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# CHEST RADIOGRAPHY IN INTERSTITIAL DISEASES OF THE LUNGS : CORRELATION WITH HIGH RESOLUTION COMPUTED TOMOGRAPHY.

**Radiodiagnosis**

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## ABSTRACT

**Introduction:** Interstitial lung disease is heterogenous group of disorders affecting the pulmonary interstitium comparising of interalveolar connective tissue, peribronchovascualr and perilymphatic tissue including the alveolar epithelium, capillary endotjhelium and basement membranes. Interstitial lung disease (ILD) is a heterogeneous group of diffuse parenchymal lung diseases, characterize by restrictive physiology, impaired gas exchange, pulmonary inflammation and fibrosis.

**Material and method:** All the patients with clinical suspicion of interstitial lung disease who were referred to the department of Radiodiagnosis, father muller medical college hospital for diagnosis and evaluation were subjected to both conventional chest radiograph and HRCT. A cross sectional study was performed. All ages and both sexes were included in the study. It was a duration based study. 35 patients were included in the study. The study was conducted over a period of one year. The most common Interstitial lung disease found in our study usual interstitial pneumonia (UIP) and idiopathic pulmonary fibrosis(n=9), followed by Cryptogenic organizing pneumonia(n=4) and military tuberculosis(n=4).

**Conclusion:** usual interstitial pneumonia (UIP) and idiopathic pulmonary fibrosis were the most common interstitial lung disease observed in our study. This study concluded that chest radiograph is noninvasive, economical and easily available alternative to HRCT with acceptable diagnostic accuracy in diagnosis of interstitial lung disease.

## KEYWORDS

Diagnosis, chest radiograph, HRCT, interstial lung disease, usual interstitial pneumonia.

## INTRODUCTION

Interstitial lung disease is heterogenous group of disorders affecting the pulmonary interstitium comparising of interalveolar connective tissue, peribronchovascualr and perilymphatic tissue including the alveolar epithelium, capillary endotjhelium and basement membranes. Interstitial lung disease (ILD) is a heterogeneous group of diffuse parenchymal lung diseases, characterize by restrictive physiology, impaired gas exchange, pulmonary inflammation and fibrosis.(1,2)

The term ILD is often used change interchangeably with diffyse lung diseases, however neither all DLD involve in interstitium nor all ILDs are diffuse

In most cases the pathology of ILD lies in the pulmonary interstitium which consist of connective tissue space between the alveolar epithelial cells and the adjacent capillary endothelial cells. Extensive work up is needed for the diagnosis of ILD.(3)

Cigarette smoking, aspiration, certain drugs, radiation therapy, cancer, systemic diseases, environmental and occupational factors had been reported in association with the ILD in one third cases.(4)

However two-thirds cases of ILD have no reportable association.(5,6) Chest radiograph (CXR) may be normal during early in the course of the disease and shows few abnormalities hence unable to identify the specific etiology of ILD.(7)

Pulmonary function testing (PFT) cannot diagnose a specific ILD or distinguish between active lung inflammations versus fibrosis.(8)

HRCT (High resolution computed tomography) is the most accurate noninvasive, high spatial resolution cross sectional imaging modality for evaluation of lung parenchyma. It assess the presence of disease in lung, type of disease, changes of active. lung disease, biopsy site localization, change in disease activity following treatment, characterization of interstitial lung disease (ILD) in appropriate clinical setting. It is more sensitive than the plain radiograph in identifying ILD (sensitivity greater than 90%) and the image pattern of parenchymal abnormalities on HRCT often suggests a particular set of diagnostic possibilities.(9)

Present study aimed to study basic HRCT patterns associated with Interstitial Lung Disease and correlation of HRCT patterns with clinical data in differential diagnosis of Interstitial Lung Disease

## METHODS AND MATERIALS :

### SOURCE OF DATA :

All the patients with clinical suspicion of interstitial lung disease who were referred to the department of Radiodiagnosis, father muller medical college hospital for diagnosis and evaluation were subjected to both conventional chest radiograph and HRCT. Diagnosis was based on clinical and radiographic findings.

HRCT scans were performed in supine position in a GE BRIGHT SPEED 16 Slice CT machine in suspended inspiration after taking informed consent using a kVp of 120 and mAs of 100-240. The matrix used was 512 x 512 and section thickness 0.625-1.5mm.

Scan was done with 1cm collimation. Volume averaging within the plane of the scan significantly reduces the ability of CT to resolve small structures. Scanning with the thinnest possible collimation is essential if spatial resolution is to be optimized therefore 1mm collimation was used. High resolution techniques in addition to increasing image sharpness also increases the noise in CT images. Thus, increasing the kVp, mA, or the scan time can reduce noise and improve image quality.

### METHOD OF COLLECTION OF DATA :

A cross sectional study was performed. All ages and both sexes were included in the study. It was a duration based study. 35 patients were included in the study. The study was conducted over a period of one

year . No extra financial burden was incurred on the patient.

