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Role of Fibreoptic Bronchoscopy in the Evaluation of Haemoptysis

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ABSTRACT

Introduction: Hemoptysis is an alarming symptom requiring rapid evaluation in order to establish etiology and initiate treatment. This study aims to assess the diagnostic yield of bronchoscopy and outcomes of patients with hemoptysis.

Aims and objectives: To study the clinical profile, etiology and immediate outcomes among patients who underwent bronchoscopy for the purpose of evaluation of hemoptysis.

Materials and Methods: This one year retrospective study included all patients who underwent bronchoscopy as part of evaluation of haemoptysis. Collected data was analyzed using SPSS software.Chi Square test was performed and p value calculated. A p value of <0.05 was considered statistically significant.

Results: The most common diagnosis determined were pulmonary tuberculosis (31.7%), bronchiectasis (23.7%), bronchogenic carcinoma (13.2%), community acquired pneumonia (10.5 %) and post TB fibrosis (7.9%) Less common etiologies included aspergillosis (2.6%), mucormycosis (2.6%), lung abscess (2.6%) and pulmonary infarct (2.6%). There was one isolated case of bronchogenic carcinoma with pulmonary tuberculosis.

Conclusion: Bronchoscopic evaluation of hemoptysis is beneficial in controlling haemoptysis, determining etiology and is also exceptionally accurate in detecting PTB in sputum negative individuals.

Keywords: BAL, AFB, TB, Malignancy, PCR, Haemoptysis

INTRODUCTION

Haemoptysis is coughing out of blood in sputum. It can originate from tracheobronchial tree or from lung parenchyma.[1] It has to be differentiated from pseudo haemoptysis by thorough history taking and physical examination. Most cases of pseudo haemoptysis are due to upper respiratory or upper gastrointestinal causes.[2] Although majority of the cases are due to benign causes and are self limiting, some can be severe and due to serious causes.[1] Based on the quantity of expectorated blood, haemoptysis can be graded as mild/minor if expectorated blood is less than <30 mL, moderate to severe (major) if 30 to 300ml, and massive if its more than 300 to 400 mL in 24 hours.[3] Haemoptysis is an alarming symptom requiring rapid evaluation in order to establish etiology and initiate treatment. Chest X-ray is the initial investigation of choice in patients who are haemo dynamically stable. Most often it will show some abnormality which can guide evaluation. If Chest X-ray is normal or when patient has massive haemoptysis, further evaluation can be done by CT scan with or without bronchoscopy.[1] Al though massive haemoptysis account for 5% of cases, mortality can be as high as 50%.[4]

Bronchoscope is the instrument used to visualize the tracheobronchial tree. The rigid bronchoscope was first invented in the year 1897 by Gustav Killian.[5] It was only

in 1968 that Shigeto Ikeda invented the flexible bronchoscope and revolutionized the use of bronchoscopy. Flexible bronchoscope helps in the visualization of airways upto subsegmental bronchi thereby providing details about the origin of pathology until this point.[6]

As the tracheobronchial tree is directly visualized, localization of a bleed in a case of haemoptysis can be easily achieved and etiology determined.[7] This study aims to assess the role of bronchoscopy in haemoptysis.

Aims and Objectives

To study the clinical profile, etiology and immediate outcomes among patients who underwent bronchoscopy for the purpose of evaluation of hemoptysis.

MATERIALS AND METHODS

This retrospective study was done in Father Muller medical college for a period of 1 year. It included all patients who underwent bronchoscopy as part of evaluation of haemoptysis. The study collected data from subjects fulfilling the selection criteria.

Method: Based on a structured proforma, details were collected to include patient demographics, relevant clinical history, Chest X-ray and CT scan findings, any complications during procedure and bronchoscopic findings along with lavage and biopsy findings if any were collected. This data was further analyzed to establish frequency of etiology, clinical profile and outcomes then entered into Microsoft excel and converted into statistical software package for social sciences to obtain descriptive statistics. Statistical analysis was done using chi square test. A p value of < 0.05 was considered significant.

RESULTS

Our study included 38 patients with a mean age of 52; oldest patient was 75 years old and youngest 19 years old. 31 patients were males (81.6%) and 7 were females (18.4%). 34 (89.5 %) patients presented with mild haemoptysis, 3 (7.9 %) with moderate and 1(2.6 %) with massive hemoptysis. 26.3 % of the patients had pulmonary tuberculosis (PTB) in the past. 60.5 % of the patients were smokers.

