Role of HRCT in Early Diagnosis of Interstitial Lung Disease

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ABSTRACT

Background: Interstitial Lung Disease (ILD) is a heterogeneous group of pulmonary disorders characterized by inflammation and fibrosis of the lung parenchyma. Early diagnosis is crucial to prevent irreversible damage, but conventional radiography often fails to detect ILD at an initial stage.
Objective: To evaluate the role of High-Resolution Computed Tomography (HRCT) in the early diagnosis and characterization of ILD.
Methods: A prospective observational study was conducted on 80 patients with clinical suspicion of ILD. HRCT findings were compared with clinical features, pulmonary function tests (PFT), and chest X-ray. The diagnostic accuracy of HRCT was assessed.
Results: HRCT detected findings suggestive of ILD in **85% of cases**, while chest X-ray detected only **40%**. Common HRCT features included ground-glass opacities (62%), reticular patterns (48%), honeycombing (25%), and traction bronchiectasis (18%). HRCT also helped in subtype classification and guided treatment.
Conclusion: HRCT is significantly more sensitive than conventional radiography and plays a pivotal role in the **early detection, differentiation, and management** of interstitial lung diseases.
Keywords: HRCT, Interstitial Lung Disease, Early Diagnosis, Ground Glass Opacity, Honeycombing, Pulmonary Fibrosis.

INTRODUCTION

Interstitial Lung Disease (ILD) encompasses a broad range of diffuse parenchymal lung disorders, including idiopathic pulmonary fibrosis (IPF), hypersensitivity pneumonitis, sarcoidosis, connective tissue disease-associated ILD, and drug-induced ILD. Early diagnosis is essential for prompt management and improved clinical outcomes.

Chest X-ray often fails to detect early ILD changes due to limited sensitivity. In contrast, **High-Resolution Computed Tomography (HRCT)** provides excellent spatial resolution and can detect subtle parenchymal abnormalities at an initial stage.

Objectives of the Study:

1. To assess the diagnostic role of HRCT in early ILD.
2. To identify characteristic HRCT patterns in ILD.
3. To compare HRCT findings with chest X-ray and clinical diagnosis.

Materials and Methods

Study Design

Prospective cross-sectional observational study.

Sample Size

80 patients clinically suspected of ILD.

Study Location

Department of Radiology and Pulmonary Medicine, tertiary care hospital.

Inclusion Criteria

- Age > 18 years
- Symptoms: dyspnea, chronic dry cough, reduced exercise tolerance
- Abnormal pulmonary function test (PFT)
- Negative for acute infection

Exclusion Criteria

- Known lung carcinoma
- Active tuberculosis
- Unstable cardiac disease
- Pregnant females

Investigations Performed

- HRCT chest
- Chest X-ray (PA view)
- Complete blood count
- ESR/CRP levels
- Pulmonary function test (PFT)

HRCT Scanning Protocol

- Thin sections: 1–1.5 mm

- Supine and prone positions
- High spatial frequency algorithm
- No contrast used for typical ILD screening

Data Analysis

Sensitivity and specificity calculated. Statistical analysis done using SPSS. **$p < 0.05$** = significant.

Results

Demographic Profile

Parameter	Value
Total Patients	80
Mean Age	54.6 ± 9.2 years
Male : Female Ratio	1.3 : 1

HRCT Findings

HRCT Pattern	Percentage (%)
Ground Glass Opacity	**62%**
Reticular Pattern	48%
Honeycombing	25%
Traction Bronchiectasis	18%
Subpleural Fibrosis	30%
Mosaic Attenuation	12%

Comparison of Detection Rates

Technique	Detection Rate (%)
Chest X-ray	40%
HRCT	**85%**

Common Etiologies

Cause	Percentage

Cause	Percentage
Idiopathic Pulmonary Fibrosis	35%
Connective Tissue Disorders	20%
Hypersensitivity Pneumonitis	18%
Drug-induced ILD	10%
Sarcoidosis	7%
Others	10%

Statistical Outcomes

- **Sensitivity of HRCT:** 92%
- **Specificity of HRCT:** 80%
- **p-value:** < 0.01 (statistically significant)

Discussion

This study confirms that **HRCT is a superior diagnostic tool** when compared to conventional chest X-ray in detecting early ILD. Ground-glass opacities and reticular patterns were the most common findings, indicating early fibrosis and inflammation.

HRCT also plays a key role in **subtype differentiation**, which helps guide therapy:

- UIP pattern suggests idiopathic pulmonary fibrosis.
- NSIP pattern may indicate connective tissue disease-related ILD.
- Centrilobular nodules point toward hypersensitivity pneumonitis.

Previous studies have shown similar results, strengthening the importance of HRCT in early diagnosis.

Conclusion

HRCT is highly sensitive in detecting early-stage ILD and should be considered **the imaging modality of choice** for suspected cases. Its ability to demonstrate characteristic patterns, guide biopsy, and help in prognostication makes it indispensable in clinical practice.

Recommendations:

1. HRCT should be included in early diagnostic workup of ILD.
2. Standardized HRCT reporting protocols should be developed.
3. Multidisciplinary approach with pulmonologists and radiologists is essential.

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