ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2016; 2(12): 543-546
www.allresearchjournal.com
Received: 07-07-2016
Accepted: 23-10-2016

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Role of fiberoptic bronchoscopy in sputum smear negative pulmonary tuberculosis

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Abstract
Introduction: Tuberculosis (TB) is one of the oldest and deadliest disease in the world and also major health problem, archaeological evidences from ancient civilizations have shown the existence of tuberculosis in the prehistoric era. The initial diagnostic approach to suspected case of pulmonary tuberculosis is to demonstrate mycobacterium tuberculosis in stained smears of expectorated sputum.
Aims and Objectives: To diagnose the role of Fibreoptic bronchoscopy in sputum Smear Negative Tuberculosis.
Material and Methods: This is Institutional based Prospective observational study conducted in the Department of Respiratory Medicine in Prathima Institute of Medical Sciences, Karimnagar conducted from June 2016 to November 2016. Patients were selected after screening of inclusion and exclusion criteria and taken up for the bronchoscopy. Procedure was carried out in patients with nil orally for 4 to 6 hours. Written consent was obtained from the patients. Procedure was explained to the patient in his own language. Patients were pre medicated 30 mints prior to bronchoscopy with 0.6 mg Atropine and Nebulization was done with 4% Xylocaine via ultrasonic nebulizer.
Result: The total number of patients involved in this study was 50, out of which32 males patients, i,e. 64% and 18 females patients (36%). The youngest patient was aged 18 years and the oldest was 72 years. 34 (68%) patients had unilateral lesions (right + left) and 16 (32%) had bilateral lesions. 12 (24%) had cavitary lesion, and 38 (76%) had infiltrations without cavitations on chest radiography. The most common bronchoscopic finding was congestion with mild to moderate hyperemia with whitish plaques of variable size in between, and it observed in 41 (82%) cases. Bronchial washings smear for AFB was positive in 16/50 (32%) cases, out of this predominant age group that shows more positivity belongs to 15 – 30 years (42.85%) followed by 31-45 years (40.0%).
Conclusion: This study proved that Fiberoptic Bronchoscopy though little cost effective, is an effective tool in the diagnosis of sputum negative pulmonary tuberculosis. It has shown that additional yield of 38% more than direct sputum smear examination, which helps to initiate early treatment of tuberculosis to cut off the epidemiological cycle as we know one sputum positive case can infect 15 cases. So, prevention of these cases will neutralize the cost of bronchoscopy.

Keywords: Fiberoptic bronchoscopy, tuberculosis, sputum smear

1. Introduction
Tuberculosis (TB) is one of the oldest and deadliest disease in the world and also major health problem, archaeological evidences from ancient civilizations have shown the existence of tuberculosis in the prehistoric era. Even though effective chemotherapy for tuberculosis has been available for decades, TB still remains a public health challenge all over the world. Even though the disease is curable, 2 million deaths occurring every year that is some 5000 deaths occurring everyday [1].
In 2015, 10.4 million TB cases were reported to WHO of these 9.7 million were people newly diagnosed and another 0.4 million were already on treatment [2].
"Notifications on TB cases has stabilized in recent years. About 64% of the Estimated 10.4 million people who developed TB were notified as newly diagnosed cases [3]. Over the years not only the medical implications but also the social and economic impact of tuberculosis has been enormous. In 1993, the World Health Organization (WHO) declared Tuberculosis as a global emergency because of the scale of the tuberculous epidemic and the HIV pandemic. There was a need for improving the global Tuberculosis control programme. The persistence of TB has been chiefly due to failure of the NTCP [4].

Poverty, overcrowding and migration, prevalence of diabetes, malignancy have contributed for significant rise of TB cases in HIV endemic areas. To help and address the situation, a Global strategy called DOTS was introduced [5]. WHO has been promoting the incorporation of the DOTS strategy into the national tuberculosis control programmes all over the world since then. National tuberculosis programme (NTCP) started in 1962 when reviewed in 1992 after three decades of operation; it was found that it has not made much of an epidemiological impact on the disease [6]. The review resulted in the genesis of Revised National Tuberculosis Control Programme (RNTCP). The programme tested as a pilot project in 1993 was found to be effective. The expansion of the programme was started in 1998. The programme is based on the WHO strategy of Directly Observed Treatment Short course (DOTS) [7].

