations included CBC, LFT, RFT, PT, INR, BT, CT, x-ray chest PA, CT thorax with contrast sputum AFB, gramme culture, and fungal culture sputum cartridge. A nucleic acid amplification test (CBNAAT) was done on the patients after haemoptysis was controlled. The patients were followed for up to six months. Repeat BAE is done in patients with PVA particles before refining to surgical intervention in cases with recurrent haemoptysis. **Results:** 13 (26.1%) had sputum AFB, 25 (38.4%) had CBNAAT, 8 (12.3%) were pyogenic, and 2 (3.01%) had a positive fungal culture. The co-morbidities were 2 (3%) COPD, 4 (6%) HTN, 6 (9.2%) DM, 2 (3%) HIV, 2 (3%) congulapathy, and 8 (12.3%) multiple co-morbidities. The complications were: 3 (4.6%) had puncture site haematoma, 32 (49.2%) had puncture site pain, 8 (12.3%) had transient chest pain, and 2 (3%) had transient neurological deficit. In the recurrent hemoptysis at 3rd month, 2 (3%) had severe haemoptysis. The BAE was repeated with PVA and referred for lobotomy. **Conclusion:** It is concluded that the major cause of haemoptysis was pulmonary tuberculosis. The BAE technique was successful therapy at 98% in the follow-up to 3 months; failures were referred to surgical intervention.

INTRODUCTION

Haemoptysis is a common complaint in daily clinical practice that needs further investigation. Haemoptysis is defined as the coughing of blood, streaked sputum, or gross blood that originates from the lower respiratory tract.[1] Hemoptysis, when massive and untreated, has a mortality rate of >50%. In the majority of patients, the source of massive hemoptysis is the bronchial circulation .[2]

Multi-detector CT angiography (MDCTA) of the chest is a sensitive, fast, and accurate tool for assessing the etiology of bleeding into the airways and helping in the management plan.

The overall goals in the treatment of haemoptysis are control of bleeding, prevention of aspiration, and treatment of the etiology.[3]

Bronchial artery embolism (BAE) is not considered the first-line therapy to control chronic recurrent mild and moderate haemoptysis. Since its introduction in 1973, clinical success immediately post-embolism has reached 73–99% of the patients. The most common complications of BAE are chest pains.[4]

Chronic recurrent haemoptysis can occur in chronic lung disease. Such as bronchiectasis and tuberculosis, in which haemoptysis is troublesome though not immediately life-threatening.[4] Hence, an attempt is made to evaluate the safety and efficacy of bronchial arterial angiography in the detection of the source of haemoptysis and bronchial artery embolisation for the management of recurrent or massive haemoptysis.

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MATERIALS AND METHODS

65 (sixty-five) patients regularly visited the respiratory medicine (chest medicine) department of the MediCiti Institute of Medical Sciences, Ghanpur Village, Medchal Mandal, Medchal Malkajgiri (dist), Telangana State-501401, Hyderabad were studied.

Inclusive Criteria

65 patients with massive haemoptysis who underwent brachial artery embolism (BAE) were selected, and clinically confirmed patients above 18 years old had moderate to severe haemoptysis. The patients who gave consent in writing were selected for the study.

Exclusion Criteria Patients below 18 years Non-pulmonary cause of hemoptysis (immunological lung disease, cardiac and vascular disease),[3] pulmonary artery aneurysm,[4] non-co-operative patients,[5] pregnant patients,[6] renal impairment or failure patients,[7] patients with severe ischemia of the lower limb,[8] immune compromised patients,[9] patients with thoracic or aortic aneurysm,[10] Patients with a known history of contrast were excluded from the study.

Method

Every patient was embolised with Gel foam particles or PVA sample size was calculated by non-probability convenient sampling.

All patients were enquired about the nature and duration of their illness, and were examined and evaluated for haemoptysis 1-Mild<20 ml/dm 2-Moderate 20-500 ml/day, 3- severe / massive > 500 ml/day or 1500 ml/hour or 100 ml / blood loss per day for three consecutive days.

