

# Role of Transbronchial Lung Biopsy in Diffuse Parenchymal Lung Diseases

Mohammed Hidayath Hussain<sup>1</sup>, Hina Afreen<sup>2</sup>

<sup>1</sup>Professor and HOD, Department of Pulmonology, Shadan Institute of Medical Sciences, Hyderabad, Telangana, India, <sup>2</sup>Second Year Postgraduate, Department of Pulmonology, Shadan Institute of Medical Sciences, Hyderabad, Telangana, India

## Abstract

**Introduction:** Diffuse parenchyma lung disease (DPLD) encompasses a heterogeneous group of disorders, characterized by a spectrum of inflammatory and fibrotic changes affecting alveolar walls and air spaces. Lung biopsy is generally required to make an etiological diagnosis of DPLD's. Transbronchial lung biopsy (TBLB) is a minimally invasive method to achieve a lung sample which has been found to be a useful diagnostic tool in patients with DPLD. Despite the small size, TBLB provides information regarding pathology that is located beyond the cartilaginous airways that may include elements of the small airways of the distal bronchial tree, the alveolar space, the vasculature, and lymphatic structures immediately surrounding the alveoli.

**Aim:** This study aims to obtain a specific diagnosis by subjecting the TBLB specimen for histopathological examination.

**Materials and Methods:** It is a prospective observational study. Twenty adult patients with radiologically diffuse parenchymal lung disease admitted between January 2010 and March 2012 in Mahavir Hospital and Research Centre, Hyderabad, were subjected for TBLB through flexible fiber-optic bronchoscopy, without fluoroscopic guidance.

**Results:** It was observed that the lung tissue yield of the procedure is 75% (15/20) and the diagnostic yield of the procedure is 93.3% with overall diagnostic yield being 70%. No significant bleeding was observed in any patient. Moreover, no mortality was observed after the procedure.

**Conclusion:** Transbronchial lung biopsy through flexible bronchoscopy is a very simple procedure. It is a relatively safe and effective procedure and helps in early diagnosis of diffuse parenchymal lung diseases. In the present study, adequate lung tissue was obtained successfully in 75% patients. Of these cases, the procedure was diagnostic in 93.3%. Complications (pneumothorax) were observed in only two patients out of twenty, which were successfully managed with ICD. Advent of HRCT chest and C-arm/Fluoroscopy help the bronchoscopist to accurately localize the lobe/segment of maximum disease for transbronchial lung biopsy and to increase the yield of the procedure.

**Key words:** Diffuse parenchymal lung diseases, High-resolution computed tomography, Transbronchial lung biopsy

## INTRODUCTION

Diffuse parenchyma lung disease (DPLD) encompasses a heterogeneous group of disorders, characterized by a spectrum of inflammatory and fibrotic changes affecting alveolar walls and air spaces.<sup>[1-3]</sup> They comprise over 200 entities and include a wide spectrum of diseases, many uncommon and many of unknown etiology and account for 15% of diseases seen in pulmonary medicine

practice.<sup>[4]</sup> The onset, rate of progression, and duration of symptoms are extremely variable. The presentations range from and asymptomatic patient with long-standing radiological changes to an acute onset of breathlessness over days leading rapidly to respiratory failure and death. The incidence and prevalence rates of DPLD have not been precisely estimated due to difficulties in ascertaining a specific diagnosis on a specific disease. Moreover, interstitial lung diseases (ILD) usually remains a diagnosis of exclusion requiring extensive investigations to differentiate ILD from other diseases.<sup>[5]</sup>

Open lung biopsy though is considered as the "gold standard" for DPLD, it is often associated with significant morbidity and mortality, and hence a safer method, the transbronchial lung biopsy (TBLB), is gradually gaining wide acceptance among the medical society.<sup>[3]</sup> Laboratory

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**Corresponding Author:** Dr. Hina Afreen, Department of Pulmonology, Shadan Institute of Medical Sciences, Hyderabad, Telangana, India.

blood testing alone is rarely diagnostic, but may be strongly supportive in the appropriate clinical setting.

