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Research Article

A CLINICAL STUDY ON ETIOLOGY OF HEMOPTYSIS AND DIAGNOSTIC YIELD OF HIGH-RESOLUTION COMPUTED TOMOGRAPHY THORAX AND FIBEROPTIC BRONCHOSCOPY IN PATIENTS PRESENTING WITH HEMOPTYSIS

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ABSTRACT

Objective: About 20–30% of patients with hemoptysis may show normal or non-localizing chest X-ray. Whether the clinician should choose computed tomography (CT) scan of the thorax or fiberoptic bronchoscopy (FOB) as the first diagnostic option in evaluating patients with hemoptysis and those who are with a normal chest radiograph (CXR) is still debatable. In this study, we have tried to explore the causes of hemoptysis and compare the diagnostic yield of FOB and high-resolution CT (HRCT) thorax in the evaluation of hemoptysis.

Methods: It was a single institutional prospective study among patients presented with hemoptysis. After stabilization and control of hemoptysis, all patients underwent CT thorax. In cases where the cause of hemoptysis could not be diagnosed by CT scan was diagnosed by FOB.

Results: The mean age of the overall study population was 39.83±12.6 years. Male: female ratio was 1.7:1. In this study, the etiology of hemoptysis was diagnosed by HRCT in 18 (25%) cases and by FOB in 32 (44.4%) cases. In 16 cases, diagnosis was not possible by CT and FOB. Bronchiectasis was the most common (22.2%) pathology diagnosed followed by pulmonary tuberculosis (20.8%). Bronchogenic carcinoma constituted 12.5% of cases, and 22.2% cases of hemoptysis were idiopathic.

Conclusion: Both CT and FOB play a definite role in diagnosing the etiology of hemoptysis and they are complementary to each other in the diagnosis of hemoptysis.

Keywords: Hemoptysis, High-resolution computed tomography Thorax, Fiberoptic bronchoscopy.

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INTRODUCTION

The coughing up of blood is termed hemoptysis. The amount of blood produced varies from mere blood streaking of expectorated sputum to massive volumes of pure blood. Any part of the lower respiratory tract can be the source of bleeding, which includes the trachea, bronchi, bronchioles, and alveoli. The differential diagnosis of hemoptysis includes disorders arising within the airways and the pulmonary parenchyma [1]. Inflammatory processes (e.g., bronchitis and bronchiectasis) and neoplasms are the most common causes of blood arising within the airways. Within the pulmonary parenchyma common causes are infections, such as tuberculosis, pneumonia, aspergillosis, or lung abscess. Pulmonary edema due to left atrial failure can also give rise to hemoptysis.

For proper management, it is necessary to diagnose the exact cause of hemoptysis. A thorough physical examination may provide helpful clues to diagnosis. A chest radiograph (CXR) is essential for the diagnostic evaluation of hemoptysis. In general, it provides direction for further workup, as to the need for other diagnostic tests. However, about 20–30% of patients with hemoptysis may show normal or non-localizing CXR. Moreover, some of the lung parenchymas are obscured by ribs, diaphragm, mediastinal structures, and clavicle. Therefore, abnormalities localized behind these structures may not show-up on plain chest radiographs and require special views [2].

Fiberoptic bronchoscopy (FOB) allows direct visual examination and collection of tissue samples from the proximal endobronchial tree [3,4]. However, FOB is not useful in detecting lesions within the distal airways and the lung parenchyma.

On the other hand, computed tomography (CT) scan of thorax may detect both endobronchial and parenchymal abnormalities but does not allow tissue sampling for histological diagnosis. It is a useful noninvasive screening investigation for planning further invasive diagnostic tests. Proximal endobronchial abnormalities detected by CT scan would need further assessment by FOB. Patients without abnormalities on CT scans would be spared of invasive diagnostic procedures.

Whether the clinician should choose a CT scan of the thorax or FOB as the first diagnostic option in evaluating patients with hemoptysis and those who are with normal CXR is still debatable. In this study, we have tried to explore the causes of hemoptysis and compare the diagnostic yield of FOB and CT Thorax in the evaluation of hemoptysis.

METHODS

It was a descriptive, observational, study among patients presented with hemoptysis at the respiratory medicine department of our institute in the period of January 2019–April 2020. The study was initiated after getting ethical clearance from the institutional ethics committee.

