Determination Of Etiology Of Hemoptysis In Patients With Normal Chest Radiograph: Bronchoscopy/High Resolution CT Scan Correlation

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Citation

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Abstract

Introduction: The exact role of fiberoptic bronchoscopy (FOB) and high resolution CT of chest (HRCT) in the diagnosis of etiology of patients presenting with hemoptysis and normal chest radiograph has not been clearly defined.

Methods and materials: A prospective study was designed to evaluate 50 patients presenting with a hemoptysis and a normal chest radiograph using FOB and high resolution computed tomography (HRCT). When we could not detect the etiology of hemoptysis with use of HRCT and FOB we used other diagnostic tools (PFT, ECHO, etc.).

Results: A definite diagnosis was established in 45(90%) patients. The etiologies included bronchiectasis in 19 (38%), Tuberculosis in 11(22%), Bronchitis in 6 (12%), Bronchial Adenoma in 1(2%), Bronchogenic Carcinoma in 1(2%), concomitant Tuberculosis-Bronchiectasis in 3 (6%), and other rare etiologies in 4 (8%). The diagnosis was made by HRCT in 19 cases (38%), by FOB in another 19 (38%), and by the other tools in 4 (8%), combined HRCT-bronchoscopy in 3 cases (6%), 5(10%) were undiagnosed. The diagnosis was made by HRCT and FOB in 41 (82%).

Conclusion: It is concluded that there is high prevalence of TB and bronchiectasis in our population. We should perform both HRCT and FOB in all patients with hemoptysis and normal chest X-ray.

INTRODUCTION

Hemoptysis is a very common and important symptom in clinical practice. It is reported in 7-15% of patients evaluated in chest clinic ([1]). A number of patients presenting with hemoptysis may have a serious underlying disorder as tuberculosis and bronchogenic carcinoma ([2]) .In approximately 10%-30% of the patients, the cause remains indeterminate ([3]) .The diagnosis of the cause of hemoptysis is often difficult, more so in patients presenting with a normal chest x-ray (1). Such patients constitute 20-30% of those with hemoptysis ([3],[4]) .The role of fiber-optic bronchoscopy (FOB) is not well established when the chest radiograph is normal. Studies have been performed to evaluate such patients using either computed tomography (CT of chest) or FOB. Although few studies have been reported in the western and Indian literature ([1],[2],[5],[6]) . The present prospective study was performed to evaluate both of these modalities in Iranian patients.

METHODS

Fifty patients with hemoptysis and normal chest X-ray were studied prospectively from 1998 to 2001 . All patients were subjected to a detailed history and physical examination including ear, nose, throat (ENT) exams. Twenty-three patients had severe hemoptysis (volume of hemoptysis > 600cc/24 Hrs) and 27 patients had mild to moderate hemoptysis (volume of bleeding<600 cc /24). Patients with a definite localizing abnormality on chest X-ray, a previous history of lung cancer, a bleeding lesion in the upper respiratory tract or oral cavity, cardiac lesion resulting in pulmonary hypertension, bleeding diatheses, and a history of oral anticoagulant or antiplatelet drug intake were excluded from the study. Chest radiographs of all patients were reported as normal. A radiologist interpreted the chest

radiograph. CT scans of the chest were performed using the Siemens,Germany Scanner. All scans were obtained using the following protocol: Conventional 8 mm-thick axial sections were obtained at every 16mm interval from apex to lung base, followed by high resolution scan (2mm sections) at 10mm interval from the apex to carina , then high resolution CT scan (HRCT) with section 4 mm-tick through major airways. Finally, high-resolution 2mm thick section were obtained at 10 mm intervals through the lung base. Intravenous contrast was administered only when necessary. A senior radiologist analyzed scans. The technique of FOB has been described for all patients and done with Olympus video fiberoptic bronchoscope. All patients were fasted overnight.Premedication included 25 mg prometazin and 0.5 mg atropine was given intramuscularly 30 min prior to procedure. With the patients in supine position, the bronchoscope was passed transnasally after adequate topical anesthesia of the nasal passages and pharynx was applied. Thereafter, a thorough examination of the upper airway and tracheo bronchial tree was performed. Supplemental oxygen via nasal catheter was administered throughout the procedure. Routine bronchial washings were obtained and processed with Papanicolaous and Ziehl-Nielsen stains for malignant cells and mycobacterium tuberculosis respectively. Bronchial biopsies and brushings were performed as indicated. Other pertinent tests (pulmonary function tests, Echocardiogram, radionucleide scanning of lung) were performed when indicated.

