ADDITIONAL YIELD IN THE DIAGNOSIS BY USE OF FIBER OPTIC BRONCHOSCOPY AND CT SCAN IN EVALUATION OF PATIENTS WITH HAEMOPTYSIS HAVING NORMAL CHEST X-RAY

Bindu Cheriattil Govindan[1]

[1]*Assistant Professor, Department of Pulmonary Medicine, Government TD Medical College, Alappuzha, Kerala.*

ABSTRACT

BACKGROUND

Haemoptysis is a symptom that warrants immediate attention. Chest radiograph is mandatory for patients with haemoptysis and it often shows abnormality, but many a time CXR may appear normal. The diagnosis of the cause of haemoptysis is often difficult, especially in patients presenting with a normal chest x-ray. This study has been performed to evaluate these patients using either computed tomography chest or fiber optic bronchoscopy.

MATERIALS AND METHODS

A prospective cross-sectional study done at a sanatorium of chest diseases in a tertiary care center where 409 cases of haemoptysis were recruited. Among these, 114 patients had CXR that appeared normal (27 %) and they were further evaluated with FOB and CT chest. CT scan was done in 53 and FOB in 80 patients with haemoptysis.

RESULTS

The use of CT chest, in patients with normal CXR an additional diagnosis was obtained in 37 patients (69.8%). High proportion of patients had bronchiectasis (n-22, 41.5%); carcinoma lung was diagnosed in 3 patients (11.3%). Among 114 patients with normal CXR, 80 underwent bronchoscopy and 3 cases of carcinoma lung were additionally diagnosed.

CONCLUSION

Computerized tomography and fiber optic bronchoscopy thus helped in increasing yield in diagnosis in 114 patients who had a normal CXR. Patients in whom diagnosis could not be obtained by conventional methods, CT scan increased yield in diagnosis by 32.5%. And with fiber optic bronchoscopy, carcinoma was diagnosed in another 2.6%.

KEYWORDS

CT Scan, Fiberoptic Bronchoscopy, Haemoptysis, Normal CXR.

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BACKGROUND

Haemoptysis is defined as expectoration of blood that originates from tracheobronchial tree or pulmonary parenchyma. The diagnosis of the cause of haemoptysis is often difficult, more so in patients presenting with a normal chest x-ray. This study has been performed to evaluate such patients using either computed tomography (CT scan of chest) or (FOB) fibreoptic bronchoscopy. Chest radiograph is mandatory for patients with haemoptysis and it often shows abnormality. With underlying abnormality etiological analysis gets easier, but many a time, haemoptysis patients may have completely normal chest radiograph (CXR). Finding the etiological cause of haemoptysis is difficult when there is no abnormality found on CXR. Further evaluation is done using Bronchoscopy and CT scan of the chest. Chest radiography can help localize the bleeding with a high degree of certainty and can often help detect underlying parenchymal and pleural abnormalities. Conditions such as bronchiectasis, lung malignancy infection, some of the most common underlying causes of haemoptysis, are easily detected with imaging and permits non-invasive, rapid, and accurate assessment of the cause. Many cases of haemoptysis with normal CXR and negative bronchoscopy were proved to be malignancy or bronchiectasis on CT scan. Whereas endobronchial diseases were better evaluated and dealt with bronchoscopy. Additional follow-up testing in patients presenting with haemoptysis in which the underlying cause was not detected at initial radiography, is worthwhile. It may be useful or even necessary to perform follow-up CT several months after the episode of haemoptysis to study the evolution of underlying parenchymal lung abnormalities or to exclude the possibility that a small malignancy may have been missed at initial CT. FOB also has the absolute advantage of clearing airways of its secretions and collecting material for biopsy and cytology and other microbiological investigations. Thirumaran and colleagues found that 9.6% had respiratory tract malignancies as the cause of the haemoptysis in patients who had a normal CXR. Haemoptysis should be considered a possible signal of an underlying serious illness, particularly lung cancer.[1] They performed both FOB and chest CT in >90% of the patients who presented with haemoptysis and

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Corresponding Author:
Dr. Bindu Cheriattil Govindan,
Assistant Professor,
Department of Pulmonary Medicine,
Government TD Medical College,
Alappuzha- 688005, Kerala.
E-mail: binducg123@gmail.com
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a normal CXR. This approach seems clinically reasonable, because CXR "misses" small lung cancers and endobronchial lung cancers.[1]

Fiberoptic bronchoscopy has rapidly become established as a useful diagnostic tool and the investigation of choice in evaluating patient with haemoptysis. The relative simplicity of the examination, high acceptability to patients and improved visualization of segmental and sub segmental bronchi have led physicians to perform bronchoscopic examinations more readily.