Inclusion criteria

1. Age 18–80 years
2. Both male and female patients with one or more episodes of hemoptysis.

Exclusion criteria

1. Presence of prolonged bleeding time, clotting time, and prothrombin time.
2. Patients in immunodeficiency state.

3. Pregnancy.
4. Patients who have bleeding manifestations other than hemoptysis, such as hematemesis, epistaxis, and gum bleeding.
5. Presence of cardiovascular disease, such as ischemic heart disease.

Study technique

After the patient attended our OPD/emergency, a detailed history was taken and a clinical examination was done. Patients were given primary management of hemoptysis, for maintenance of airways, breathing, circulation, and other ancillary measures such as antibiotics and sedatives. After stabilization and control of hemoptysis, all patients underwent CT thorax. In cases where the cause of hemoptysis could not be diagnosed by CT scan was diagnosed by FOB.

Statistical analysis of data

Data were collected in MS excel and were analyzed with the help of MS excel.

Statistical analysis was done using the SPSS software. Data are presented as means and percentages. Categorical data were compared by Chi-square test.

RESULTS AND DISCUSSION

During our study period, a total of 72 patients were evaluated and among them, 62% patients were male (male: female=1.7:1). Mean age of the overall study population was 39.83±12.6 years, the mean age for male was 43.06±12.63 years and for female, it was 49.18±10.45 years. The majority (44.4%) of the patients were in the age group of 20–34 years but surprisingly more than half (52%) of the patients were non-smokers (Table 1).

Upon doing high-resolution CT (HRCT) thorax, 75% of cases showed no abnormality while 22% of cases had bronchiectasis followed by arteriovenous malformation (1.3%) and sequestration of lung (1.3%) (Table 2).

32 (44.4%) cases were diagnosed by FOB examination, where pulmonary tuberculosis 14 (19.4%), bronchitis 11 (15.2%), bronchogenic carcinoma 06 (8.3%), and bacterial pneumonia 01 (1.3%) (Table 3).

As per the final diagnosis, proportion of bronchiectasis was the most common (22.2%) pathology diagnosed followed by pulmonary tuberculosis (20.8%). Bronchogenic carcinoma constituted 12.5% of cases and 22.2% of cases of hemoptysis were idiopathic (Table 4).

In a patient presenting with hemoptysis, it is necessary to use all diagnostic tools such as chest X-ray, HRCT, FOB, CT-guided fine needle aspiration cytology (FNAC), and biopsy to accurate the diagnosis. Major reasons for hemoptysis are tuberculosis, bronchiectasis, and bronchogenic carcinoma. Hemoptysis is an important symptom of pulmonary disease reported in 7–15% of patients. In 30% of patients presenting with hemoptysis, the underlying cause remains undetermined despite extensive investigations. Diagnosis of the etiology of hemoptysis in patients with normal chest X-ray is often more difficult [2].

A total of 72 cases were included in this study and showed that most of the patients were from 20–34 years (44.4%), followed by the age group of 35–49 years (31.9%). The lowest age of the patient was 21 years and the maximum age was 70 years. The mean age of the patients was 39.83±12.6 years.

In this study, it was found that males (62.5%) were more affected than females (37.5%) which is similar to the findings in studies by Thirumaran *et al.*, who reported male 60%, Hirshberg *et al.*, who reported male 72% [5].

In this study, smokers were affected more by bronchiectasis (50%), chronic bronchitis (53.8%), and lung carcinoma (77.7%).

Table 1: Distribution of general characteristics

Parameter	n (%)
Age group (years)	
20–34	32 (44.4)
35–49	23 (31.9)
50–64	15 (20.8)
≥65	2 (2.8)
Total	72 (100)
Gender of patient	
Male	45 (62.5)
Female	27 (37.5)
Total	72 (100)
Associated clinical presentation	
Cough	58 (80.6)
Fever	6 (8.3)
Chest pain	4 (5.6)
None	4 (5.6)
Total	72 (100)
Addiction	
Smoker	34 (47.2)
Non-smoker	38 (52.8)
Total	72 (100)

Table 2: Distribution of high-resolution CT findings

CT finding	n (%)
Bronchiectasis	16 (22)
Arteriovenous malformation	1 (1.3)
Sequestration of lung	1 (1.3)
No abnormality detected	54 (75)
Total	72 (100)

CT: Computed tomography

Table 3: Distribution of FOB findings

FOB finding	n (%)
Pulmonary tuberculosis	14 (19.4)
Bronchitis	11 (15.2)
Bronchogenic carcinoma	6 (8.3)
Bacterial pneumonia	1 (1.3)
Others	40 (55.5)
Total	72 (100)