RESULTS

The study included 27 male(54%) and 23 female(46%), with ages ranging from 13 to 77 years (mean: 43 years).These results are shown in tables 1and 2 . The majority of patients were in the 30-39 years old age group (26 patients) and 26 patients were older than 60 years.

Figure 1

Table 1: Demographic Features of the Study Population

Sex Age	Number		Percent	
	M	F	M	F
<20 years	1	2	2%	4%
20-29	2	3	4%	6%
30-39	7	6	14%	12%
40-49	5	5	10%	10%
50-59	4	2	8%	4%
≥60	8	5	16%	10%
Sum	27	23	54%	46%
Total	50		100%	

Figure 2

Table 2: Rate and Percent of Underlying Disease by Sex In population study

Sex UD*	M		F	
	Number	Percent	Number	Percent
Bronchiectasis	9	18%	10	20%
Tuberculosis**	4	8%	7	14%
Bronchitis	3	6%	3	6%
TB+Bronchiectasis	-	-	3	6%
CHF+MS***	1	2%	-	-
PE****	1	2%	-	-
Pneumonia	1	2%	-	-
Asthma	1	2%	-	-
Bronchial Adenoma	1	2%	-	-
Squmous cell carcinoma	1	2%	-	-
Unknown	3	6%	2	4%
TOTAL	25	50%	25	50%

*Underlying Disease **Tuberculosis ***Congestive Heart Failure+Mitral Stenosis **** Pulmonary Embolism

A history of smoking was obtained in 13 patients (26%) and 22 patients had severe hemoptysis. None of the patients had bleeding, coagulation disorder, or special diseases. Twenty two patients had severe hemoptysis (46%). The correlation between severity of hemoptysis and type of disease is shown in table 3.

Figure 3

Table 3 : The Rate and Percent of Underlying Disease by the Severity of Hemoptysis.

Severity Underlying Disease	Severe		Mild	
	Number	Percent	Number	Percent
Bronchiectasis	13	26%	6	12%
Tuberculosis	2	4%	9	18%
Bronchitis	2	4%	4	8%
TB+Bronchiectasis	1	2%	2	4%
CHF+MS	1	2%	-	-
PE	1	2%	-	-
Pnomonia	-	-	1	2%
Asthma	-	-	1	2%
Bronchial Adenoma	1	2%	-	-
SCC	1	2%	-	-
Unknown	1	2%	4	8%
TOTAL	23	46%	27	54%

A definite diagnosis was established in 45 patients (90%). An accurate diagnosis in 40 patients (80%) was made by combination use of CT scan and FOB. CT scanning of chest in was diagnostic in 22 patients (44%), but was nonspecific in the remaining patients (56%). Definite diagnosis was established bronchoscopically in 21 patients (42%). Fourteen of these patients were proved to have tuberculosis. Three of these patients also had evidence of bronchiectasis on CT scan (6%). Six patients had endoscopic evidence of bronchitis (12%). One patient had focal narrowing in bronchoscopy due to bronchial adenoma (2%). Another one

had squamous cell carcinoma (2%). Four patients (8%) had other disease such asthma (1 patient: 2%), Congestive Heart failure (1 patient: 2%), Pulmonary Embolism (1 patient: 2%), Pneumonia (1 patient: 2%). Five patients (10%) had not definite diagnosis.

Figure 4

Table 4: Rate and Percent of Bronchiectasis and Tuberculosis by the Age-Groups.

Disease / Age	Bronchiectasis		TB	
	Number	Percent	Number	Percent
<20 years	1	2%	1	2%
20-29	1	2%	-	-
30-39	5	10%	3	6%
40-49	5	10%	3	6%
50-59	4	8%	1	2%
>60	3	6%	3	6%
TOTAL	19	38%	11	22%

Figure 5

Table 5: Correlation of Efficiency of High Resolution CT scan / Bronchoscopy in the Diagnosis of Underlying Disease in population study.

Diagnostic tools / Underlying Disease	HRCT		Bronchoscopy /BAL	
	Positive	Negative	Positive	Negative
Bronchiectasis	22	23	-	45
Tuberculosis	-	45	14	31
Bronchitis	-	45	6	39
CHF	-	45	-	45
PE	-	45	-	45
Pneumonia	-	45	-	45
Asthma	-	45	-	45
Bronchial Adenoma	-	45	1	44
Squamous Cell Ca	-	45	-	45

