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# Findings of High Resolution Computed Tomography in Patients Presenting with Signs and Symptoms of Interstitial Lung Disease Having Normal Chest X-Ray

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## Abstract

**Background:** Interstitial lung Disease is a general category that includes many different lung conditions. This study aimed to compare the chest X-rays and HRCT for clear diagnosis of ILD. **Objectives:** To rule out the findings of high resolution computed tomography in patients presenting with signs and symptoms of interstitial lung disease having normal chest x-ray. **Methods:** The study was conducted in the department of Radiology, Gulab Devi Trust Teaching Hospital and its duration was of three months from September 2019 to November 2019. **Results:** Out of 148 patients, there were 65 (43.9%) males and 83 (56.1%) were females, with the mean age of  $55.89 \pm 14.39$  years. Patchy ground glass appearance 92.6%, Honey Comb Appearance 45.9%, Centri lobular CT 29.1% and Parenchymal appearance 24.3% were the high scoring variables of HRCT and were also most frequent in the patients presented with ILD. While Pleural Effusion 4.7%, Consolidation 2.7%, and nodules 12.8 % were found the less frequent variables. **Conclusion:** After having normal chest X-ray and confirmation of diagnosis on high resolution computed tomography (HRCT), it can be concluded that HRCT is more accurate and highly reliable technique or diagnostic tool to diagnose interstitial lung disease as compared to chest X-ray.

**Keywords:** Interstitial Lung Disease, Computed Tomography, High Resolution Computed Tomography

## Introduction

Interstitial lung disease (ILD) relates to a miscellaneous class of disorder such as interstitial pneumonia, idiopathic pulmonary fibrosis, and hypersensitivity pneumonitis (HP). Although it is uncommon in children, lungs are commonly influence organ in the course of chronic granulomatous disease (Esenboga, 2017). ILD usually consists of boundary scale in younger group as compared to adults, although it is not very common in children (Vij, 2013). ILD causes are asthma, respiratory allergy may be due to environmental changes, air borne and air pollution (D'amato, 2015). Further reasons of ILD are coal mine, dust lung disease, smoking, silica dust, rheumatoid arthritis, chronic obstructive pulmonary disease. Interstitial lung disease is group of diffuse parenchymal lung abnormalities define by pulmonary inflammation and fibrosis (Agrawal, 2019).

Other than these the drug induce injury, which also involve air ways lung parenchyma, mediastinum, pleura, pulmonary vasculature or may be neuromuscular system, it is often drug induced lung toxicity, the drugs may

involve are antimicrobial agents, anti-inflammatory, biological agents, cardiovascular agents, chemotherapeutic agents (Schwaiblmair, 2012). Signs and symptoms of ILD are chest pain, dyspnea, hemoptysis (blood in sputum), dry cough (can be chronic dry) or long term dry cough lasting tiredness, weight loss, bulb like development of fingertips (a condition called clubbing), the patient with these symptoms are advised for chest x-ray and HRCT, chest X-ray and HRCT used in suspicious profile of patients in ILD, HRCT is valid in detection of more ILD cases as compared to chest radiographs, chest X rays tend to be normal often in patients with (ILD), In a survey it is indicated that 6 of out 37 patients of ILD show normal chest X rays, While HRCT indicated the abnormalities in these patients. Chest radiographs are the initial imaging techniques for the lungs but in present time HRCT is mostly advised to clarify the CXR findings in ILD patients (Lynch, 2019). Chest radiograph demonstrates patchy ground-glass pattern with fine reticulation of lungs while computed tomography (CT) shows patchy, centrilobular ground-glass opacification with septal thickening, honeycombing with subpleural bullae (Esenboga, 2017). In this era, HRCT is a gold standard for diagnosis of ILD, it permits early ascertain of lung involvement even at very initial stages, HRCT has been the respectable diagnostic elevation for the previous two decades in detection of ILD, a wide range of research in diagnostic HRCT is done, although it was the beginning of advancement of the precise beam collimation, high spatial resolution, reconstruction algorithm raised up the possibility of the computed tomography (CT) for diagnostic usage in ILD, they associate HRCT scans with histopathology detections and conclusions were that HRCT was the standard non-invasive modality scan for detection of ILD, the sensitivity of HRCT is 94.59% and its specificity is 66.66% and the sensitivity for chest radiograph in the detection of ILD is 83.78% and specificity is 33.33%, sensitivity and specificity were less with radiographs compared to HRCT in the detection of ILD<sup>10</sup>. The recent study is designed and guided for the comparison of the sensitivity and specificity of HRCT and chest radiographs in patients with ILD, lungs are generally recognized to be more influenced organ in the patients, being the causal nodules, scarring, emphysema, tractionchiectasis, airtrapping, mediastinal hilar lymphadenopathies and pleural effusion, these all probably caused by invading bacterial-fungal inflammation or by hyperinflammation (Esenboga, 2017). The lab test required for ILD are antinuclear antibody, aldose test, creatinin kinase test, erythrocyte sedimentation rate, pulmonary function test are also performed on patients with 6 minutes walk test that is performed for diagnosis and examination, total lung capacity and oxygen saturation is also examined, lung biopsy for upper, middle and lower lung field are also helpful.

## Methods

It was a comparative cross sectional study carried out in department of Radiology, Gulab Devi Trust Teaching Hospital, Pakistan and its duration was from July 2018 to November 2018. By the use of cross sectional technique and convenient sampling, 148 patients were included in the study of all age groups and with the symptoms of chest pain, dyspnea, hemoptysis, dry cough and weight loss. Patients with lungs cancer wasn't made the part of study due to limitation of HRCT in the diagnosis of lung carcinoma. 16 slice Toshiba Aquilion were the equipment used. SPSS 20 was used for the statistical analysis, frequencies and percentages were found.