History of the patients was also taken with special consideration to history of haemoptysis in the past history of tuberculosis. Underlying comorbidities like diabetes hypertension, human airway disease anticoagulation, trauma, previous history of bronchial artery embolism was noted. History regarding substance abuse and addiction was also noted. The blood examination included CBC, Blood sugar LFT (liver function test) renal function test (RFT), PT (prothrombin time), INR Ratio, BT (Bleeding time), CT (clotting time), chest x-ray PA view, and CT thorax with contrast, sputum Acid Fast Bacilli (AFB), gram culture and fungal culture.

Sputum cartridge base nucleic acid amplification test (CBNAAT) was done in the patients after haemoptysis was controlled.

All the patients were managed conservatively, and attempts to stabilize the patients were made before referring them to BAE. The procedure was done by an interventional radiologist using digital subtraction angiography. Under all aseptic precautions, the right femoral artery access was taken with an SF catheter. A selective bronchial artery angiogram was done with a cobra catheter, and blush was noted, indicating a bleeding site. Embolism was carried out using gel-form particles in 50 patients and PVA in 15 patients only.

A post-operative check angiogram was carried out to observe vascular sites. All the patients were advised to undergo strict immobilization for six hours after the removal of the sheath. Intra- and immediate post-procedure status was noted as puncture site hematoma pain or focal neurological deficit. All the complications were managed appropriately, and the patients included in the study were followed up on a monthly basis for six months. The history regarding symptoms and the recurrence of haemoptysis was noted and managed accordingly. Haemoptysis, if controlled post-procedure and in six-month follow-up, was considered a successful outcome;

Persistent haemoptysis even after the procedure or recurrence of haemoptysis within six months of the procedure was considered a failure.

The duration of the study was May 2021 to June 2023.

Statistical Analysis

Diagnosis of the patients with sputum examination, study of co-morbidities, study of complications by BEA procedure Study recurrence in patients was classified by percentage. The statistical analysis was carried out in SPSS software. The ratio of male and female was 2:1.

RESULTS

Table 1: Diagnosis with sputum examination

- 27 (41.5%) PT, 17 (26.1%) AFB, 25 (38.4%) CBNAAT, 8 (12.5%) pyogenic
- 20 (30.7%) had post tubercular sequale, 4 (6.1%) had Brochiectasis, 4 (6.1%) had Fungal ball, (Aspergillum) and 2 (3%) had fungal culture positive, 3 (4.6%) had lung malignancy, 7 (10.7%) were other.

Table 2: Study of co-morbid condition in patients with BAE having haemoptysis – 2 (3.07%) had COPD, 4 (6.1%) had HTN, 6 (9.2%) had DM, 2 (3.07%) had HIV 2

(3.07%) had coagulopathy, 8 (12.3%) had multiple comorbidities

Table 3: Study of complications – 3 (4.6%) had puncture site haematoma, 32

(49.2%) had pain at puncture site, 8 (12.3%) had transient chest pain, 2 (3.8%) had transient neurological deficit

Table 4: study of recurrent haemoptysis and management during follow up –

- In first month – 4 (6.1%) patients had mild/streaky pain and managed conservatively and cured
- In IInd Month – 3 (4.6%) patients had moderate pain and BAE was repeated with PVA and cured.
- IIIrd Month – 2 (3.07%) had severe pain BAE is repeated with PVA and referred for lobectomy.