Figure 6

Table 6 : Rate and Percent by the Underlying Disease in population study

Underlying disease	Ultimate diagnosis	Number	Percent
Bronchiectasis	HRCT*	19	38%
TB	Bronchoscopy	11	22%
Bronchitis	Bronchoscopy/BAL	6	12%
TB+Bronchiectasis	Bronchoscopy/BAL-CT	3	6%
CHF+MS	Echocardiography	1	2%
PE	Radio Isotope Scan	1	2%
Pneumonia**	Clinical-Xray response	1	2%
Asthma	PFT***	1	2%
Bronchial Adenoma	Bronchoscopy/Biopsy	1	2%
Squamous Cell Ca	Open Biopsy	1	2%
Unknown	-	5	10%
TOTAL		50	100%

*High Resolution CT scan

**A diagnosis of pneumonia was made by the response to antibiotics

***Pulmonary Function Tests.

DISCUSSION

Objective diagnostic criteria are becoming increasingly important to the clinician. In a patient presenting with hemoptysis and normal chest radiograph, it is necessary to use diagnostic tools such as HRCT and bronchoscopy to get an accurate diagnosis. The frequent reports confirm that disease such as Tuberculosis, bronchiectasis, and Lung Cancer are the major reasons of hemoptysis with a normal chest x-ray (2 ,$_{7}$) .Hemoptysis is an important symptom of pulmonary disease reported in 7-15% of patients ($_{8}$) .In 50% of patients presenting with hemoptysis, the underlying cause remains undetermined despite extensive investigations ($_{9}$). The diagnosis of the etiology of hemoptysis is often difficult more so in patients with normal chest X-ray. In the present study, a definite diagnosis was made in 45 patients (90%) . The diagnosis was made by high resolution CT (HRCT) in 19 patients (38%), by FOB in another 18 (36%), and in three patients with concomitant tuberculosis and bronchiectasis, the diagnosis was made by HRCT and FOB. In five patients (10%) the diagnosis was made by the other means (PFT,ECO,etc.) . In the study of Magu et al, the definite diagnosis was obtained by HRCT in 53% of patients (7). The only disease that was solely diagnosed by HRCT was bronchiectasis (19 patients: 38%). Several studies confirm the efficacy of HRCT in establishing the diagnosis of bronchiectasis (1 , 2 , 7). However Bavender et al emphazised that high resolution CT scan of chest is not absolutely needed in patients with hemoptysis and normal chest X-ray ($_{10}$). FOB does not have a direct role in the diagnosis of bronchiectasis. A definite diagnosis is possible in 95% of bromchoscopically visible primary malignancy (2). In addition, FOB is also useful in localizing the site of bleeding and evacuation of blood clots. FOB also has other potential therapeutic uses such as the application of fibrinogen-thrombin treatment of massive hemoptysis, and endobronchial brachytherapy for treatment of primary and recurrent bronchogenic carcinoma ($_{11}$). Despite all that, the overall diagnostic accuracy of FOB in patients presenting with hemoptysis and normal chest is low (0 to 17%) (3 ,7 , $_{12}$,$_{13}$). The results in our study were relatively high.(36% : 18 patients). The high efficacy of FOB in the definite of diagnosis of disease may be related to high incidence of TB in our country. The prevalence of pulmonary TB is variable in patients presenting with normal chest radiography and hemoptysis (from 2% up to 20%) (1 ,7 , $_{14}$). In our study,

the incidence of TB was 22 % which is compatible with study results of Magus et al. A definite diagnosis (TB,bronchiectasis) was made by the combination of HRCT and FOB in 6% of the cases. The prevalence of bronchogenic carcinoma is low in patients presenting with normal chest X-ray, varying from 0 to 16%. Zavalu reported malignancy in 9 out of 55 patients ([15]), whereas in other study, the prevalence of malignancy was much lower ([16] , [17,18,19]). In our study, only one patient had bronchogenic carcinoma. We believe that the prevalence of malignant neoplasm is low in patients with hemoptysis and normal chest X-ray (2, 3, 12,15). In addition, in 5 patients (10%), definite diagnosis was established by using other means (PFT, perfusion scan ,Echocardiography, response to antibiotic, follow-up chest X-ray). Finally, there were 5 patients (10%) in whom a definite diagnosis was not made.

CONCLUSION

Due to the high prevalence of bronchiectasis and tuberculosis, it is necessary to use diagnostic tools that allow us to reach definite diagnosis in patients with hemoptysis and normal chest X-ray. It appears that high-resolution CT scan and FOB are not competitive but complementary in assessing patients with hemoptysis and normal chest X-ray. High resolution CT scan cannot replace FOB in its ability to provide biopsy and fluid specimens for histologic and bacterologic examination. However, FOB is unable in detecting peripheral airway disease, especially bronchiectasis. Based on our results, we currently suggest performing HRCT and FOB together as first investigations of choice in patients with hemoptysis and normal chest radiograph unless diagnosis of Tuberculosis is made by using sputum analysis.

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