Table 1: Demographics of the study group

Haemoptysis	Males		Females		Total
	Smokers	Nonsmokers	Smokers	Nonsmokers	
Mild	19	8	0	7	34 (89.5%)
Moderate	3	0	0	0	3 (7.9%)
Massive	1	0	0	0	1 (2.6%)
Total	23	8	0	7	38 (100%)

10 (26.3 %) patients had no abnormality detected on chest X-ray. 28 patients (73.7 %) had abnormal findings out of which 17 patients (44.7 %) had right sided, 8 patients (21.1%) had left sided and 3 patients (7.9 %) had bilateral lung involvements. 92.1% had a normal Haemoglobin level. 31.6 % cases had elevated WBC count. All the patients had normal coagulation profiles.

CT scan showed abnormality in all the cases and sputum was negative for Acid fast bacilli (AFB) by fluorescent staining in all cases and hence they were subjected to bronchoscopy.

Bronchoalveolar lavage (BAL) was done, origin of haemoptysis identified and in moderate/severe cases, instillation of 500mg tranexamic acid was done intrabronchially. BAL was subjected to relevant investigations based on diagnosis suspected on CT scan.

12 cases were suspected to have active tuberculosis. BAL of all 12 were Polymerase Chain Reaction (PCR) positive for mycobacterium tuberculosis by GeneXpert method and liquid culture. 10 out of these 12 cases were positive for acid fast bacilli by fluorescent staining. Out of these 12 cases, 2 cases showed rifampicin resistance in GeneXpert which was later confirmed by culture and sensitivity. One of

these was a primary MDR and one was a secondary MDR.

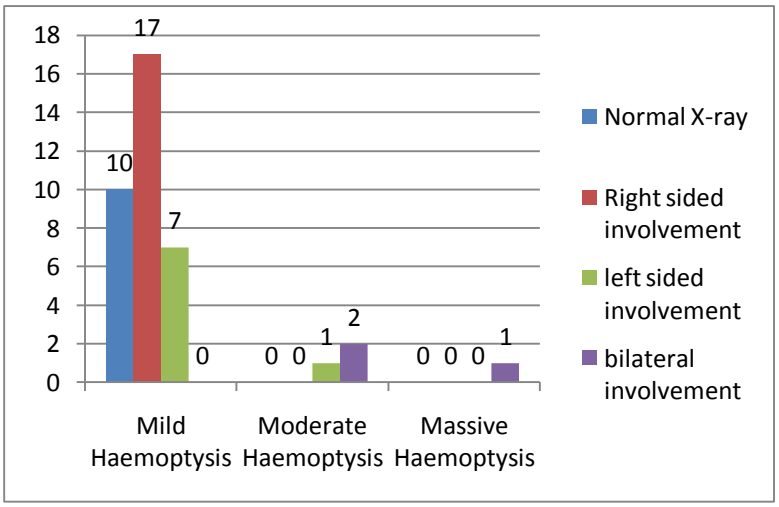

Figure 1: Chest X-ray findings

Table 2: Sputum and BAL AFB correlation

			sputum for AFB negative	Total
BAL for AFB	negative	Count	26	26
		%	68.4%	68.4%
	positive	Count	12	12
		%	31.6%	31.6%
Total		Count	38	38
		%	100.0%	100.0%