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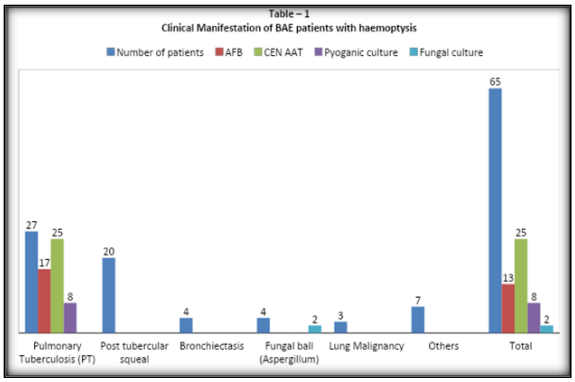
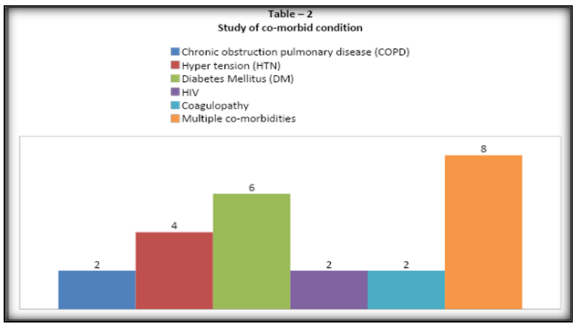


Figure 1:



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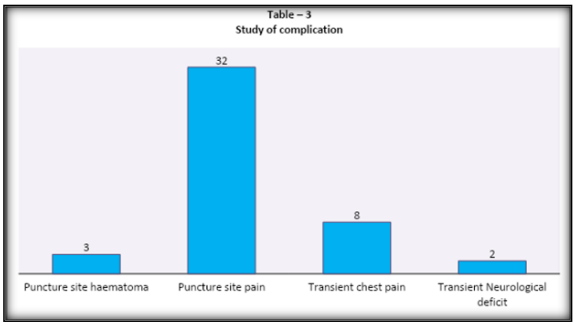

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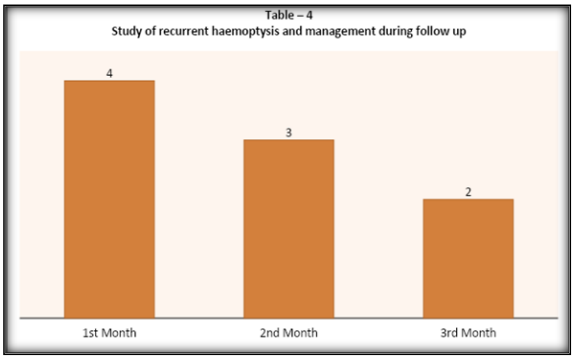

Figure 4:

Table 1: Clinical Manifestation of BAE patients with haemoptysis

Diagnosis	Number of patients	AFB	CEN AAT	Pyogenic culture	Fungal culture
Pulmonary Tuberculosis (PT)	27 (41.5%)	17(26.1%)	25 (38.4%)	8 (12.3%)	--
Post tubercular squeal	20 (30.7%)	--	--	--	--
Bronchiectasis	4 (6.1%)	--	--	--	--
Fungal ball (Aspergillum)	4 (6.1%)	--	--	--	2 (3.0%)
Lung Malignancy	3 (4.6%)	--	--	--	--
Others	7 (10.7)	--	--	--	--
Total	65 (100%)	13 (26.1%)	25 (33.4%)	8 (12.3%)	2 (3.0%)

Table 2: Study of co-morbid condition

Comorbid conditions	Number of patients
Chronic obstruction pulmonary disease (COPD)	2 (3.07%)
Hyper tension (HTN)	4 (6.1%)
Diabetes Mellitus (DM)	6 (9.2%)
HIV	2 (3.07%)
Coagulopathy	2 (3.07%)
Multiple comorbidities	8 (12.3%)

Table 3: Study complication

Complications	Number of patients
Puncture site haematoma	3 (4.6%)
Puncture site pain	32 (49.2%)
Transient chest pain	8 (12.3%)
Transient Neurological deficit	2 (3.07%)

Table 4: Study of recurrent haemoptysis and management during follow up

Time for recurrence	No. of patients	Severity (degree)	Management	End results
1st Month	4 (6.1%)	Mild/streaky	Conservative	Cured
2nd Month	3 (4.6%)	Moderate	Repeat BAE with PVC	Cured
3rd Month	2 (3.02%)	Severe	Repeat BAE with PVA	Required lobectomy

