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The Role of Bronchoscopy in the Diagnosis of Sputum Smear Negative Pulmonary Tuberculosis

Authors
Vikash Gupta[1], Anurag Agrawal[2], Lalit Singh[2], Rajeev Tandon[3]
[1]JR-3 Pulmonary Medicine, [2]Professor of Pulmonary Medicine, [3]Assistant Professor of Pulmonary Medicine
[1,2,3]Department of Pulmonary Medicine, Shri Ram Murti Smarak Institute of Medical Sciences, Bareilly
Email: *viksh.lucky@gmail.com*
Corresponding Author
Dr Vikash Gupta
JR-3 Department of Pulmonary Medicine
SRMS IMS Bareilly, Pin-243202

ABSTRACT

Introduction: *Diagnosis of sputum/smear-negative pulmonary tuberculosis patients can be both challenging and time consuming with many patients being put on empirical anti-tubercular treatment. Bronchoscopy may provide a confirmative and early diagnosis in such patients.*

Aims And Objective: *To assess the role of fibreoptic bronchoscopy in patients with suspected pulmonary tuberculosis who have no or inadequate sputum or have a sputum smear negative for acid fast bacillus (AFB) on two samples as per RNTCP 2013 guidelines.*

Materials And Methods: *The study was conducted in department of Pulmonary Medicine, SRMS Institute of Medical Science, Bareilly from 1st Jan 2015 to 31st Dec 2015. Fourty six patients with clinical and radiological evidence of pulmonary TB with no or inadequate sputum or smear negative for AFB on two samples were studied. Fibreoptic bronchoscopy was performed; bronchial washings and bronchial brush was taken. The specimens were subjected to Ziehl Neelsen staining and were examined under oil immersion lens for the presence of AFB.*

Results: *In suspected cases of sputum smear negative pulmonary tuberculosis, the diagnosis of tuberculosis (smear positive) was established in 23 (50%) patients in bronchial brush and 21 (45.7%) patients were positive in bronchial wash, highlighting its role in diagnosis of pulmonary tuberculosis. Patients were followed up after 6 months and those positive for AFB responded well to ATT.*

Conclusion: *Bronchoscopy is a useful tool in diagnosis of pulmonary tuberculosis in sputum smear negative patients. Bronchoscopy reveals a higher bacteriological confirmation of diagnosis in patients with strong clinical and radiological evidence suggestive of pulmonary tuberculosis and those having more risk factors.*

Keywords: *Bronchoscopy, pulmonary tuberculosis, sputum smear negative.*

INTRODUCTION

Pulmonary tuberculosis is a major public health problem, and its diagnosis is based on isolation of the organism from respiratory specimens, especially sputum samples. World Health Organization recommends bacteriological confirmation of pulmonary tuberculosis by the detection of acid-fast bacilli (AFB) in respiratory specimens.(1)

Difficulties arise when a patient who is suspected of active tuberculosis, both clinically and

radiologically, does not produce sputum. About 40-60% of patients with active pulmonary tuberculosis suspected clinically or radiologically may fail to produce sputum, or when it is available AFB may be negative on repeated smear examination. Henceforth, more aggressive procedures need to be undertaken in these patients in order to establish the diagnosis.[1]

Among various alternative methods, use of fibreoptic bronchoscopy (FOB) is one of the most widely studied alternative diagnostic approach among sputum negative patients.[2][3] The FOB facilitates rapid diagnosis and offers the additional advantage of the diagnosis of several conditions that may mimic pulmonary tuberculosis. However, FOB is an invasive procedure, and is associated with the risk of transmission of tuberculosis and other infections. It is costly, and is not widely available in the developing countries. In developed countries with no limitations on resources, early FOB seems to be the best course of action in a patient with suspected sputum smear tuberculosis. With the changing economic scenario and availability of FOB facilities in developing countries, the picture is changing fast, hence it is essential that its utility in smear negative situations must be evaluated.