PFTs cannot diagnose a specific ILD and cannot distinguish between active lung inflammations versus fibrosis, but are important in the objective assessment of respiratory symptoms as well as in paring the differential diagnosis, grading the severity of disease, and monitoring response to therapy or progression. Chest radiograph is an essential test, diagnostic in at least 50% of cases. It has limited sensitivity and specificity in diagnosis of DPLD. Up to 10% of patients of biopsy proven DPLD have normal chest X-ray.<sup>[6]</sup> High-resolution computed tomography (HRCT) is more sensitive than plain chest radiograph in identifying ILD (sensitivity greater than 90%) and the image pattern of parenchymal abnormalities on HRCT often suggest a particular set of diagnostic abnormalities. Fiber-optic bronchoscopy with bronchoalveolar lavage (BAL) may substantiate specific diagnosis in some patients (e.g, sarcoidosis, LCG, LAM, CEP, and COP) and BAL may be adequate in to diagnose specific infections. TBLB achieves a high diagnostic yield in DPLDs with centrilobular attenuation, such as granulomatous and metastatic diseases, infection, alveolar proteinosis, and eosinophilic pneumonias.<sup>[7-9]</sup>

## MATERIALS AND METHODS

Twenty adult patients with radiologically diffuse parenchymal lung disease admitted between January 2010 and March 2012 in Mahavir Hospital and Research Centre, Hyderabad, were subjected for TBLB through flexible fiber-optic bronchoscopy, without fluoroscopic guidance.

### Study Design

This was a prospective observational study.

### Setting

A total of 300 bedded tertiary care hospital, Hyderabad.

The patients were enrolled into the study according to the inclusion criteria.

The study was commenced after obtaining approval from the Institution's Ethical Committee.

### Inclusion Criteria

All adult patients having radiologically (chest X-ray posteroanterior view and HRCT – chest) diffuse parenchymal lung disease, who were not diagnosed by clinical, radiological, and routine laboratory investigations were included in the study.

### Exclusion Criteria

Patients having

1. Obvious lung mass
2. Sputum for acid-fast bacillus (D/S) positive
3. Not willing to give informed consent
4. Unfit for bronchoscopy.

### Technique

After obtaining informed consent from the patients, the procedure was performed using flexible fiber-optic bronchoscope (Olympus BFTE2 and Fujinon). Pre-medication was done with atropine 0.6 mg IM and 2% lignocaine spray was done through atomizer in patients mouth in the direction of fauces and transnasal topical 2% lignocaine gel was given into each nostril.

The lung lobe having the maximum radiological abnormality was chosen and fiber-optic bronchoscopy wedged into the bronchus of that segment. When the pulmonary disease was equally distributed in both lungs, the basal segments of lower lobes were selected for TBLB.

Biopsy forceps was advanced beyond the tip of the scope until resistance was met. The forceps was then withdrawn by 1–2 cm and cup of the forceps was opened. The patient was then asked to inhale deeply and the forceps was readvanced during inhalation for 2–3 cm or till resistance was met. The patient was asked to exhale and forceps was closed at the end of expiration and the biopsy forceps were withdrawn and the sample was collected.

An average of four lung biopsy samples was taken (ranging between 3 and 6) and kept in 10% formalin and was subjected for histopathological examination.

## RESULTS

### Sex Ratio

This study has a female-to-male ratio of 3:2.

One study reported that 80.9 per 100,000 men and 67.2 per 100,000 women suffer from interstitial disease in the United States, with 31.5 new cases diagnosed per 100,000 men per year and 26.1 new cases diagnosed per 100,000 women per year.<sup>[10]</sup>

In the references to the study by Song *et al.*,<sup>[11]</sup> the sex ratio was equal in males and females in idiopathic pulmonary fibrosis (IPF), collagen vascular disease (CVD)–PF, and hypersensitivity pneumonitis. However, the female incidence was greater in sarcoidosis and male incidence in pneumoconiosis.

### Characteristic Radiographic Appearances

Glazer study<sup>[12]</sup> of patients on radiographic appearances in ILD described the characteristic radiographic appearances of ILD – the ground glass effect, consolidation, and cysts – honey combing pulmonary nodules and interstitial thickening. They also included the advantage of HRCT in ILD.

