Journal of Infectious Diseases & Research
JIDR, 1(1): 5-8
www.scitcentral.com

Original Research Article: Open Access

Fiberoptic Bronchoscopy for the Rapid Diagnosis of Suspected Pulmonary Tuberculosis

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Received September 11, 2018; Accepted October 23, 2018; Published November 23, 2018

ABSTRACT

Background: Microbiological confirmation of Mycobacterium tuberculosis disease can be challenging in patients with a low bacterial load or in those who do not expectorate. In such situations sampling through brochoalveolar lavage (BAL), induced sputum and gastric lavage are alternatives. The Xpert MTB/RIF assay is a rapid technique with high sensitivity and specificity for diagnosing TB and detecting drug resistance in extra pulmonary and smear-negative TB cases and from Bronchoalveolar lavage. Hence we conducted this study to evaluate the significance of Xpert MTB/RIF performed on bronchial washing fluid obtained bronchoscopically from patients with a clinical and radiological suspicion of pulmonary tuberculosis.

Methods: We retrospectively reviewed the clinical records and fibre optic bronchoscope (FOB) results of all patients with suspected PTB who visited the pulmonary clinic of Government Rajaji Hospital (GRH), Madurai from January 2017 to June 2017.

Results: A total of 100 sputum smear-negative patients were posted for FOB, 71 men (71%) and 29 women (29%), the median age was 53 years. The patients aged 41 to 60 years (53.5%) were the ages most frequently encountered. Twenty two out of the 100 BAL specimens (22.7%) were positive culture for M. tuberculosis by Xpert MTB/RIF. Drug sensitivity test showed one case (4.5%) resistant to Rifamycin who was referred to initiate on Multi-drug resistant TB treatment.

Conclusion: This study revealed high positive rates of PTB from bronchoscopy samples, providing rapid and definitive ability for PTB diagnosis, and details of drug susceptibility. Therefore, FOB is an important diagnostic procedure in patients with suspected PTB whose sputum specimens were negative.

Keywords: Pulmonary tuberculosis, Fibreoptic bronchoscopy, Xpert MTB/RIF

INTRODUCTION

Too many people have undetected Tuberculosis (TB) for too long; late detection of TB increases their risk of transmitting the disease to others. Detecting patients with active Pulmonary Tuberculosis (PT) disease is an important component of tuberculosis control programs, as early diagnosis and treatment of pulmonary tuberculosis is essential in reducing the morbidity, mortality and the escalating costs associated with advanced disease. A high-quality laboratory system that uses modern diagnostics is a prerequisite for the early, rapid and accurate detection of TB and drug resistance. In December 2010, GeneXpert MTB/RIF assay was endorsed by World Health Organisation (WHO) and then recommended for detection of Mycobacterium tuberculosis (M.TB) complex and rifampicin resistance [1].

In everyday clinical practice, we often encounter patients suspected of PTB but they do not produce sputum. One study showed 50% of patients with suspected active TB are either unable to produce sputum or demonstrate a negative

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Citation: Rathinam P, Pandian PGDN, Rajendran M, Karunaikadal BB & Sankaralingom E. (2018) Fiberoptic Bronchoscopy for the Rapid Diagnosis of Suspected Pulmonary Tuberculosis. J Infect Dis Res, 1(1): 5-8.

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sputum smear for acid fast bacillus (AFB) [2]. Microbiological confirmation of *Mycobacterium tuberculosis* disease can be challenging in patients with a low bacterial load or in those who do not expectorate. In such situations sampling through brochoalveolar lavage (BAL), induced sputum and gastric lavage are alternatives. Where available, bronchoscopy and BAL can be performed to obtain samples.

The Xpert MTB/RIF assay is a rapid and simple technique with high sensitivity and specificity for diagnosing TB and detecting drug resistance in extra pulmonary and smear-negative TB cases [3] and from Bronchoalveolar lavage [4,5]. With the advent of fibre-optic bronchoscopy, smear and culture for mycobacteria from the bronchial aspirate, bronchial brushing, bronchial washing, bronchoalveolar lavage fluid, post bronchoscopy sputum and biopsy material have all been used in various studies for diagnosing pulmonary tuberculosis. There are limited studies to demonstrate the use of Xpert MTB/RIF performed on bronchial lavage specimens in our settings. Hence we conducted this study to evaluate the significance of Xpert MTB/RIF performed on bronchial washing fluid obtained bronchoscopically from patients with a clinical and radiological suspicion of pulmonary tuberculosis.

METHODS

Study population

We retrospectively reviewed the clinical records and fibre optic bronchoscope (FOB) results of all patients with suspected PTB who visited the pulmonary clinic of Government Rajaji Hospital (GRH), Madurai from January 2017 to June 2017.

