

Original Research Article

Role of fiberoptic bronchoscopy in sputum smear negative suspected cases of pulmonary tuberculosis: a study conducted in Southern part of Rajasthan

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ABSTRACT

Background: Sputum smear negative pulmonary tuberculosis is a common problem faced by clinicians. Fiberoptic bronchoscopy may be very useful in diagnosing these cases which have no sputum or whose sputum smear is negative for acid fast bacilli. Objective of the current study was to assess the role of fiberoptic bronchoscopy in sputum smear negative under NTEP and radiologically suspected cases of pulmonary tuberculosis.

Methods: Clinico-radiological suspected cases of pulmonary tuberculosis patients in whom two sputum smear for acid fast bacilli by Ziehl Neelsen stain under NTEP was negative were included in the study. Fiberoptic bronchoscopy was performed in all these patients and samples taken were sent for investigations.

Results: Fiberoptic bronchoscopy was performed in 250 patients of suspected pulmonary tuberculosis whose sputum for AFB smear was negative. Cough was the most predominant symptom. Radiologically, right side disease was more common and upper zone was most commonly involved and infiltrates were common radiological finding. During bronchoscopy, congestion and hyperaemia (36%) and mucopurulent/mucoid secretions (32%) was seen in maximum number of cases. BAL was positive in 200 patients (80%), post bronchoscopy sputum was positive in 70 cases (28%) and biopsy was positive in 12 patients out of 16 performed biopsies (75%). The total TB positive cases after combining all the methods were 215 making the overall diagnostic yield of 86%.

Conclusions: Fiberoptic bronchoscopy and post bronchoscopy sputum can be very useful for diagnosing sputum for AFB smear negative but clinico-radiological suspected cases of pulmonary tuberculosis patients.

Keywords: Sputum smear negative-pulmonary tuberculosis, Ziehl Neelsen stain, *Mycobacterium tuberculosis*, Fiberoptic bronchoscopy, Brocho alveolar lavage

INTRODUCTION

Pulmonary tuberculosis (PTB) is one of the most important problem worldwide.¹ India has more new TB cases annually than any other country.² The most widely used tool of diagnosis of PTB is sputum examination and chest X-ray. The WHO also recommends the detection of

acid fast bacilli (AFB) in respiratory specimens as the initial approach in the diagnosis of pulmonary TB.³ Though AFB smear is the most rapid, highly specific (98-99%) and low cost test but has poor sensitivity (30-70%).^{4,5} Early diagnosis to reduce the period of infectivity is considered to be one of the most effective TB control strategies. Mycobacterial cultures are more

sensitive than AFB smears (80-85%) but cultures require 3-8 weeks.^{6,7}

Though sputum smear and culture examinations still remain the gold standard in the diagnosis of PTB, but even in advanced disease it may be negative due to immunosuppression, low bacterial yield, poor quality of the sample collection, inadequate preparation, staining or examination of the smear.⁸ According to the global tuberculosis report 2013, there were 1.29 million notified tuberculosis cases in India in 2012, out of which about 30% were smear negative cases.⁹ The diagnosis becomes even more difficult when a patient who is suspected to have active pulmonary TB, both clinically and radiologically, does not produce sputum particularly in HIV positive, miliary tuberculosis or NTM disease situations. If these patients are left untreated then about 70% of them may develop active TB in next 12 months.¹⁰ In these suspected sputum smear negative (SSN-PTB) cases, repeat sputum samples are examined after 10-14 days under NTEP, but it may delay or miss the diagnosis.

The various diagnostic methods which can help in early diagnosis of suspected Sputum smear negative-pulmonary tuberculosis (SSN-PTB) cases are sputum induction with hypertonic saline, radiologically guided transthoracic needle aspiration, gastric lavage, bronchoscopic procedures bronchial aspirate/brocho alveolar lavage (BAL)/brushing/biopsy and post bronchoscopy sputum. After the availability of flexible fiber-optic bronchoscope (FOB) in 1966, there have been many studies performed for early diagnosis of TB and many advances has occurred in FOB techniques. Bronchoscopy and related procedures such as bronchoalveolar lavage, bronchial brushing, transbronchial biopsy and post bronchoscopy sputum examination may provide alternative ways of reaching an early diagnosis.¹¹⁻¹⁵

Therefore, this study was done to determine the role of bronchoscopy in the diagnosis of SSN-PTB, as no such large study is being done till now in this part of the country i.e. Southern part of Rajasthan.