Ethical approval: The study was approved by the Institutional Ethics Committee

**INCLUSION CRITERIA :**

- Patients presenting with collagen vascular diseases like
- systemic lupus erythematosus, rheumatoid disease, systemic sclerosis.
- Vasculitides like Wegener's granulomatosis.
- Pulmonary tuberculosis with disseminated disease status
- Industrial exposure related diseases like asbestosis, silicosis, coal worker's pneumoconiosis, etc
- Medication, drugs and radiation exposure related cases
- Cases of idiopathic interstitial pneumonias and hypersensitivity pneumonias
- Cases of allergic bronchopulmonary aspergillosis, invasive aspergillosis and lymphangitic spread of tumour.

**RESULTS :**

The 35 patients were subjected to both conventional chest radiograph and HRCT scan thorax and a detailed work up of these patients was performed; their clinical history, relevant past and occupational history and any laboratory data recorded.

Of the 35 patients, 22 patients were males (62.85%) and 13(37.15%) were females. The age of the patients ranged from 27 years to 67 years. The Table 2 shows HRCT finding wise distribution among 35cases in study group. Majority of the cases i.e. 9 (20%) had usual interstitial pneumonia (UIP) and idiopathic pulmonary fibrosis (IPF), 4(11.42%) cases had Cryptogenic organising pneumonia (COP) , 3(8.5%) cases had hypersensitive pneumonitis,7(20%) cases had miliary TB, 4(11.42%) cases had nonspecific interstitial pneumonia (NSIP), 2 (5.7%) cases had asbestosis and 2 (5.7%) cases had sarcoidosis and lymphangitis carcinomatosis, 1(2.8%) cases had fibrosis and 3 (8.5%)were normal.

**TABLE 1: Hrct Diagnosis Wise Distribution Of Cases In Study Group**

| HRCT DIAGNOSIS | NUMBER OF CASE | PERCENTAGE S |
|---|---|---|
| usual interstitial pneumonia (UIP) and idiopathic pulmonary fibrosis (IPF) | 9 | 20 |
| Cryptogenic organizing pneumonia (COP) | 4 | 11.42 |
| hypersensitive pneumonitis | 3 | 8.5 |
| miliary TB | 4 | 11.42 |
| nonspecific interstitial pneumonia (NSIP) | 2 | 5.7 |
| Asbestosis and lymphangitis carcinomtosis. | 2 | 5.7 |
| fibrosis | 1 | 2.8% |

The comparative tables between Xray and HRCT in the detection of different findings are given below

**TABLE 2 : Comparative Findings In Xray And Hrct**

| | | Plain radiogram | HRCT |
|---|---|---|---|
| **1** | Air space consolidation | 15 | 21 |
| **2** | Septal thickening | 13 | 20 |
| **3** | Reticular opacities | 17 | 29 |
| **4** | Peribronchial cuffing | 5 | 16 |
| **5** | Honeycombing | 6 | 13 |
| **6** | Nodular opacities | 15 | 19 |
| **7** | Traction bronchiectasis | 5 | 13 |
| **8** | Hilar lymphadenopathy | 7 | 19 |

**TABLE 3: Comparative Findings In Plain Radiograph And Hrct**

| AIR SPACE CONSOLIDATION | HRCT | | PLAIN RADIOGRAPH | |
|---|---|---|---|---|
| | n | % | n | % |
| **Present** | 21 | 60% | 15 | 42.85% |
| **Absent** | 14 | 40% | 20 | 57.15% |
| **Total** | 35 | 100% | 35 | 100% |

| SEPTAL THICKENING | HRCT | | PLAIN RADIOGRAPH | |
|---|---|---|---|---|
| | n | % | n | % |
| **Present** | 20 | 57.15% | 13 | 37.15% |
| **Absent** | 15 | 42.85% | 22 | 62.85% |
| **Total** | 35 | 100% | 35 | 100% |

| RETICULAR OPACITIES | HRCT | | PLAIN RADIOGRAPH | |
|---|---|---|---|---|
| | n | % | n | % |
| **Present** | 29 | 82.85% | 17 | 48.58% |
| **Absent** | 6 | 17.15% | 18 | 51.42% |
| **Total** | 35 | 100% | 35 | 100% |
| **PERIBRONCHIAL CUFFING** | **HRCT** | **PLAIN RADIOGRAPH** | | |
| | n | % | n | % |
| **Present** | 16 | 45.72% | 5 | 14.28% |
| **Absent** | 19 | 54.28% | 30 | 85.72% |
| **Total** | 35 | 100% | 35 | 100% |
| **HONEYCOMBING** | **HRCT** | **PLAIN RADIOGRAPH** | | |
| | n | % | n | % |
| **Present** | 13 | 37.15% | 6 | 17.15% |
| **Absent** | 22 | 62.85% | 29 | 82.85% |
| **Total** | 35 | 100% | 35 | 100% |
| **NODULAR OPACITIES** | **HRCT** | **PLAIN RADIOGRAPH** | | |
| | n | % | n | % |
| **Present** | 19 | 54.28% | 15 | 42.85% |
| **Absent** | 16 | 45.72% | 20 | 57.15% |
| **Total** | 35 | 100% | 35 | 100% |
| **TRACTION BRONCHIECTASIS** | **HRCT** | **PLAIN RADIOGRAPH** | | |
| | n | % | n | % |
| **Present** | 13 | 37.15% | 5 | 14.12% |
| **Absent** | 22 | 62.85% | 30 | 85.78% |
| **Total** | 35 | 100% | 35 | 100% |
| **HILAR LYMPHADENOPATHY** | **HRCT** | **PLAIN RADIOGRAPH** | | |
| | n | % | n | % |
| **Present** | 19 | 54.28% | 7 | 20% |
| **Absent** | 16 | 45.72% | 28 | 80% |
| **Total** | 35 | 100% | 35 | 100% |

