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Role of Flexible Fiberoptic Bronchoscopy in Sputum Smear Negative Pulmonary Tuberculosis Patients Undergoing Treatment Under Revised National Tuberculosis Control Programme (RNTCP)

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Abstract

Background: India is the country with the highest burden of Tuberculosis and accounts for one fourth of the global TB burden. Sputum-negative pulmonary tuberculosis still remains a common problem, more so in immunocompromised patients. The various diagnostic methods which can help in early diagnosis of suspected sputum smear negative pulmonary tuberculosis (SSN-PTB) cases are sputum Fiber optic bronchoscopy which offers an effective investigative tool in sputum smear negative cases, whereby bronchial secretion and washing can be collected from the most likely abnormal site under direct vision. We conducted an observational cross sectional study to assess the diagnostic yield of fiberoptic bronchoscopy in sputum smear negative patients and chest x-ray suggestive of pulmonary tuberculosis. **Methods:** 50 patients who have Chest x ray findings suggestive of pulmonary tuberculosis but sputum smear is negative for AFB where subjected to bronchoscopy after getting informed consent. **Results:** Overall diagnostic yield of various bronchoscopic specimens in diagnosing tuberculosis were trans-bronchial lung biopsy (53.8%), broncho-alveolar lavage/washings (46%), bronchial brushing (38%) and post bronchoscopic sputum (24%) in our study. In the present study, bronchoscopy was helpful to establish the diagnosis in 46 out of total 50 cases. 34 (68%) patients had tuberculosis, 8 (16%) had pyogenic infections/pneumonia, 4 (8%) patients were diagnosed with malignancy and the results were inconclusive in 4 (8%) patients. **Conclusion:** The combination of various modalities during bronchoscopy produced better results than any of the modalities alone as far as diagnostic yield is concerned.

Keywords: Bronchoscopy, Bronchoscopic alveolar lavage, Trans bronchial lung biopsy, Post bronchoscopic sputum, Bronchial brushing.

Introduction

Pulmonary tuberculosis (PTB) is a leading cause of morbidity and mortality worldwide. According to the recent estimates, there were 10.4 million and 2.84 million new cases of TB worldwide and in India respectively.¹

It is estimated that about 40% of the Indian population is infected with tuberculosis (TB) bacteria, the vast majority of whom have latent rather than active TB. The diagnosis of pulmonary TB is based on sputum smear examination in Revised National TB control Program (RNTCP). Though Acid Fast Bacilli (AFB) smear is the most rapid, highly specific (98% to 99%) and low cost test but has poor sensitivity (30% to 70%).^{2,3} Mycobacterial cultures are more sensitive than AFB smears (80-85%) but cultures require 3 Weeks to 8 weeks.^{4,5} Sputum smear and culture examination still remain the gold standard in the diagnosis of pulmonary tuberculosis. But about 30% of new cases of pulmonary TB may remain smear negative for acid fast bacilli (AFB). Lack of sputum production, low bacterial load and improper technique can be the factors for sputum smear negative pulmonary tuberculosis. In immuno-competent patients, sometimes, poor quality of the sputum sample, deficient preparation, staining, or examination of the sputum smear can contribute to the negative results.⁶

The various diagnostic methods⁷⁻⁹ which can help in early diagnosis of suspected sputum smear negative pulmonary tuberculosis (SSN-PTB) cases are sputum Fiber optic bronchoscopy which offers an effective investigative tool in sputum smear negative cases, whereby bronchial secretion and washing can be collected from the most likely abnormal site under direct vision. Induction with hypertonic saline, transtracheal needle aspiration, radiologically guided transbronchial needle aspiration, gastric lavage and bronchoscopic procedures like Bronchial aspirate/BAL. The modern flexible bronchoscope was invented by Ikeda¹⁰ in 1964 and was made commercially available in 1967. This study was undertaken to determine the role of flexible fiber optic bronchoscopy in the diagnosis of sputum

smear negative pulmonary tuberculosis (SSNPTB) undergoing treatment Under Revised National Tuberculosis Control Programme (RNTCP).

Materials and Methods

The present study was carried out on patients who were attending the outpatient department and/or admitted in Chest & Tuberculosis Hospital, Government Medical College, Amritsar, after taking approval of the ethical committee and informed consent of each patient. This is an observational cross-sectional study which will include 50 patients who have Chest x ray findings suggestive of pulmonary tuberculosis but sputum smear is negative for AFB.