METHODS

Presented prospective observational study was conducted in Geetanjali hospital, Udaipur, Rajasthan from January 2018 to March 2020. The patients attending the chest OPD and those admitted in chest ward with the following inclusion and exclusion criteria were included in the study.

Patients with age more than 15 years, patients with clinico-radiological suspicion of pulmonary TB and in whom sputum was either not produced or was inadequate for examination (only saliva or sputum quantity <2 ml) or sputum was negative for acid fast bacilli on two samples under NTEP were included in the study. Patients with bleeding diathesis, history of recent myocardial infarction

or arrhythmia, hemodynamically unstable patients and patients aged ≤ 15 years were excluded from the study.

Procedure

After an informed written consent, the bronchoscopy was performed in all the patients who fulfil the inclusion criteria. Patients were kept nil by mouth for 6 hours prior to procedure. Bronchoscopy was carried out under local anesthesia and a thorough examination of the bronchial tree was done. BAL was taken from the radiologically suspicious areas/segments in all patients. Bronchial brushing and biopsy was taken in any patient who had some kind of visible pathological lesion on bronchoscopy and in whom biopsy was feasible. BAL taken was sent for AFB smear by ZN stain method, AFB culture and GeneXpert MTB. Post bronchoscopy sputum samples one taken immediately and other taken 24 hours post bronchoscopy was sent for AFB smear examination by ZN stain.

Post procedure the patient was kept in recovery room for half an hour to watch for any complications and was asked to keep nil by mouth for 1 hour post procedure. Mathematical percentage statistics is used to analyse the results.

RESULTS

Fiberoptic bronchoscopy was performed in 250 patients of suspected pulmonary tuberculosis whose sputum for AFB smear was negative. Out of 250 patients, 174 were males and 76 were females (Table 1). The mean age of the patients was 50 ± 30 years with a higher frequency between 20 to 60 years of age (Table 1). Cough was the most predominant symptom in 96% of patients (Table 2). Majority of patients had multiple symptoms. Radiologically, right side disease was more common on chest X-ray and upper zone was most commonly involved and infiltrates were common radiological finding (Table 3-4). The bronchoscopy findings are as mentioned in table 5 with congestion and hyperaemia (36%) and mucopurulent/mucoid secretions (32%) were seen in maximum number of cases. During bronchoscopy, bronchial aspirate and lavage were collected and sent for all microbiological investigations and cytological examination. In few patients, transbronchial and endobronchial biopsy were taken and sent for histopathological and AFB smear and culture and genexpert examination. After bronchoscopy, post bronchoscopy sputum was sent for AFB smear examination. BAL was positive in 200 patients (80%). Post bronchoscopy sputum was positive in 70 cases (28%) and biopsy was positive in 12 patients out of 16 performed biopsies (75%) (Table 6). 3 of the biopsy positive patients had BAL positive also. And 64 of the post bronchoscopy sputum positive patients had BAL positive. So the total TB positive cases after combining all the methods were 215 making the overall diagnostic yield of 86% by fiberoptic bronchoscopy.

Table 1: Age wise distribution of male and female patients.

Age groups (years)	M	F	Total
<21	14	11	25
21-30	38	22	60
31-40	32	20	52
41-50	34	9	43
51-60	34	11	45
61-70	14	1	15
71-80	7	1	8
81-90	1	1	2
Total	174	76	250

Table 2: Distribution of patients according to clinical features (symptoms).

Symptoms	Frequency	Percentage
Cough	240	96
Expectoration	150	60
Chest pain	100	40
Breathlessness	130	52
Fever	160	64
Loss of appetite	210	84
Weight loss	150	60
Hemoptysis	15	6

Table 3: Chest X-ray, site of disease.

Chest X-ray site	Frequency	Percentage
Right	125	50
Left	100	40
Bilateral	25	10

Table 4: Distribution of patients according to type of opacity on chest X-ray.

Type of opacity	Frequency	Percentage
Infiltration	120	48
Consolidation	70	28
Cavity	60	24

Table 5: Bronchoscopic findings.