The initial diagnostic approach to suspected case of pulmonary tuberculosis is to demonstrate mycobacterium tuberculosis in stained smears of expectorated sputum. In most of the tuberculosis centres even after meticulous search the bacteriological positive yield from sputum is around 15-50% and large portion remain negative in spite of clinical profile and radiological lesions being consistent with diagnosis of Pulmonary tuberculosis. Those sputum smear negative cases are undiagnosed and also under treated or lately treated in advanced stages. Even culture of sputum may be non contributory. The difficulty is further compounded by the fact that culture of mycobacterium requires 6-8wks [8].

Early diagnosis of pulmonary tuberculosis prevents progression of disease, morbidity, spread of disease and permanent damage by fibrosis. Culture of sputum for acid fast bacilli takes long time and a reliable serological test is not at available. So in such condition bronchoscopy has been tried for rapid diagnosis of tuberculosis in smear negative cases.

Flexible fiberoptic bronchoscopy and bronchial washing analysis have an extensive diagnostic potential in pulmonary tuberculosis. The fiberoptic bronchoscopy with bronchial washing analysis for AFB including culture for mycobacterium tuberculosis has significant role to establish the diagnosis in those cases where the extensive search for AFB in expectorated sputum has repeatedly failed or those cases where sputum expectoration is absent or the sputum induction has failed.

Aims and Objectives

To diagnose the role of Fibreoptic bronchoscopy in sputum Smear Negative Tuberculosis.

Material and Methods

This is Institutional based Prospective observational study conducted in the Department of Respiratory Medicine in Prathima Institute of Medical Sciences, Karimnagar conducted from June 2016 to November 2016.

Inclusion criteria

1. Age is more than 15years.
2. Both sexes are included**.**
3. Clinically suspected cases of pulmonary tuberculosis with cough of more than 2 weeks, fever, loss of appetite &weight
4. Two sputum smear negative for acid fast bacilli (spot, overnight)
5. Chest X-ray suspicion of pulmonary tuberculosis.

Exclusion criteria

1. Positive Sputum smear cases.
2. Patients with history of ATT for more than 1 month / Defaulters / Failures /Relapses.
3. Children with pulmonary tuberculosis less than 15 years of age.
4. Immuno compromised individuals.
5. Patients with severely Hypoxic/Dyspnoeic.
6. Patients with resent history of myocardial infarction/arrhythmias
7. Patients who are not cooperative for bronchoscopy

Methodology

Patients were selected after screening of inclusion and exclusion criteria and taken up for the bronchoscopy. Procedure was carried out in patients with nil orally for 4 to 6 hours. Written consent was obtained from the patients. Procedure was explained to the patient in his own language. Patients were pre medicated 30 mints prior to bronchoscopy with 0.6 mg Atropine and Nebulization was done with 4% Xylocaine via ultrasonic nebulizer. Bronchoscopy was carried out under local anesthesia, 4%lignocaine was sprayed to both nostrils and mouth with 26 G syringe. OLYMPUS BF type E2 bronchoscope was used. The tip of the bronchoscope was lubricated with lignocaine jelly and was advanced into the nostril under direct vision along the floor of the nose of the widest visible opening between the turbinates and lateral wall of the nostril. Patients who had narrow nostril, to pass the bronchoscope this procedure was done through oral route by asking to hold bite block between the teeth.

The instrument was advanced till glottis and larynx were in view, the movement of vocal cord with respiration was observed and 2% lignocaine was pushed through the suction channel of bronchoscope to anesthetize the vocal cords.

The tip of bronchoscope was centered with regard to vocal cords and was quickly advanced through the opening. Once crossed the vocal cords 2ml of 2% lignocaine was given and bronchoscope was passed into the normal bronchial tree first and then on the abnormal side. If bilateral lesion were present bronchoscope was maneuvered first on the right side, scope was maneuvered up to sub segmental bronchi and observed for mucosal irregularity, ulcerations, granulations and any growth.

Bronchial washing was performed by instillation of 0.9% isotonic saline at room temperature through the internal channel of FOB and aspirated into a trap connected to suction tubing. Usually 20ml of fluid was instilled with each washing and about 5-10ml of fluid was retrieved in the suction trap.

While doing procedure it is important to observe any bronchospasm, oxygen saturation, pulse rate, blood pressure by pulse oximeter. If necessary oxygen was given during the procedure.