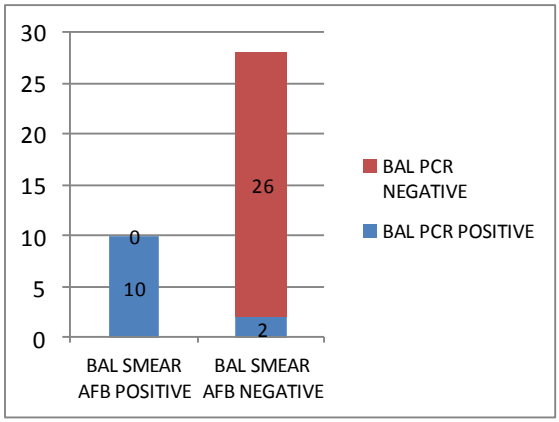

Figure 2: BAL smear and PCR findings

3 cases had post TB fibrosis on CT scan. Bronchoscopy showed bronchial mucosal irregularity with mucoid secretions. BAL of these patients was negative for AFB, PCR and cultures. 9 patients had bronchiectasis on CT. Bronchoscopy showed dilated subsegmental bronchi in all cases. PCR and cultures were negative.6 cases were showing features of malignancy on CT scan which was confirmed by bronchoscopy. Biopsy reports were suggestive of malignancy. One out of these 6 cases had active tuberculosis also as determined by BAL AFB, PCR and liquid culture. 4 cases showed consolidation on CT scan. BAL PCR was negative. Cultures showed growth of klebsiella in 2 cases, pseudomonas, streptococci in one each cases. One each case of disseminated aspergillosis and mucormycosis was confirmed by KOH mount and fungal culture of BAL. There was an isolated case of lung abscess, BAL PCR of which was negative and culture showed pseudomonas. One isolated case of pulmonary infarction was diagnosed when CT scan showed a peripheral consolidation in right lower lobe, PCR and cultures were negative and CT pulmonary angiography confirmed infarction. There were no intra-procedural or post procedural complications encountered.

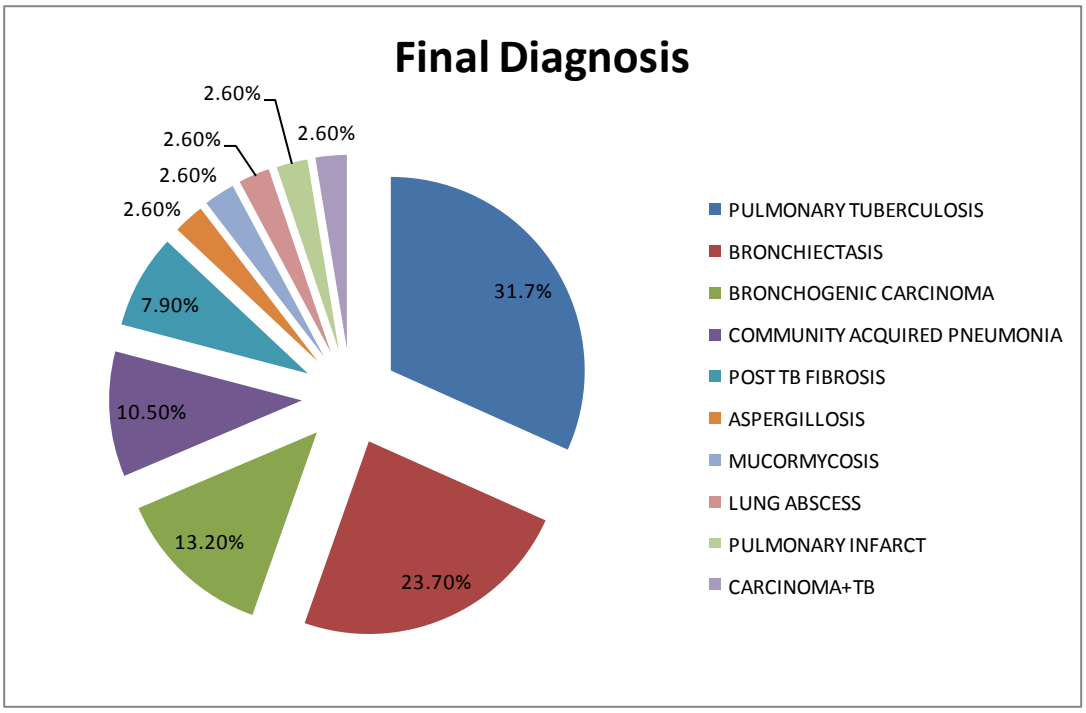

Figure 3: Final diagnosis of patients of our study

Table 3: Correlation of amount of haemoptysis to final diagnosis

	Mild Haemoptysis	Moderate Haemoptysis	Massive Haemoptysis	Total
Tuberculosis	9	3	0	12 (31.7%)
Bronchiectasis	9	0	0	9 (23.7%)
Malignancy	5	0	0	5 (13.2%)
CAP	4	0	0	4 (10.5%)
Post TB fibrosis	3	0	0	3 (7.9%)
Aspergillosis	1	0	0	1 (2.6%)
Mucormycosis	1	0	0	1 (2.6%)
Lung Abscess	1	0	0	1 (2.6%)
Pulmonary Infarction	1	0	0	1 (2.6%)
TB+malignancy	0	0	1	1 (2.6%)
Total	34	3	1	38 (100%)