FOB: Fiberoptic bronchoscopy

Table 4: Distribution of etiology of hemoptysis

Final diagnosis	n (%)
Bronchiectasis	16 (22.2)
Pulmonary tuberculosis	15 (20.8)
Bronchitis	13 (18)
Idiopathic	16 (22.2)
Bronchogenic carcinoma	9 (12.5)
Others	3 (4.1)
Total	72 (100)

To diagnose the etiology of hemoptysis, CT was helpful in recognizing the pattern. Upon doing HRCT thorax, 75% of cases showed no abnormality while 22% of cases had bronchiectasis followed by AV malformation (1.3%) and sequestration of the lung (1.3%) (Table 2). Mass lesions were seen in 09 cases in which 06 cases were with central mass lesions and 03 cases were peripheral mass lesions. These 03 cases were further diagnosed by CT-guided tru-cut biopsy, and in the rest 06 cases, diagnosis was done by FOB. In total 09 cases of bronchogenic carcinoma, 05 cases (55.5%) were squamous cell carcinoma and 02 (22.2%) cases were adenocarcinoma and small cell carcinoma each.

In 14 cases, mycobacterium tuberculosis was diagnosed by BAL fluid CBNAAT, in those patients who have sputum-negative tuberculosis, and 1 case was diagnosed by CT-guided FNAC from cavitary lung lesion. In this study, it was found that the exact etiology of hemoptysis was bronchiectasis in 22.2%, pulmonary tuberculosis in 20.8%, chronic bronchitis in 18.1%, and lung carcinoma in 12.5% cases, and 22.2% cases were cryptogenic.

A study on the Indian population by Joseph *et al.* found that bronchiectasis was the etiology in 25.49% of cases. In their study by Maria *et al.*, among 184 patients, bronchiectasis was found in 26% of cases. Chronic bronchitis found in 12% cases in Khezrollah which was less than our study [6]. Maria *et al.* found chronic bronchitis in 23% of cases which was more than our study.

Lung carcinoma was found in 26% of cases in the study by Thirumaran *et al.* (17%).

In this study, study population according to gender and etiology of hemoptysis males are more affected in case of bronchiectasis 10 (13.8%), pulmonary tuberculosis 10 (13.8%), chronic bronchitis 09 (12.5%), and lung carcinoma 09 (12.5%); in a similar study by Hirshberg *et al.*, males were most affected [6]. Study population according to the habit of smoking and etiology of hemoptysis, we found that smokers were affected more by bronchiectasis (22.8%), pulmonary tuberculosis (22.8%), chronic bronchitis (20%), and lung carcinoma (20%). In Hirshberg *et al.*, 90% of males in the study population were smokers [6].

In this study, the etiology of hemoptysis was diagnosed by HRCT in 18 (25%) cases and by FOB in 32 (44.4%) cases and when it combined with CT and FOB, then a total of 56 (77.7%) cases were diagnosed. In 16 cases, diagnosis was not possible by CT and FOB.

Khezrollah found in their study that diagnosis was made by CT in 38% of cases, by FOB in 38% of cases, and by the other tools in 8% of cases, 10% of cases were undiagnosed [7].

A study by Hirshberg *et al.* showed that a CT scan acts as a diagnostic test in 67% of cases when employed alone. However, when combining CT study with bronchoscopy, diagnostic accuracy was increased to 93% [6]. In our study, CT and FOB together diagnosed 79% of cases in our study population. Lee *et al.* in their study found that only 16.2% of patients are only diagnosed by FOB when CT was not helpful.

Limitation of the study

1. Not included patients below 18 years.
2. Patients with mild hemoptysis refused to be admitted.
3. Small sample size, single institutional study.

CONCLUSION

Both CT and FOB play a definite role in diagnosing the etiology of hemoptysis. CT and FOB are complementary to each other in the diagnosis of hemoptysis. FOB has a better yield. For bronchial and parenchymal abnormalities, CT has the advantage of being more sensitive in diagnosing, on the other hand, FOB is better in evaluating mucosal pathologies and taking biopsy samples.

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AUTHORS' CONTRIBUTION

Dr. Tanbir Ahamed designed, conducted the research, and finalized the manuscript. Dr. Linkon Biswas did the statistical analysis, data interpretation, and editing of the manuscript. Dr. Sumitra Basuthakur did a literature review, reviewing, and final editing of the manuscript.

CONFLICTS OF INTEREST

None to declare.

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