Bronchoscopy helped in localizing site of bleeding in 68%.[2] In cases where high clinical suspicion of carcinoma and relevant radiographic abnormalities were seen bronchoscopy allowed both localization and histological in 78%, but was unreliable in demonstrating peripheral tumours that was demonstrated in CT.[2] Bronchoscopy was helpful in demonstrating early mucosal abnormalities, bronchitis, squamous metaplasia and benign papilloma where CT was insensitive. Bronchoscopy was useful in obtaining tissues for histopathology examinations like biopsy, cytology, and brushings except in peripheral lesions where CT was move useful.[3]

Diagnostic yield from biopsy of bronchoscopically visible tumours that occupy the lumen of the bronchus is, in the best analysis, over 90%.[4] The number of biopsies taken to achieve this should be 3 or 4.[4] The yield for bronchial brushing/washing submitted for cytology in the same situation may be almost as high as biopsy (5). A British study in a group of 125 endoscopically visible tumours found a positive biopsy result in 76% the positive bronchial washing in 50% and the positive brushing in 52%. Biopsy and brushing together increased yield to 97%.[5]

CT has shown to be accurate in diagnosis of a wide range of bronchial abnormalities including both central and peripheral abnormalities especially bronchiectasis (6, 7). CT can detect most bronchiectasis. In patients with haemoptysis one third of the chest radiograph remained either normal or non-localizing especially when parenchymal lesions were small, lesions were in larger airways or inflammatory pathologies of bronchial mucosa. CT scan is more sensitive than chest radiography such cases. The central airways, tracheal, carina and main stream bronchi, lobar and proximal portion of segmental bronchi are easily definable by CT scan. CT can accurately define both intraluminal and extra luminal component of these tumours. CT may be helpful in determining whether a parenchymal lesion should be approached bronchoscopically or by percutaneous needle aspiration. The role of CT in diagnosis of bronchial inflammations like bronchiectasis has been well documented.

Although reported sensitivities of CT have varied considerably in recent studies, CT consistently has been shown to depict more than 90% of lesion identified bronchoscopically.[6] Naiditch et al[7] in a study of 64 patients with focal bronchial disease, showed that CT accurately depicted the abnormality in 59 of them (92%). Woodring et al[8] in a retrospective analysis of 50 patients with segmental or lobar atelectasis, found that CT allowed correct identification of all 27 obstructing carcinomas based on the presence of either central bronchial abnormalities or a central hilar mass.[9]

Mayr et al, in an evaluation of 361 abnormal airways documented by fiber optic bronchoscopy, found CT to be over 99% sensitive for each of two observers respectively.[6]

Millar et al, evaluating 22 consecutive patients presenting with haemoptysis and normal findings at chest radiography and fiber optic bronchoscopy, found that CT disclosed previously unsuspected abnormalities in 15 (68%), three of whom had bronchiectasis. These authors believed that CT was essential in investigation in all cases in whom chest radiographs and bronchoscopy proved to be non-diagnostic.[10] The use of CT scan is to study the mediastinum to readily distinguish vessels, lymph nodes and masses. CT scan in addition to identification of otherwise unsuspected abnormalities, defines the extra luminal extent of lesions in relation to bronchi and mediastinal structures, it allows optimization of bronchoscopic techniques Study conducted by Sarita Magu et al[11] where CT provided diagnostic information in 53% and the commonest aetiologies identified included bronchiectasis and tuberculosis. It was concluded that CT should be obtained prior to fiber optic bronchoscopy in all patients with haemoptysis with normal or non-localizing chest radiograph.

McGuiness G et al[12] conducted a comparative study of CT and FOB, CT was valuable in identifying both intraluminal and extra luminal extent of central lung cancers and its value in diagnosis of bronchiectasis suggest that CT should be obtained prior to bronchoscopy in all patients presenting with haemoptysis.