**DISCUSSION :**

Interstitial lung disease is heterogenous group of disorders affecting the pulmonary interstitium comparising of interalveolar connective tissue, peribronchovascualr and perilymphatic tissue including the alveolar epithelium, capillary endotjhelium and basement membranes. The term ILD is often used change interchangeably with diffyse lung diseases, however neither all DLD involve in interstitium nor all ILDs are diffuse The chest radiograph can appear completely normal in patients suffering from interstitial lung diseases. Therein lies the inherent lack of sensitivity of conventional chest radiography in the diagnosis of the conditions. In our study, 3 of the 35 patients had no abnormalities in their chest radiographs. However HRCT was able to show reticular and nodular changes in these patients.

In this study, plain chest radiograph showed air space consolidation in 15 patients(42.85%) while when it was correlated with HRCT chest showed air space consolidation in 21 (60%). {table 3}

In this study, plain chest radiograph showed septal thickening in 13 patients(37.15%%) while when it was correlated with HRCT chest showed septal thickening in 20(57.15%). Plain radiograph shows reticular opacities in 17 patients while HRCT showed in 29 patients .

peribronchial cuffing was seen in 5 patient on pain chest radiograph while it was seen in 16 patients on HRCT chest. Nodular opacities are another very common manifestation of interstitial lung diseases. In our study 43% had nodular opacities in their chest radiographs. While HRCT showed evidence of nodular opacities in 54% of the cases. The end stage of interstitial lung disease is characterized by honeycombing. It reflects extensive lung fibrosis with alveolar destruction,thereby resulting in a

characteristic reticular appearance. On HRCT, it is associated with gross distortion of lung architecture, where individual lobules are no longer visible. In our study, such honeycombing was seen in 37.15% of the cases on HRCT while chest radiography could detect them in only 17.15%. On HRCT, honeycombing was much more accurately diagnosed by the presence of thick walled, air filled cysts, usually measuring 3mm to 1cm in diameter. Traction bronchiectasis or bronchial dilatation resulting from lung fibrosis was visible in 14% of the cases on chest radiography. HRCT however managed to detect traction bronchiectasis in 37%. Higher no. of samples with lymphadenopathy were detected in HRCT 54.28% method compared to plain radiograph 20% patients. {table 3}

Sumikawa H, et al in 2006 found signs of interstitial fibrosis more frequently in IPF than in extrinsic allergic alveolitis (91.6% versus 33.3%)[10]. The presence of fibrosis with basal and peripheral distribution was characteristic of idiopathic pulmonary fibrosis, with good sensitivity and specificity (75%), whereas in chronic extrinsic allergic alveolitis the areas of fibrosis often presented an irregular and heterogeneous distribution, in 91.6% of cases[10]. However, 25% of extrinsic allergic alveolitis cases had a distribution mimicking idiopathic pulmonary fibrosis. The presence of areas with increased ground- glass opacity is more common in EAA than in IPF (66.6% versus 33.3%)[10]. In our study also, the basal and pleural distribution of honeycombing in IPF was well appreciated on HRCT. However appreciation of the same on conventional chest radiography was difficult.

## CONCLUSION :

All the patients were subjected to both conventional radiography and HRCT examinations and the images were viewed and analyzed. The two modalities were compared with regards to their ability to detect findings like nodular opacities, reticular opacities, septal thickening, honeycombing, lymphadenopathy etc.

The main result of the study was that higher number of samples with findings were detected by HRCT than conventional radiography. Of the 30 patients, 4 had normal chest radiograms while HRCT was able to detect reticular and nodulaar opacities in these patients. The most common abnormality seen in both chest radiograms and HRCT was reticular opacities. The distinction between air space nodules and interstitial nodules was also much better appreciated on HRCT than on conventional radiography. In the detection of honeycombing, HRCT was much more specific being able to detect it in cases when the chest radiograph showed only reticular opacities. Even in the detection of other findings like lymphadenopathy, HRCT scored over conventional radiography. HRCT therefore seems to be the investigation of choice in evaluating patients of interstitial lung disease. Chest radiography is relatively insensitive and all patients with a clinical suspicion of interstitial lung disease should benefit from an HRCT examination of the ches

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