Inclusion criteria:

- 1) Patients consenting for the study.
- 2) Adult patients aged 12 years and above.
- 3) Suspected patients of Pulmonary tuberculosis (as per RNTCP guidelines) with initial sputum smear for AFB negative on Zeihl- Neelsen staining

Exclusion criteria:

- 1) Patients not consenting for the study.
- 2) Patient with bleeding diathesis
- 3) Patients on anti-tubercular therapy (ATT) for more >1 month.
- 4) Patients with history of myocardial infarction, arrhythmias
- 5) Patients having severe hypoxia

All patients who were suspected to have pulmonary tuberculosis but sputum was negative for AFB by Ziehl -Neelsen staining were subjected to bronchoscopy, after excluding patients with deranged coagulation profile, severe cardiac illness or severe hypoxia. The samples were subjected to direct smear examination for mycobacteria by Ziehl-Neelsen method, for gram staining, culture sensitivity, cytology and for histo-pathological examination. Various specimens obtained after bronchoscopy will be used to study their yield and usefulness in detecting tuberculosis

At the end of the study the data collected was documented, compiled, and analyzed by using Chi Square and T-test to get the final results.

Results

The present study was conducted in the department of Chest and Tuberculosis, Government Medical College, Amritsar, which included 50 patients who were sputum smear

negative for acid fast bacilli by Ziehl-Neelsen staining, but clinicoradiologically have features suggestive of pulmonary tuberculosis. This study was conducted to determine the role of fiber optic bronchoscopy in sputum smear negative pulmonary tuberculosis patients undergoing treatment under Revised National Tuberculosis Control Programme. The following observations were made

Table 1: Age wise distribution of patients (in years)

Age group (years)	No. of cases	%age
20-29	4	8.0
30-39	15	30.0
40-49	23	46.0
50-59	6	12.0
60 -69	2	4.0
Total	50	100.0

In our study age distribution ranged from 20-70 years of age. Majority of the patients (46%) were in the age group 40-49 years of age.

Table 2: Distribution of patients according to symptoms

Chief complaints	No. of cases	Percentage
Cough	40	80.0
Cough with Expectoration	14	28.0
Fever	36	72.0
Dyspnea	11	22.0
Chest pain	4	8.0
Loss of appetite	15	30.0
Loss of weight	19	38.0
Hemoptysis	6	12.0

The most common symptom of presentation was cough. It was present in 40 patients(80%), followed by fever (72%),Loss of weight (38%), Loss of appetite (30%),Cough with Expectoration

(28%), Dyspnea (22%), Hemoptysis (12%), Chest pain (8%).Many of the patients presented with more than one symptom.

Table 3 -Showing yield of bronchoscopic modalities in finding tuberculosis

Bronchoscopic modality	No. of cases of done	No. of cases diagnosed as tuberculosis	Percentage
BAL	50	23	46.0
Brush smear	50	19	38.0
TBLB	26	14	53.8
PBS	50	12	24.0

Diagnostic yield of various bronchoscopic modalities in diagnosing tuberculosis in order of frequency are as follows: Trans-bronchial lung biopsy (53.8%), broncho-alveolar lavage/washings (46%), bronchial brushing (38%) and lastly post bronchoscopic sputum (24%). Thus, trans-bronchial lung biopsy has the highest diagnostic yield. Overall, diagnostic yield for tuberculosis combining the various diagnostic modalities of bronchoscopy was 68%. Hence, combination of various modalities of bronchoscopy gives better results than any of the modalities alone, as far as diagnostic yield is concerned.

Discussion

Pulmonary tuberculosis is still a major health problem globally and in India also. Early diagnosis and treatment improves the prognosis and reduces transmission of the disease. Clinically and radiologically suspected cases of pulmonary tuberculosis that are not producing sputum adequately is frequently encountered situation in clinical practice, where only saliva or scanty sputum is available for examination and reported as negative smear for AFB. In RNTCP these patients are given symptomatic treatment for 10 days to 14 days and then their sputum is re-examined for AFB smear, leading to delay in the diagnosis and increased chances of transmission of tuberculosis.

The study was carried out on 50 patients who were attending the outpatient department and /or admitted in Chest & Tuberculosis Hospital, Government Medical College, Amritsar who have chest x ray findings suggestive of pulmonary tuberculosis but remain undiagnosed because of a negative sputum smear for AFB.

Out of 50 patients taken for the study, there were 36 males, 14 females showing a significant difference in male to female proportion. This difference (M:F::2.6:1) reflects our male dominant society, in which males being bread earners, are made to report to the health facilities earlier as compared to females.

Out of 50 patients in present study, 29 patients were smokers, 21 were non-smokers. Thus, majority of patients were smokers. Out of 29 smokers, 23 (79.3%) were diagnosed to have Tuberculosis by various diagnostic modalities of bronchoscopy. On the other hand, 11 (52.3%) patients out of 21 non-smokers had tuberculosis confirmed by this procedure. Hence, the prevalence of tuberculosis was more common in smokers as compared to non-smokers as diagnosed by bronchoscopy. This may be due to the fact that smokers have depressed immunity, mucociliary-escalator as well as macrophage dysfunction, which makes them prone to respiratory diseases. Majority of females patients were non-smokers. This may be attributed to cultural inhibitions amongst females regarding smoking in this region.