Table 4: correlation between smoking and final diagnosis

			Smoking		Total
			NO	YES	
DIAGNOSIS	Infections	Count	8	12	20
		%	53.3%	52.2%	52.6%
	Bronchiectasis	Count	5	4	9
		%	33.3%	17.4%	23.7%
	Post TB fibrosis	Count	1	2	3
		%	6.7%	8.7%	7.9%
	Malignancy	Count	0	5	5
		%	0.0%	21.7%	13.2%
	Pulmonary infarct	Count	1	0	1
		%	6.7%	0.0%	2.6%
Total		Count	15	23	38
		%	100.0%	100.0%	100.0%

When Chi-square test was applied (X2=5.818), p value was 0.213 which means the relation between smoking and final diagnosis was not statistically significant though TB and malignancy was more commonly found among smokers.

Table 5: Correlation of BAL AFB with diagnosis

			BAL for AFB		Total
			Negative	Positive	
DIAGNOSIS	Infections	Count	8	12	20
		%	30.8%	100.0%	52.6%
	Bronchiectasis	Count	9	0	9
		%	34.6%	0.0%	23.7%
	Post TB fibrosis	Count	3	0	3
		%	11.5%	0.0%	7.9%
	Malignancy	Count	5	0	5
		%	19.2%	0.0%	13.2%
	Pulmonary infarct	Count	1	0	1
		%	3.8%	0.0%	2.6%
Total		Count	26	12	38
		%	100.0%	100.0%	100.0%

When BAL AFB was correlated with final diagnosis using chi square test (x2=15.785), p value was 0.003 which is highly significant.

Table 6: Correlation of BAL PCR with diagnosis

			BAL PCR		Total
			Negative	Positive	
DIAGNOSIS	Infections	Count	7	13	20
		%	28.0%	100.0%	52.6%
	Bronchiectasis	Count	9	0	9
		%	36.0%	0.0%	23.7%
	Post TB fibrosis	Count	3	0	3
		%	12.0%	0.0%	7.9%
	Malignancy	Count	5	0	5
		%	20.0%	0.0%	13.2%
	Pulmonary infarct	Count	1	0	1
		%	4.0%	0.0%	2.6%
Total		Count	25	13	38
		%	100.0%	100.0%	100.0%

When BAL PCR was correlated with final diagnosis using chi square test (x2=17.784), p value was less than 0.001 which is highly significant.

Table 7: correlation between Chest X-ray findings with BAL AFB.

			BAL for AFB		Total
			positive	negative	
Chest X-ray	Abnormal	Count	6	22	28
		%	50.0%	84.6%	73.7%
	Normal	Count	6	4	10
		%	50.0%	15.4%	26.3%
Total		Count	12	26	38
		%	100.0%	100.0%	100.0%

Even in 6 patients with normal chest X-ray and sputum being negative for AFB, BAL fluid was smear positive for AFB. p value is 0.024 which is highly significant. Similarly p value for BAL PCR is 0.005 which is statistically significant.

Table 8: correlation between past history of TB with final diagnosis

			DIAGNOSIS					Total
			Infections	Bronchiectasis	Post TB fibrosis	Malignancy	Pulmonary infarct	
Past h/o TB	n	Count	16	6	0	5	1	28
		%	80.0%	66.7%	0.0%	100.0%	100.0%	73.7%
	y	Count	4	3	3	0	0	10
		%	20.0%	33.3%	100.0%	0.0%	0.0%	26.3%
Total		Count	20	9	3	5	1	38
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Patients with prior history of Tb are at more risk of developing reinfection or reactivation of TB as well as other infection. p value was 0.025 which is highly significant.

The sensitivity of bronchoscopy in arriving at a diagnosis was 97%. With the help of CT scan, the sensitivity touches 100%.