Material and Methods

The study was conducted in department of Pulmonary Medicine, SRMS Institute of Medical Science, Bareilly from 1st Jan 2015 to 31st Dec 2015. The subjects of the study group were from among the patients attended the outpatients department and those admitted in the wards. The inclusion criteria were – 1) All patients attended opd and admitted in wards with clinical history, physical findings and chest X-ray lesions (consolidation, infiltration, cavity) suggestive of pulmonary tuberculosis. 2) Sputum either not produced or inadequate for examination (only saliva or sputum quantity < 2 mL) or sputum smear negative for acid fast bacillus (AFB) on two samples, as per RNTCP 2013 guidelines.

Bronchoscopy Procedure

After obtaining well-informed written consent, all the bronchoscopy was performed as an elective procedure.

- Food and drinks were withheld at least 6 hours prior to bronchoscopy. Pre-broncho-scopy scree-ning was done with history, physical examination, BT, CT, PT, platelet count, fresh X-ray chest PA and ECG, sputum smear for AFB on two consecutive days, xylocaine sensitivity test.
- Local anaesthesia was achieved by spray-ing the orophayrnx with 4-5 ml of 4% xylocaine.
- The total dose of xylocaine never exceeded 400 mg.
- Small amount of additional 2% lignocaine was used during bronchoscopy to suppress coughing.
- All bronchoscopies was performed by a single operator and was done with the patient lying supine on the operation table with the operator standing at the head end.
- Trans-nasal passage was used for bronchoscopy thorough examination of nasopharynx and larynx was done.
- Nasal passage functions as a stint for the passage of flexible fibreoptic broncho-scope, permitting leisurely inspection of upper airways and observation of the glottis and trachea under dynamic or static conditions.
- Washings was obtained by lavage with 20-40 ml of normal saline, and subsequent aspiration into a trap connected to the suction tubing. The specimen was sent in sterile container for AFB.

  Smear examination for AFB was carried out by Fluorescent Microscopy technique.

Contraindications for Bronchoscopy

- If a patients has saturation below 90% on air at rest, the risk of significant hypox-emia during bronchoscopy is increased.
- FEV_1 <40% predicted.

- Blood clotting abnormalities, particularly platelet level <50,000/mm^3.
- Uraemia, PHT, SVCO, liver disease, and immunosuppresion predispose to haemorrhage.
- Recent MI may be associated with cardiac ischaemia during bronchoscopy.

RESULT

Out of 46 patients 29 were male and 17 were female. Most patients were in the age group of 18-40 years. On the total, 87% of patients had cough with sputum but negative for AFB smear.

Table 1: Distribution of Patients according to clinical features (symptoms)

Symptoms	Frequency	Percentage
Cough	40	87.0%
Fever	32	69.6%
Breathlessness	23	50.0%
Loss of appetite	21	45.7%
Chest pain	19	41.3%
Haemoptysis	16	34.8%
Weight loss	5	10.9%

Radiologically, Upper zone was most commonly involved- infiltration was present more in right upper zone (12), left upper zone (1), Bilateral (2). Consolidation in right upper zone (2), left upper zone (1). Cavity in left upper zone (1). Fibrosis in right upper zone (3). A total of 12 patients had involvement of multiple zones.

Table 2: Distribution of Patients according to type of opacity present in each zone on Chest X-ray

Type of opacity	Zone	Side			Total cases
		Right	Left	Bilateral	
Infiltration (n=33)	UZ	12	1	2	15
	UMLZ			3	3
	LZ		6		6
	MZ	4		1	5
	UZ MZ	3		1	4
Consolidation (n=13)	UZ	2	1		3
	UMLZ	1			1
	LZ	3	2		5
	MZ	1		1	2
	UZ MZ		1		1
	MZ LZ		1		1
Cavity	UZ		1		1
	UMLZ			1	1
	LZ		1		1
	MZ		1		1
	UZ MZ	1			1
Fibrosis	UZ	3			3

UZ- Upper zone; UMLZ- Upper middle and lower zone; LZ-Lower zone; MZ- Middle zone, UZMZ - Upper zone and middle zone; MZLZ- Middle zone and lower zone.

Bronchoscopy was done in all 46 patients and among 46 patients 21(45.7%) patients were positive for AFB in bronchial wash. Bronchial brush was positive in 23(50%) patient.

Table 3: Distribution of Patients according to Bronchial wash for AFB.