In the current study, the characteristic radiographic appearances observed are honey combing (10%), reticulation (20%), and reticulonodular (35%).

| Study          | Characteristic appearance   |
|----------------|---|
| Glazer C study | Ground glass<br>Consolidation<br>Honeycombing<br>Nodules<br>Interstitial thickening |
| Present Study  | Honeycombing (10%)<br>Reticular (20%)<br>Reticulonodular (35%)                      |

HRCT chest was done in all cases. HRCT is more sensitive than chest X-ray in ILD. HRCT showed changes such as reticulonodular pattern, traction bronchiectasis, and honey combing.

### Diagnostic Yield

This study was undertaken to evaluate the diagnostic yield of TBLB in diffuse parenchymal lung disease in this institution.

The present study has a diagnostic yield of 70%, which is comparable with many other studies.

| Reference        | No. of patients | Diagnostic yield |
|------------------|-----------------|------------------|
| Kalra et al      | 26              | 76%              |
| R.K. Ailani      | 30              | 77%              |
| Andersen         | 939             | 79.4%            |
| Milman et al     | 126             | 66.7%            |
| Mitchell et al   | 183             | 61%              |
| Szlobowski et al | 123             | 65%              |
| Ibrahim AS et al | 71              | 81.7%            |
| Hanson et al     | 164             | 57%              |
| Ahluwalia et al  | 25              | 80%              |
| Present study    | 20              | 70%              |

### Complications

In the present study, two patients developed pneumothorax, which was treated with closed tube thoracostomy. In the study done by Ensminger and Prakash,<sup>[13]</sup> TBLB was done with the aid of fluoroscopy with a diagnostic yield of 75.9% and complications (pneumothorax) were observed in 1.26% of patients.

TBLB can be performed safely and effectively on outpatient basis in selected cases as done by Suri *et al.*<sup>[14]</sup> and Blasco *et al.*<sup>[15]</sup>.

### DISCUSSION

ILDs are heterogeneous group of diseases involving lung interstitium. They have features in common such as similarities of symptoms, comparable radiographic appearances, consistent alterations in the pulmonary physiology, and typical histological features.

In the present study, patients of ILD were selected and studied during the period from 2010 to 2012 in the Department of Pulmonary Medicine, Mahavir Hospital and Research Centre, Hyderabad.

The diagnosis of diffuse parenchymal lung disease is often challenging due to wide variety of causes included in the group and their varied presentations. Fiber-optic bronchoscopy with TBLB is a widely accepted technique for the diagnosis of diffuse parenchymal lung disease. The study group included various etiological forms of ILD such as IPF, ILD due to CVD, military metastasis, PCP, and pneumoconiosis. TBLB through flexible bronchoscopy is a simple, safe, and effective procedure for the diagnosis of diffuse parenchymal lung diseases.

However, the study was not without limitations. The various limitations include the lack of efficacy in results due to the relatively small size. The relatively small size of patients and the lack of a control group imposed limited value to statistical analysis of group difference between groups exposed to smoking or dust. The study also had many female patients. In our study, biopsy samples taken are only 4. The study would have been more effective had the sample size been 6. Even though there are many trials in DPLD, histological support for a specific diagnosis can be obtained using TBLB in 29–79% of cases. This wide range reflects the multiplicity of factors influencing the yield of the procedure, including the distribution of the lesion (focal or diffuse), status of the immune system of the patient, small size of the obtained samples, confounding due to crush artifacts, and failure to penetrate beyond the peribronchial sheath.

### CONCLUSION

Transbronchial lung biopsy through flexible bronchoscopy is a very simple procedure. It is a relatively safe and effective procedure and helps in early diagnosis of diffuse parenchymal lung diseases. In the present study, adequate

lung tissue was obtained successfully in 75% patients. Of these cases, the procedure was diagnostic in 93.3%. Complications (pneumothorax) were observed in only two patients out of twenty, which were successfully managed with ICD. Advent of HRCT chest and C-arm/Fluoroscopy help the bronchoscopist to accurately localize the lobe/segment of maximum disease for transbronchial lung biopsy and to increase the yield of the procedure.

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