For the purposes of our study we considered a clinical suspicion of pulmonary tuberculosis if any two of the following were present: known HIV infection, persistent cough lasting >3 weeks, hemoptysis, weight loss >4 kg, intermittent fever >3 weeks or drenching night sweats >2 weeks. In addition, at least one of the following radiological criteria had to be present for inclusion: cavitation, diffuse infiltrates, hilar or mediastinal adenopathy. All had 2 early morning sputum smears negative for AFB by fluorescent microscope stain. They had no response to 2 weeks antibiotics used for lower respiratory tract infection. The study was approved by the Hospital Ethics Committee. A waiver of consent was obtained due to the retrospective nature of the study.

Procedure

Bronchoscopic procedure was performed according to our institute's infection regulation and instruction guideline. The patients were informed about the procedure and consents were obtained. The patients underwent bronchoscopy by flexible fiberoptic bronchoscope through trans nasal route in supine position and under local anaesthesia. All the patients underwent continuous monitoring of electrocardiogram, blood pressure and pulse oximetry. After inspection of the bronchial tree, BAL was done with 100 ml of normal saline at the end of bronchoscopy in the region suspected for lesion based on chest radiography. The patients were observed in the recovery room. BAL samples were sent for fluorescent microscope stain, fungal smear, and cytopathology. Proper disinfection of the bronchoscope in between use was done. All Xpert MTB/RIF samples were processed according to the manufacturer's specifications.

RESULTS

All the records were scrutinized, checked and computerized by trained data entry operators. Data entry was done in Excel 2013 and analysis was performed using SPSS 20. Descriptive statistics were performed. The study involved the patients attending the TB clinic in GRH, who had clinical and radiological findings suggestive for PTB, whose sputum smear were negative by fluorescent microscopy and a FBO was performed for TB diagnosis. A total of 100 sputum smear-negative patients were posted for FOB, 71 men (71%) and 29 women (29%), the median age was 53 years. The patients aged 41 to 60 years (53.5%) were the ages most frequently encountered **(Table 1)**. Twenty two out of the 100 BAL specimens (22.7%) were positive culture for *M. tuberculosis* by Xpert MTB/RIF. Drug sensitivity test showed one case (4.5%) resistant to Rifamycin who was referred to initiate on multi-drug resistant TB treatment.

DISCUSSION

Fiberoptic bronchoscopy (FOB) is an alternative option to provide respiratory specimens for diagnosis, particularly from sites which are suspected by radiological findings to be involved in PTB after sputum expectoration has continually failed because of lacking sputum. We evaluated the clinical value of Xpert MTB/RIF assays for the diagnosis of active PTB in sputum-scarce PTB suspects in TB endemic setting.

In our study bronchial washings Xpert was positive for acid fast bacilli in 22.7% patients which were missed in smear microscopy. Although sputum microscopy is the most appropriate, low cost, highly specific investigation to diagnose pulmonary tuberculosis, Sputum smear-negative pulmonary tuberculosis (SSN-PTB) still remains a common problem faced by the clinicians. Despite being less infectious than sputum smear-positive PTB, smear-negative PTB serves as an important cause of transmission in communities by delaying diagnosis and precluding initiation of treatment and often leads to complications of irreversible lung damage in infected individuals. 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. Therefore, sputum smear-negative PTB often requires more invasive diagnostic tools to be distinguished from other diseases such as lung cancer. Fibreoptic bronchoscopy may provide a

Table 1: Clinical characteristics and bronchoscopic findings of study patients.

Variables	n (%)
Age (in years)	
Median (IQR)	53 (43.61)
Age Group (in years)	
≤ 20	2 (2.0)
21-40	19 (19.2)
41-60	53 (53.5)
61-80	24 (24.2)
>80	1 (1.0)
Sex	
Male	71 (71.0)
Female	29 (29.0)
Case	
HIV	1 (1.0)
Extra Pulmonary	2 (2.0)
Smear Negative PT	97 (97.0)
Results	
Negative	75 (77.3)
Positive	22 (22.7)
DST (Sensitivity to Rifamycin)	
Sensitive	20 (90.9)
Resistant	1 (4.5)
Indeterminate	1 (4.5)

DST: Drug Sensitivity Testing; Indeterminate: The test could not accurately determine if the bacteria are resistant to RIF; Growth-based susceptibility testing to first-line TB drugs should be performed

DISCUSSION

Fiberoptic bronchoscopy (FOB) is an alternative option to provide respiratory specimens for diagnosis, particularly from sites which are suspected by radiological findings to be involved in PTB after sputum expectoration has continually failed because of lacking sputum. We evaluated the clinical value of Xpert MTB/RIF assays for the diagnosis of active PTB in sputum-scarce PTB suspects in TB endemic setting.