Bronchial wash for AFB	Frequency	Percentage
Positive	21	45.7%
Negative	25	54.3%
Total	46	100%

Table 4: Distribution of Patients according to Bronchial brush for AFB

Bronchial brush for AFB	Frequency	Percentage
Positive	23	50.0%
Negative	23	50.0%
Total	46	100%

All patients with smear positive bronchial brush and bronchial wash were treated with anti-tuberculous treatment (ATT) as per national control program. All patients on ATT had a successful outcome (cured or treatment completed).

DISCUSSION

In the earlier days of rigid bronchoscopy, patients with tuberculosis were seldom subjected to bronchoscopy for diagnostic purpose. With the advent of fiber-optic bronchoscopy, smear for mycobacteria from the bronchial aspirate, bronchial washing, bronchial brushing, brochoal-veolar lavage fluid, have all been used in various studies for diagnosing pulmonary tuberculosis.

Those were diagnosed as active pulmonary tuberculosis by demonstration of acid fast bacilli in bronchial washing and brush. Pulmonary tuberculosis (smear negative) was diagnosed in those who were negative for AFB in bronchial washing, brush, and were suggestive of pulmonary tuberculosis on basis of clinic-radiological profile and also responding well to ATT given on empirical basis.

Out of 46 patients 29 were male and 17 were female. Most patients were in the age group of 18-40 years. On the total, 87% of patients had cough with sputum but negative for AFB smear.

Radiologically Infiltrative opacities were seen in majority of the cases 33 (71.7%) followed by consolidation 13 (28.3%), cavity 5 (10.9%) and fibrosis 3 (6.5%). Majority of the cases had unilateral involvement. Among cases with unilateral involvement right side was more commonly involved 26 (56.5%) as compared to left side 13 (28.3%). Bilateral involvement was in 7 (15.2%).

In pulmonary tuberculosis (smear positive) infiltration 18 (62.1%) was more common type of opacity on chest X-ray, more in upper zone in 7 (46.7%). In a study by Biswas S et al.[4] radiologically, an exclusive upper zone involvement was seen in 67% of patients while 16% of other patients had multi-lobar involvement including upper zones.

In pulmonary tuberculosis (smear positive) Bronchoscopic visualization yielded mucopurulent secretion in 11 (37.9%) cases, followed by mucosal hyperaemia 9 (31.0%). Kulapati et al.[5] observed the coating of mucosa of involved segments with yellowish white secretions in all most all patients and also revealed mild to moderate hyperaemia after bronchial wash. Purohit et al.[6] reported ulceration in 64% of patients; 60% had frothy secretion for the bronchus. A moderate hyperaemia of bronchial mucosa was observed in all the patients. Wongthim et al.[7] reported that over a four-year period, 112 of the 1265 bronchoscopies were performed in patients with suspected PTB, Bronchial brushings gave the highest diagnostic yield being positive in 33 of the 65 (51%; 4.6% exclusively positive) compared to bronchial washings which were positive in 24 of the 50. In

the series reported by Chawla et al.[8] 50 sputum smear-negative patients suspected to have PTB underwent FOB. Early diagnosis could be made in 36 of the 50 (72%) patients and a definitive diagnosis was made in 45 (90%) of them. The yield from brush smears were found to be significantly better when compared to bronchial aspirate smear ($p<0.01$) and post-bronchoscopy smear ($p<0.01$). Dasgupta et al.[9] reported a study in which fiberoptic bronchoscopy with bronchial aspiration, washings and biopsy was performed in 104 patients. Diagnostic yield for tuberculosis was in 69.22% (72/104) cases, it includes positive aspiration and washing smears in 38.46% (40/104) patients.

CONCLUSION

Our study concluded that in our single centre prospective study at SRMS Institute of Medical Science, Bareilly that bronchoscopy is a useful tool in diagnosis of pulmonary tuberculosis in sputum smear negative patients. Bronchoscopy reveals a higher bacteriological confirmation of diagnosis in patients with strong clinical and radiological evidence suggestive of pulmonary tuberculosis and those having more risk factors.

The results from current study reemphasizes on the diagnostic utility and safety of the bronchoscopy procedure. In suspected cases of sputum smear negative pulmonary tuberculosis, the diagnosis of tuberculosis was established in bronchial brush 23 (50%) and bronchial wash 21 (45.7%), highlighting its role in diagnosis of pulmonary tuberculosis.

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