Study conducted by Damini G et al showed that HRCT allowed diagnosis of lesion type, extent and site in 97% patients while fiber optic bronchoscopy did the same in only 35% because of the lack of accuracy in identifying and characterizing peripheral lesions. He concluded that compared to FOB, CT scan played a basic role in the diagnosis of inflammatory conditions causing haemoptysis.[13]

Fiberoptic bronchoscopy allowed both localization and histologic diagnosis in 78% of carcinoma but was unreliable in locating peripheral tumours. CT scan was insensitive in demonstrating early mucosal abnormalities, bronchitis, squamous metaplasia and benign papilloma, and other endobronchial lesions all detected at bronchoscopy. It was concluded that fiber optic bronchoscopy should be the initial investigation when there is high clinical suspicion of carcinoma and relevant radiographic abnormalities. When the clinical suspicion of carcinoma is not strong and chest radiograph is normal CT is the preferred investigation.[15] Diagnostic efficiency of peripheral lesions using CT guided transthoracic needle biopsy is as good for small pulmonary nodule (more than or equal to 15 mm) as for larger lesions. CT allowed definitive staging by documenting either direct mediastinal invasion and/or metastatic disease. CT studies showed no false negative results in reporting inoperable lung cancer.[14]

Haemoptysis with a normal chest radiograph should raise concerns at several levels. For the individual patient

and their doctor, it should raise the suspicion of lung cancer.[14] Haemoptysis, though, seems to be a more accurate predictor of underlying lung cancer than other respiratory symptoms, such as cough.[14] For the overall healthcare system, a clearer understanding of which patients would benefit from screening for lung cancer is obviously needed.[14]

Cases of haemoptysis with a normal chest radiograph may indicate a serious underlying disorder hence adequate investigation is a must. The aim of this study was to further evaluate these cases with CT scan and FOB to determine the additional yield in the diagnosis and to compare it with the diagnostic yield in diagnosis by use of conventional methods.

Objectives of the Study

Primary Objective

- To find out the additional diagnostics yield using fiber optic bronchoscopy and computerized tomography in evaluation of patients with haemoptysis.

Secondary Objective

- To compare the additional yield in diagnosed cases of lung cancer by conventional methods, CT scan and FOB.

MATERIALS AND METHODS

409 consecutive patients with complaints haemoptysis (defined as coughing out of blood from LRT) attending outpatient department of Respiratory medicine, Medical College, Trivandrum from 1.12.99-30.06.2000 satisfying the inclusion criteria and exclusion criteria were included.

Inclusion Criteria

All cases with haemoptysis (defined as coughing out of blood from LRT) attending the outpatient department.

Exclusion Criteria

1. Iatrogenic haemoptysis (Induced by procedures like FNAC lung, bronchoscopy, pleural aspiration etc.)
2. Spurious haemoptysis (self-induced bleeding seen malingering patients, URT bleeding in patients with no lung pathology).
3. Traumatic (following fall, RTA etc.)

Study Design

Cross Sectional Study

All patients satisfying the inclusion and exclusion criteria were admitted. A questionnaire was administered to all patients and a through clinical examination was done. By careful history taking hematemesis and URT bleed is ruled out, in doubtful cases of URT bleed ENT examination was done, and in suspected cases of hematemesis the blood brought out is examined for presence of food particles, colour, mixed with on pus. Endoscopy was done in highly doubtful cases with history and clinical examination a probable diagnosis was arrived at. The clinical diagnosis supplemented by chest radiograph. Routine investigations were done like Sputum AFB x 2 days, sputum cytology x 5 days, sputum gram staining, Hb, TC, DC, ESR, Routine urine analysis, LFT, RFT. Bleeding time, clotting time, peripheral smear in suspected cases of bleeding diathesis. ECG and ECHO done in selected cases. Fiber optic bronchoscopy and CT scan were done in patients were no diagnosis was obtained by conventional methods.