In our study bronchial washings Xpert was positive for acid fast bacilli in 22.7% patients which were missed in smear microscopy. Although sputum microscopy is the most appropriate, low cost, highly specific investigation to diagnose pulmonary tuberculosis, Sputum smear-negative pulmonary tuberculosis (SSN-PTB) still remains a common problem faced by the clinicians. Despite being less infectious than sputum smear-positive PTB, smear-negative PTB serves as an important cause of transmission in communities by delaying diagnosis and precluding initiation of treatment and often leads to complications of irreversible lung damage in infected individuals. 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. Therefore, sputum smear-negative PTB often requires more invasive diagnostic tools to be distinguished from other diseases such as lung cancer. Fibreoptic bronchoscopy may provide a confirmative and early diagnosis in such patients [6].

In the earlier days of rigid bronchoscopy, patients with tuberculosis were seldom subjected to bronchoscopy for diagnostic purpose. With the advent of fibre-optic bronchoscopy, smear and culture for mycobacteria from the bronchial aspirate, bronchial brushing, bronchial washing, bronchoalveolar lavage fluid, post bronchoscopy sputum and biopsy material have all been used in various studies for diagnosing pulmonary tuberculosis. There are studies done even in pediatric populations which had shown that the diagnostic yield for AFB from BAL was better than that from GA in children with probable pulmonary TB [7]. FOB

performed in outpatient setting is a useful and safe modality. No major complications were encountered [8].

There are several limitations in this study. First, it was a retrospective study and the study population and clinical setting were selective, so it is difficult to generalize this result to other settings. Second, to improve diagnostic accuracy and ensure safety, a well-trained pulmonologist is essential for the use of FOB in the diagnosis of PTB.

This study revealed high positive rates of PTB from bronchoscopy samples, providing rapid and definitive ability for PTB diagnosis and details of drug susceptibility. Therefore, FOB is an important diagnostic procedure in patients with suspected PTB whose sputum specimens were negative.

ACKNOWLEDGEMENT

We would like to thank the Institute for permitting us to utilise the Hospital medical records of the patients. We also thank Ms. Kayalvizhi and Ms. Gomathi for assisting in data collection.

AUTHORS CONTRIBUTION

Prabhakaran Rathinam and Poorana Ganga Devi Navaneetha Pandian designed and conducted the study; collected the data; and wrote the manuscript. Mahalakshmi Rajendran analysed the data. Bharathi Babu Karunaikadal and Elamparithi Sankaralingom interpreted the data and contributed to the writing of the manuscript. All authors have read and approved the final manuscript.

REFERENCES

1. World Health Organization (2014) Companion handbook to the WHO guidelines for the programmatic management of drug-resistant tuberculosis.
2. Brown M, Varia H, Bassett P, Davidson RN, Wall R, et al. (2007) Prospective Study of sputum induction, gastric washing and bronchoalveolar lavage for the diagnosis of pulmonary tuberculosis in patients who are unable to expectorate. Clin Infect Dis 44: 1415-1420.
3. Ullah I, Javaid A, Masud H, Ali M, Basit A, et al. (2017) Rapid detection of Mycobacterium tuberculosis and rifampicin resistance in extrapulmonary tuberculosis and sputum smear-negative pulmonary suspects using Xpert MTB/RIF. J Med Microbiol 66: 412-418.
4. Khalil KF, Butt T (2015) Diagnostic yield of bronchoalveolar lavage gene Xpert in smear-negative and sputum-scarce pulmonary tuberculosis. J Coll Physicians Surg Pak 25: 115-118.
5. Barnard DA, Irusen EM, Bruwer JW, Plekker D, Whitelaw AC, et al. (2015) The utility of Xpert MTB/RIF performed on bronchial washings obtained in patients with suspected pulmonary tuberculosis in a high prevalence setting. BMC Pulm Med 5: 103.
6. Arshad AB, Rahul G, Inaamul H, Hanumant GV (2010) Diagnosing sputum/smear-negative pulmonary tuberculosis: Does fibre-optic bronchoscopy play a significant role? Lung India 27: 58-62.
7. Menon PR, Lodha R, Singh U, Kabra SK (2011) A prospective assessment of the role of bronchoscopy and bronchoalveolar lavage in evaluation of children with pulmonary tuberculosis. J Trop Pediatr 57: 363-367.
8. Sinha S, Guleria R, Pande JN, Pandey RM (2004) Bronchoscopy in adults at a tertiary care centre: Indications and complications. J Indian Med Assoc 102: 152-156.