DISCUSSION

Present study of effectiveness and complications of bronchial artery embolism in recurrent haemoptysis in Telangana population. In the diagnostic study of sputum examination, 13 (26%) had AFB positive, 25 (38.4%) had CBNAAT positive, 8 (12.3%) were pyogenic, and 2 (3%) had fungal culture positive (Table 1). The co-morbidities were 2 (3%) COPD, 4 (6%) HTN, 6 (9.2%) DM, 2 (3%) coagulopathy,

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and 8 (12.3%) multiple comorbidities (Table 2). The complications were: 3 (4.6%) had puncture site haematoma, 32 (49.2%) had puncture site pain, 8 (12.3%) had transient chest pain, and 2 (3%) had transient neurological deficit (Table 3). In the recurrent study at 1st month, 4 (96%) had mild streaky pain managed with conservative treatment and cured. In the 2nd month, 3 (4.6%) had moderate haemoptysis. BAE was repeated with PVC and cured. In the 3rd month, 2 (3%) had severe haemoptysis. The patients did not respond to BEA and were referred to surgical intervention for lobectomy (Table 4). These findings are more or less in agreement with previous studies.[5,6,7]

Haemoptysis is defined as the expectoration of blood originating from the trachea, bronchial tree, or pulmonary parenchyma. Although haemoptysis is not dangerous, about 5–15% can be life-threatening, with a mortality rate of more than 50% if managed appropriately. BAE is a minimally invasive endovascular procedure with lower morbidity and mortality as compared with surgery. However, the main drawback of BAE is its recurrence rate, although few studies have reported the predictive factors of recurrent haemoptysis.[8]

Apart from pulmonary tuberculosis, cystic fibrosis and sarcordosis are more common factors of haemoptysis in western countries.[9]

With advances in technology and technique, the complications of BAE are gradually diminishing over the years, making it safe, but anterior spinal cord infarction is one of the most feared complications of BAE, with a reported incidence between 1.4% to 6.5% globally,[10] Such patients finally developed persistent paraplegia to avoid this major complication. A carefully reviewed pre-procedural angiogram and super selective embolism should be performed. Other major complications were transverse myelitis, bronchial infarction, and transitional cortical blindness, but such cases were not observed in the present study.

Hypervascularity was the most common angiographic abnormality (98% of cases) demonstrated during haemoptysis. It means increased calibre and branches of a systemic artery supplying an abnormal lung parenchyma. All cases with systemic pulmonary artery shunts demonstrated a sharp cut down of pulmonary arterial flow on the affected side with retrograde filling of the pulmonary artery from systemic circulation. This can be explained by the pressure gradient between systemic and pulmonary circulations that led to a physiological cut off of pulmonary artery flow on the affected side. The main source of bleeding in the present study was the bronchial arteries, followed by the intercostals and intercosto-bronchial arteries.[11] The recurrence of haemoptysis may be due to incomplete angiography to identify all bleeding vessels, recanalization of the embolized artery, neo vascularization, and collateral formation caused by persistent pulmonary inflammation.

CONCLUSION

In the present study, it is concluded that BAE is a safe, universally accepted procedure for the control of haemoptysis of varying aetiologies. BAE can be safely performed in both emergent and elective settings. Although there have been technical refinements leading to improved technical and immediate clinical success rates of BAE, haemoptysis recurrence remains high. While recurrences can be successfully managed with multiple repeat sessions, BAE essentially remains a palliative procedure for the management of haemoptysis in patients who are unfit to undergo more definitive treatments such as surgery. Moreover, an experienced and skilled radiologist can prevent the recurrence of haemoptysis and post-proceeding complications of BAE procedures.

Limitation of Study

Owing to the tertiary location of the research center, the small number of patients, and the lack of the latest technologies, we have limited findings and results.

- This research work was approved by the ethical committee of the MediCiti Institute of Medical Sciences, Ghanpur Village, Medchal Mandal, Medchal Malkajgiri (dist), Telangana State, 501401 Hyderabad.
- There is no conflict of interest.
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