After processing the collected sample was sent for investigations. After the procedure patient was observed for any shortness of breath, fever, and haemoptysis or chest pain.

The first sputum sample after bronchoscopy (post bronchoscopic sputum) was collected and sent for analysis along with bronchial washings. About 10 ml of bronchial washings was sent for cytology/AFB in a sterile bottle. The

fluid was transferred in a silicon test tube and centrifuged at 2000 rpm for 10 minutes. Smear was prepared from the sediment and examined after Ziehl-Neelsen Staining.

Results

Table 1: Number of patients, n=50 sex distribution of patients

Total number	Male (%)	Female (%)
50	32(64.0)	18(36.0)

The total number of patients involved in this study was 50, out of which32 males patients, i,e. 64% and 18 females patients (36%).

Table 2: Number of patients, n=50 age distribution of patients

Age in years	Number of cases "n" (%)
15-30	21(42.0)
31-45	14(28.0)
46-60	9(18.0)
>60	6(12.0)

The most common age group involved in this study was in between 15-30 years (42%).The youngest patient was aged 18 years and the oldest was 72 years.

Table 3: Radiological manifestations

Radiological manifestations			Number, N	Percentage (%)
Site	Right		21	42.0
	Left		13	26.0
	Bilateral		16	32.0
Total			50	100
Type	Cavitary	Single	9	18.0
		Multiple	3	06.0
	Infiltrations without cavity	Diffuse	15	30.0
		Localized	23	46.0
Total			50	100

34 (68%) patients had unilateral lesions (right + left) and 16 (32%) had bilateral lesions. 12 (24%) had cavitary lesion, and 38 (76%) had infiltrations without cavitations on chest radiography.

Table 4: Bronchoscopic findings

Finding	Number of patients (n)	Percentage (%)
Congestion/Hyperemia	41	82.0%
Erosions, ulcerations	16	32.0%
Bleeding	8	16.0%
Growth	2	4.0%

The most common bronchoscopic finding was congestion with mild to moderate hyperemia with whitish plaques of variable size in between, and it observed in 41 (82%) cases. In the remaining cases erosions & ulceration in 16(32%), intra bronchial bleeding 8(16%) and intra bronchial growth 2(4%) was observed

Table 5: Bronchial washings results

Age in years	Total number of cases, (n)	Bronchial washings for AFB	
		Positive (%)	Negative (%)
15-30	21	9(42.85)	12(57.14)
31-45	14	4(28.57)	10(71.42)
46-60	9	2(22.22)	7(77.77)
>60	6	1(20.00)	5(83.33)
Total	50	16(32.00)	34(68.00)

Bronchial washings smear for AFB was positive in 16/50 (32%) cases, out of this predominant age group that shows more positivity belongs to 15 – 30 years (42.85%) followed by 31-45 years(40.0%).

Table 6: Post bronchoscopy sputum results

Age in years	Number of cases	Post bronchoscopy sputum for AFB	
		Positive (%)	Negative (%)
15-30	21	5(23.80)	16(76.19)
31-45	14	2(14.24)	12(85.71)
46-60	9	1(11.11)	8(88.88)
>60	6	-	6 (100)
Total	50	8(16.00)	42(84.00)

Post bronchoscopic sputum smear for AFB was positive in 8/50 (16%) cases, out of this predominant age group that shows more positivity belongs to 15 – 30 years (23.80%).

Table 7: Post bronchoscopic sputum smear examination and bronchial washings

Total no of smear negative pulmonary tuberculosis cases(N)	Post bronchoscopic washing positive cases	Post bronchoscopic sputum smear positive cases	Both bronchia l washings & post bronchoscopic sputum smear positive cases	Overall yield of positivity in smear negative cases (%)
50	16 (32%)	8 (16%)	5 (10%)	19 (38.00)

Bronchial washings smear for AFB was positive in 16/50 (32%) cases, and Post bronchoscopic sputum smear for AFB was positive in 8/50 (16%) cases, and in 5 (10%) cases both post bronchoscopic sputum and bronchial washings are positive.

And the overall yield of bronchoscopy in sputum smear negative pulmonary tuberculosisis:- 16+8-5=19. And the percentage of overall yield is:- 19/50*100=38.