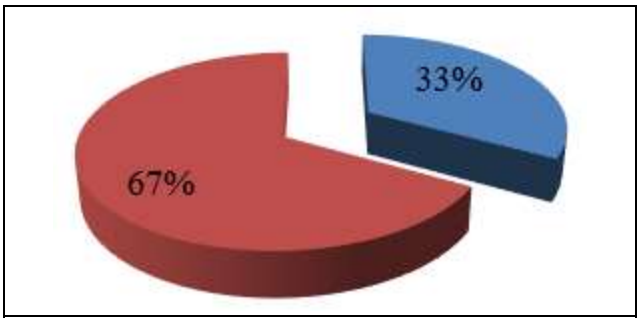
Data collection done using a questionnaire consisting of 2 parts –first part to assess the history and second part consist of clinical examination and investigation. Data Entry was done in D-base and analysis done using SPSS.

RESULTS

Participants of The Study

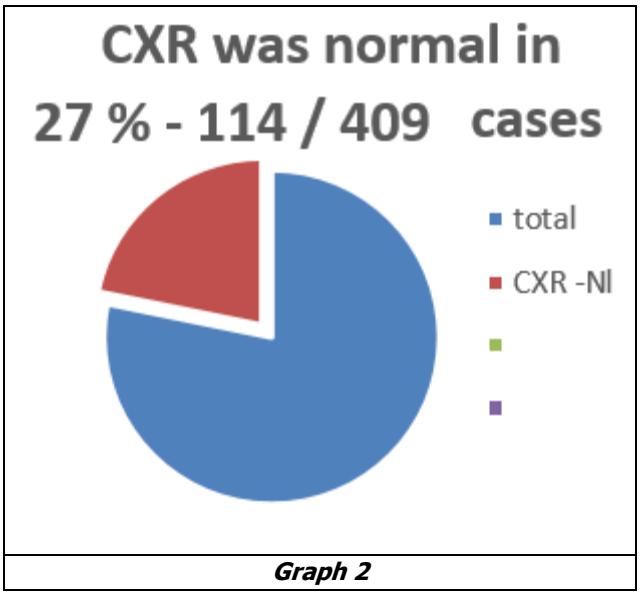
Total no. of patients with haemoptysis included the study were 409 which constituted 17.6 % of the Total IP of 2323 during study period, December 1999 to June 2000.

Sex Distribution



Graph 1

There was a predominance of males in the study with the M: F ratio of 2.03:1.



Graph 2

Among the total 409 patients recruited, 114 patients with haemoptysis had a CXR which appeared non-localizing. 27% of patients in this study had a normal CXR.

	FOB	CT SCAN
Infection	0	0
PTB	0	3
Sequelae of TB	0	7
Bronchiectasis	0	22
Benign Tumours	0	0
Lung Carcinoma	3	3
COPD	0	0
Miscellaneous	0	2
No Diagnosis	0	16
Additional Yield (%)	2.6	32.5

Table 1. Additional Diagnostic Yield of Fiber Optic Bronchoscopy and Computerized Tomography in Patients with No Diagnosis with Conventional Methods (n=114)

Etiological Diagnosis was arrived at by means of conventional methods in 126/409 (30.8%).

114 patients had a normal CXR and CT scan was done in 53. Among them diagnosis was attained in 37 patients (69.8%). High proportion of patients had bronchiectasis (n-22, 41.5%) carcinoma lung was diagnosed in 3 patients (11.3%).

In-patients with normal CXR 80 underwent Bronchoscopy and 3 cases of carcinoma lung were additionally diagnosed.

	Conventional Methods	CT Chest	FOB	
			Carcinoma	Benign Tumours
Suspected Carcinoma n=45	12	6	22	1
Others	12	3	6	6
Total	24	9	28	7

Table 2. Diagnostic Yield in Cases of Lung Tumours by Conventional Methods CT and FOB in Patients with Haemoptysis

Fiberoptic bronchoscopy was done in 197 patients. The etiologic diagnosis obtained were infection (n=16), Benign tumours (n=17) and Carcinoma lung (n=28), FOB helped in attaining histological diagnosis in 28 patients (48.3%) of carcinoma lung. Conventional methods like sputum cytology for malignant cells, FNAC lymph nodes, FNAC lung helped in diagnosing 14 cases of carcinoma lung. CT scan and CT guided FNAC increase the diagnostic yield in 9 more cases. FOB increase the diagnostic yield in 28 cases. Seven cases of benign tumours were identified by bronchoscopy.