Bronchoscopic features	Frequency (%)
Congestion and hyperemia	90 (36)
Mucopurulent/mucoid secretions	80 (32)
Narrow segmental openings	30 (12)
Edematous mucosa & caseous material	18 (7.2)
Endo bronchial growth	10 (4)
Normal study	40 (16)

Table 6: Total yield of various bronchoscopic aided methods in our study.

Methods	Positive results	Cases done	Total yield (%)
BAL/aspirate	200	250	80
Post bronchoscopy sputum	70	250	28
Biopsy	12	16	75

DISCUSSION

The challenge in front of chest physicians is to diagnose a patient of pulmonary TB with sputum for AFB smear negative but with symptoms and radiological features suggestive of TB. Though the sputum smear examination is the most reliable and cheap tool for diagnosis of pulmonary TB, but its sensitivity is quite low.^{4,5} Its sensitivity is further lower if the patient is either not producing sputum or producing scanty sputum and these cases are usually reported as negative for AFB smear. In NTEP these patients are given symptomatic treatment for 10-14 days and then their sputum is re-examined for AFB smear, leading to delay in the diagnosis and increased chances of transmission of tuberculosis. In these kind of patients, early bronchoscopy and BAL examination may help in early diagnosis.

Table 7: Combined yield, comparison of various studies.

Study	Diagnostic yield (%)
Stenson et al USA¹¹	8/16 (66)
Kulpati et al India¹²	20/33 (60)
Wongthim et al Thailand¹³	54/71 (76)
Zainudin et al Malaysia¹⁴	33/33 (100)
Fujii et al Japan¹⁵	29/32 (91)
Danek et al USA¹⁸	39/41 (95)
Sarkar et al India¹⁹	22/30 (73)
Bachh et al India²⁰	29/60 (48)
Choudhary et al India²¹	85/108 (78)
Current study	215/250 (86)

Flexible fiberoptic bronchoscopy provides material (BAL, aspirate), as well as biopsy from localized affected areas of lung aiding in early diagnosis of smear negative tuberculosis.¹¹⁻¹⁵ In present study, majority (90, 36%) of cases showed congestion and hyperaemia of bronchial mucosa on bronchoscopy, mucopurulent or mucoid secretions were seen in 80 (32%) cases, 30 (12%) cases showed narrowing of segmental openings, edematous mucosa and caseous material was seen in 18 (7.2%) cases, bleeding from bronchus was seen in 12 (4.8%) cases, endobronchial growth was seen in 10 (4%) cases. 40 (16%) cases had normal bronchial mucosa. Similarly, Purohit et al and Wallace et al reported generalized congestion/hyperaemia in most of the patients.^{16,17} The positive yield for tuberculosis using different methods during FOB in our study is 80% by BAL fluid, 28% by

post bronchoscopy sputum and 75% by biopsy (Table 6). Six patients had only post bronchoscopy sputum for AFB smear positive and nine patients had only biopsy positive for AFB examination. So, the overall positive yield for tuberculosis using FOB in our study has been found in 215 cases (86%) which is comparable with the previously reported studies (48 to 100%) (Table 7).^{11-15,18-21}

As such there was no limitation in the study apart from financial constraints in very few patients that was managed by the hospital.

CONCLUSION

The diagnostic yield of flexible fiberoptic bronchoscope is determined by indication of its use and the skills of bronchoscopist as well as pathologist. In patients where expectoration is negligible or sputum is negative and there is high suspicion of disease, fiberoptic bronchoscopy may help in rapid and precise diagnosis and thereafter early start of treatment that will reduce the risk of transmission of TB. Current study suggests that flexible fiberoptic bronchoscopy along with post bronchoscopy sputum examination is a useful tool in early diagnosis of pulmonary TB in sputum smear negative patients. Bronchoscopy reveals a higher bacteriological confirmation of diagnosis in patients with strong clinical and radiological evidence suggestive of pulmonary TB. Thus bronchoscopic aided procedures should be done in SSN-PTB patients with a high index of clinico-radiological suspicion. However, under NTEP programme, in sputum smear negative patients there is no provision of bronchoscopy based diagnosis of these patients. The financial constraints limit most of the patients to go for this procedure. Hence, there is a need to formulate guidelines where the physician can make a definitive and early diagnosis in these types of patients.

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