The initial diagnostic approach to suspected case of pulmonary tuberculosis is to demonstrate mycobacterium tuberculosis in stained smears of expectorated sputum. However, in a large proportion of patients, repeated sputum smear examination for acid fast bacilli may remain negative inspite of clinical profile and radiological lesion being consistent with the diagnosis of pulmonary tuberculosis. Even the culture of sputum may be non contributory; the difficulty is further compounded by the fact that culture of mycobacterium requires 6-8 weeks.

Various methods have been investigated for isolating Mycobacteria more efficiently. In the earlier days of rigid bronchoscopy patients with tuberculosis were seldom subjected to bronchoscopy for diagnostic purpose. With advent of fiberoptic bronchoscopy, smear and culture for Mycobacteria from the bronchial aspirate, Bronchial brushings, Bronchial washing, Bronchoalveolar lavage fluid, Post bronchoscopic sputum and biopsy material have all been used in various studies for diagnosing pulmonary tuberculosis.

Discussion

In our present study conducted in 50 patients, 64% (32/50) male patients and 36% (18/50) were female patients. Kulpati

et al., conducted a study in 20 patients, in which 12 (60%) patients were male and remaining 8 (40%) were female [9]. A similar study was conducted by Arshad Altaf Bachh *et al*., in 2010, in 75 patients, in which 50 (66.66%) patients were male and remaining were female (25/75,33.33) [10]. In Purohhit *et al*., nearly half of the patients had illness for less than 2 months and only 30% had illness of six months duration [11]. In Arshad Altaf Bachh *et al*. study, 68% of patients had developed symptoms in less than 2 months only [10].

In present study 21/50 (42%) patients had symptoms of less than 2 months, followed by 17/50 (34%) patients had symptoms 2-6 months duration. In Kulpati [9] *et al*. observed that unilateral lesions were present in 80% of cases followed by diffuse infiltrations in 75% of cases, similarly In present study patients commonly presented with unilateral lesions in 68% of cases, followed by bilateral and diffuse infiltrations.

In present study 82% of cases showed with hyperemia of bronchial mucosa on bronchoscopy, 32% of cases had erosion and ulceration. In Kulpati *et al*. observed coating of mucosa of involving segment with yellowish white secretions in almost all patients and also revealed mild to moderate hyperemia after bronchial wash. Intra bronchial growth and erosion, ulceration were seen in 30% and 25% respectively [9]. In Arshad Altaf Bachh *et al*. study congestion, hyperemia was found in 70.7% of cases followed by ulceration in 32% and intrabronchial growth in 4% of cases [10].

In Arshad Altaf Bachh *et al*. study, the overall yield of bronchoscopy in sputum smear negative PTB was 83.33% (50/60, bronchial washings for AFB culture was positive in 65%, smear in 35%, post bronchoscopy sputum smear positivity in18.33%) [10]. In Kulpati *et al*. study, the overall yield of bronchoscopy was 60.60% (bronchial washing smear positive in 40% of cases and culture positive in 65% of cases, post bronchoscopy sputum smear positivity 15% and culture positive in 25%) [9]. In Arshad Althaf Bachh *et al*. study, the overall yield of bronchoscopy was 83.33% (Bronchial washings smear for acid-fast bacilli (AFB) was positive in 21 patients (35%), while culture of bronchial washings was positive in 39 (65%) patients) [10].

In present study, the overall yield of bronchoscopy in sputum smear negative PTB was 38% (bronchial washings positive in 32% and post bronchoscopy sputum was positive in 16% of cases. This disparity compared with other studies, may be because only bronchial washings and post bronchoscopic sputum smear has been done but culture was not done in this study. In their study culture, trans bronchial biopsy was responsible for higher yield.

Conclusion

This study proved that Fiberoptic Bronchoscopy though little cost effective, is an effective tool in the diagnosis of sputum negative pulmonary tuberculosis. It has shown that additional yield of 38% more than direct sputum smear examination, which helps to initiate early treatment of tuberculosis to cut off the epidemiological cycle as we know one sputum positive case can infect 15 cases. So, prevention of these cases will neutralize the cost of bronchoscopy. Therefore, this procedure is useful in the diagnosis of sputum negative pulmonary tuberculosis. Further Bronchoscopy helps in ruling out the other non-tuberculous conditions like Malignancy, Pneumonia etc.

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