DISCUSSION

The underlying disease causing hemoptysis may involve the airways, the pulmonary parenchyma or the pulmonary veins themselves. The most common overall causes of hemoptysis include bronchiectasis, chronic bronchitis and lung cancer.[8,9] However in our study, the relative frequency of etiology in descending order of occurrence included pulmonary tuberculosis followed by bronchiectasis, bronchogenic carcinoma and pneumonia. The diagnosis of the patients with PTB was made based on bronchial washings and lavage testing PCR GeneXpert positive, as they were all sputum negative during initial evaluation.11 out of these 13 cases (including a case of TB with malignancy) were BAL positive for AFB. In addition to the diagnosis, GeneXpert gave an added advantage to diagnose multidrug resistant TB. There was a reduction in hemoptysis post procedure as we instilled 500mg of tranexamic acid intrabronchially at the site of bleeding.

Numerous studies over the span of several years have demonstrated the crucial role of bronchoscopy in haemoptysis. A study done by Ficket et al in Germany showed that it is essential to identify the underlying cause in order to initiate a target-oriented or causal therapy. Simultaneously basic diagnostic measures, i. e. appropriate laboratory tests, chest X-ray, computed tomography scan of the chest and bronchoscopy have to be performed.[8] Another study done on 52 patients in Kuwait concluded that emergency management of haemoptysis depends upon localization of the site of bleeding by roentgenogram, computerized chest tomography and bronchoscopy. Bronchiectasis and pulmonary tuberculosis were the major causes of haemoptysis in this study.[9]

A study doneby Tsoumakidou et al in Greece designed to evaluate the relative frequency of different causes of hemoptysis and the value of chest radiography, computed tomography (CT) scanning and fiber-optic bronchoscopy. They concluded that bronchiectasis was the main diagnosis in patients admitted with hemoptysis and it was more frequent among nonsmokers with moderate/severe bleeding and/or previous tuberculosis infection. The study also demonstrated that smokers with hemoptysis were at an increased risk for lung cancer and needed to be extensively evaluated with chest CT and bronchoscopy.[10] this correlates well with our study findings. A retrospective study done in China found that the haemoptysis recurrence rate was higher in chronic TB than in bronchiectasis.[11] In a study done in France it was found that bronchiectasis, cancer and tuberculosis accounted for the majority of haemoptysis requiring intensive care unit admission. Bedside evaluation and bronchoscopic evaluation was considered to be the investigation of choice to screen for requirement of bronchial artery embolization.[12] In a retrospective study done in Thailand, chest radiographs revealed unilateral, bilateral lesions and normal lungs in 57.4, 40.6, and 2.0%, respectively. A chest CT was done in 14.8% of patients. Bronchoscopy localized the bleeding and diagnosed the etiology in 19.8%. The most common causes of massive hemoptysis were bronchiectasis (33.7%), active pulmonary tuberculosis (20.8%) and malignancy (10.9%). It hence concluded that the most common cause of massive hemoptysis is benign rather than malignant disease. Intensive care including bedside bronchoscopy with conservative treatment should be applied vigorously.[13] A study done in the ICU setting when dealing with massive hemoptysis demonstrated that urgent bronchoscopy should be performed in unstable patients as it exacts a paramount role in the diagnostic search and therapy.[14]

Another study done in 1994 by Cahill et al concluded that early bronchoscopy, preferably during active bleeding, should be performed with three goals in mind: to lateralize the bleeding side, localize the specific site, and identify the cause of the bleeding.[15] A prospective study done in 2003 by Ong et al proved that bronchoscopy was more helpful in localising the bleeding (site of bleeding identified in 90%) than chest X-ray alone (identified site of bleeding in 64%). Bleeding was stopped with medical therapy in 26% patient and 51 % patients underwent bronchial artery embolization. It hence concluded that bronchoscopy should be performed to help localise the bleeding site.[16]

The findings of the present study correlates well with the above mentioned studies. Patients with smoking and past history of TB have higher risk of haemoptysis. Although majority of patients have mild haemoptysis and may have normal chest X-ray, CT scan and bronchoscopic evaluation is necessary to confirm the diagnosis and to reduce the amount of bleeding. It can also guide regarding the need of bronchial artery embolization and surgical measures if necessary.

CONCLUSION

Our study demonstrates that bronchoscopic evaluation of haemoptysis is beneficial in determining etiology and also to reduce amount of bleeding. When combined with CT scan, it increases the sensitivity to 100%. Bronchoalveolar lavage is also exceptionally accurate in detecting pulmonary tuberculosis in sputum negative individuals which make it a valuable tool especially in the Indian scenario. Our study is limited by the number of cases. Long term studies with more number of patients are required to ascertain this study.

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