Cough, fever and loss of weight were the most common presenting complaints of the patients. 40 patients (80%) had cough, 14 patients having associated expectoration as well, 26 had dry cough. Fever and loss of weight were the presenting complaints in 36 (72%) and 19 (38%) patients respectively. Similar findings were reported in the study conducted by Rajesh Kumar Jain S et al.¹¹

Majority of patients which were taken in the study have duration of symptoms more than one month, which is probably because patients came in medical college in late part of their illness. During initial period of their illness they were taking treatment from local practitioners or by themselves. In this study the overall diagnostic yield of various bronchoscopic specimens in diagnosing tuberculosis in order of frequency are as follows: Trans-bronchial lung biopsy (53.8%), broncho-alveolar lavage/washings (46%), bronchial brushing (38%) and lastly post bronchoscopic sputum (24%). Thus trans-bronchial lung biopsy has the highest diagnostic yield. These findings were similar to the study by Choudhary S et al¹² in which the yield for tuberculosis was 78%. 29 (26.9%), 41(37.9%) and 30(27.8%) patients had positive AFB smear on Bronchial brush, Broncho alveolar lavage and

post bronchoscopy sputum. Biopsy was diagnostic for tuberculosis in 69.64% patients which were comparable to our study where it was diagnostic in 53.8% patients.

In our study the various bronchoscopic modalities diagnosed tuberculosis in 34(68%) out of the total 50 patients enrolled for the same. The diagnostic yield of overall bronchoscopic procedures for tuberculosis were 74%, 32.5% and 78% in the studies conducted by Purohit SD et al¹³, Charoenratanakul et al¹⁴ and ChoudharyS et al¹² respectively which were comparable to our study.

In the present study, BAL fluid smears were positive for AFB in 23 out of 50 (46%) cases with a sensitivity of 67.65% and specificity of 100%. These findings are in conformity with the studies conducted by De Gracia et al¹⁵ and Prakash P et al¹⁶ where the sensitivity of BAL in detecting tuberculosis were 88% and 54.2% respectively.

In our study brush smears were positive for AFB in 19 out of 50 cases with a sensitivity of 55.9% and specificity of 100%. Whereas in other studies by Wilcox et al¹⁷ and Wongthim et al¹⁸ sensitivity of brush smear in detecting tuberculosis were 42% and 51% respectively.

In the present study transbronchial lung biopsy was done in selected patients where on bronchoscopic examination congestion, hyperaemia or unhealthy mucosa were present. Out of 26 patients where transbronchial lung biopsy was performed, histopathological findings suggestive of tuberculosis were present in 14 cases with a sensitivity of 73.7% and specificity of 100%. In concurrent with the present study ChoudharyS et al¹² obtained chronic inflammatory changes including caseating granulomas in 39 out of 56 patients where transbronchial lung biopsy was done.

Post bronchoscopic sputum was positive for AFB in 12 out of 50 (24%) cases in our study with a sensitivity of 35.3% and specificity of 100%. As observed in the present study similar findings were observed in the study conducted by Wongthim et al¹⁸ where the AFB smear positivity in post bronchoscopic sputum was 26% and 23% respectively.

In our study, 8 cases were diagnosed as having pyogenic infection (pneumonia) from gram's staining and culture sensitivity of BAL and 4 cases were diagnosed to have neoplasia from cytological examination of BAL and transbronchial lung biopsy. In concurrent with the present study, Caymmi ALet al¹⁹ in their study on 52 patients, 28 (80%) of the patients, diagnosis of tuberculosis was achieved through bronchoscopy (1 with concomitant neoplasia). This study confirms the finding that bronchoscopy is not only useful for the diagnosis of tuberculosis but also for the identification of other pathologies like pneumonia (8 cases), especially neoplasia (4 cases), whose delayed diagnosis may exclude the possibility of a surgical cure in the patients.

Overall, fiberoptic bronchoscopy yielded diagnosis of Tuberculosis in 34 (68%) cases in the current study. Hence, combination of various modalities during bronchoscopy gives better results than any of the modalities alone, as far as diagnostic yield is concerned.

So, fiberoptic bronchoscopy is having definite role in diagnosing tuberculosis in sputum smear negative patients having chest X-ray suggestive of pulmonary tuberculosis.

Conclusion

The combination of various modalities during bronchoscopy produced better results than any of the modalities alone as far as diagnostic yield is concerned. flexible fiberoptic bronchoscopy is relatively safe, effective, easily performable diagnostic modality, without hazards of general anaesthesia. It has a definite role in diagnosing

tuberculosis in sputum smear negative patients having chest x-ray suggestive of pulmonary tuberculosis. This study also helped in early initiating of anti-tubercular treatment and preventing the spread of infection.

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