DISCUSSION

This study is a prospective cross-sectional study where diagnostic evaluation of patients with haemoptysis attending territory care setting was done. A total of 409 consecutive patients with haemoptysis were included during the period of December 1999 to June 2000 attending the outpatient department of Respiratory Medicine in a tertiary care center in Kerala.

The commonest aetiology identified were Tuberculosis and post tuberculous bronchiectasis (50.3%) followed by lung tumours (14.1). Bronchiectasis (3.9%) followed by lung tumours (14.1). Bronchiectasis (3.9%), Pneumonia (4.4%), lung abscess (3.9%). COPD (5.1%) and a miscellaneous group (1.3%) including 2 cases of Mitral Stenosis, 1 each of pulmonary infarction, ABPA and Weil's disease.

The analysis of severity of bleeding with diagnosis obtained showed that Blood streaking/mild haemoptysis was commonly seen in lung tumours, COPD, Pneumonia, lung abscess and miscellaneous conditions like ABPA, pulmonary infarction, Weil's disease. Massive haemoptysis was extremely rare in these conditions, except one case of lung abscess where massive haemoptysis was seen.

The patients in whom no diagnosis was obtained by conventional methods and had a normal CXR, where evaluated with CT scan, an additional yield in diagnosis was obtained in 32.5%.

The commonest underlying disease identified was bronchiectasis (n=22), tuberculosis (n=10), carcinoma (n=6), pulmonary infarction (n=1) ABPA (n=1).

Various authors have described CT scan having a diagnostic yield of (30-70%) is evaluating patients with haemoptysis and a normal CXR (2, 3). A study by Damini G at who evaluated the role of CT scan and fiberoptic bronchoscopy is diagnosing inflammatory conditions causing haemoptysis CT & HRCT diagnosis obtained in 97% cases.[14] Various authors have reported the role of fiberoptic bronchoscopy in evaluating causes of suspected carcinoma with a positive yield of 60-90%. Direct visualization of lesion helped in obtaining biopsy material for histopathological examination.

In this study total of 197 bronchoscopes was done, histological diagnosis of malignancy was obtained is 19.8% and 2.6% of patients with normal CXR and in whom no diagnosis was obtained by conventional methods. In patients whom the clinical suspicious and CXR suggested malignancy n=45, 93% was diagnosed by Bronchoscopy. Fiberoptic bronchoscopy helped in visualizing the tumour, for taking brushings, washings and biopsy all of which helped obtaining a histological diagnosis.

Diseases like bronchiectasis and tuberculosis or malignancy are better picked up on radio-imaging than bronchoscopy as FOB cannot detect peripheral airway disease or mediastinal lesions whereas endobronchial pathologies are better dealt with FOB than CT.

The real concern about haemoptysis with a normal chest radiograph is understanding the cause. CT scan of chest and FOB are very useful tools in evaluation of patients with haemoptysis having a normal CXR.

CONCLUSION

1. Pulmonary tuberculosis with its sequelae constituted the major proportion among patients with haemoptysis attending the Department of Respiratory Medicine in a tertiary care center in Kerala (50.6%).

2. The next commonest cause seen was carcinoma lung (14.9%).
3. Computerized tomography and fiberoptic bronchoscopy helped in increasing yielded in diagnosis.
4. Patients in whom diagnosis could not be obtained by conventional methods, CT scan increased yield in diagnosis by 32.5%.
5. Majority of the diagnosis obtained using CT scan were bronchiectasis and sequelae of pulmonary tuberculosis.
6. Patients in whom diagnosis could not be obtained by conventional methods fiberoptic bronchoscopy, additionally diagnosed carcinoma in 2.6%.
7. Among the total 58 cases of lung tumours 24.1% could be diagnosed by conventional methods alone, 15.5% was diagnosed by help of CT scan and fiberoptic bronchoscopy helped in diagnosing 60.1%.
8. Parenchymal lesions like infections and bronchiectasis as a cause of haemoptysis where CXR was normal were better picked up by using CT scan
9. Endobronchial lesions especially lung malignancy was diagnosed early with help of FOB.
10. Both FOB and CT scan of chest have an important role in evaluation of patients with haemoptysis where CXR appears to be normal.

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