## Results

It was cross-sectional study, conducted in the Radiology Department of Gulab Devi Chest Hospital, Lahore that included 148 patients. The data was collected using consecutive technique from September 2018 to November 2018. A questionnaire was used for each patient, which was filled out on the basis of history and image findings. There was no gender specification in this study. Out of 148 patients, there were 65 (43.9%) males and 83 (56.1%) were females. (Table 1). Patients from all age groups were included in this study, 19 years were considered the minimum and 83 years were maximum age group participated. (Table 2) So the mean age was  $55.89 \pm 14.39$  years.

Table No. 1: Table shows frequency distribution in b/w male and female patients of ILD

|  | Gender | Frequency | Percent |
|--|--------|-----------|---------|
|  | F      | 83        | 56.1    |
|  | M      | 65        | 43.9    |
|  | Total  | 148       | 100.0   |

Table No. 2: Describes percentage of Chest Xrays of ILD patients showing nodules.

|       | Frequency | Percent |
|-------|-----------|---------|
| 0     | 129       | 87.2    |
| 1     | 19        | 12.8    |
| Total | 148       | 100.0   |

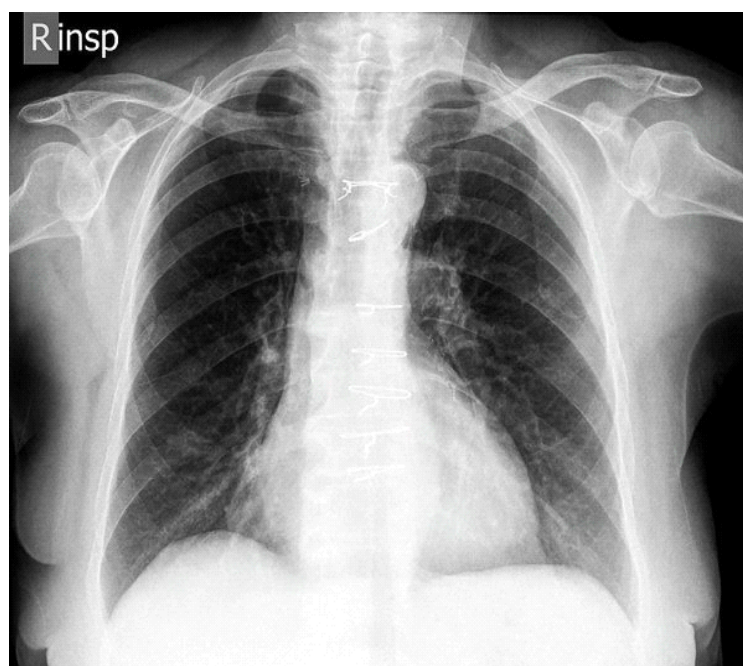
Table No. 3: Describes percentage of Chest Xrays of ILD patients having Pleura effusion.

|       | Frequency | Percent |
|-------|-----------|---------|
| 0     | 140       | 94.6    |
| 1     | 8         | 5.4     |
| Total | 148       | 100.0   |

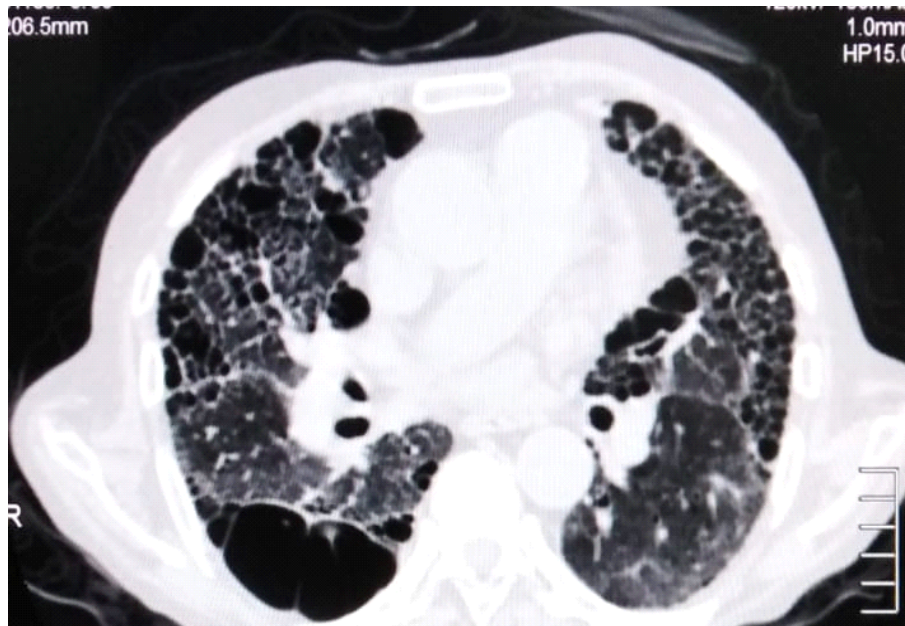
Table No.4: Describes the ratio of different variables on HRCT scans of ILD pts.

| Sr No. | Variables                   | Frequency "1" (Present) | Percentage (Present) | Frequency "0" (Absent) | Percentage (Absent) |
|--------|-----------------------------|-------------------------|----------------------|------------------------|---------------------|
| 1      | Parenchymal Abnormality     | 36                      | 24.3%                | 112                    | 75.7%               |
| 2      | Nodules                     | 19                      | 12.8%                | 128                    | 86.5%               |
| 3      | Centrilobular CT            | 43                      | 29.1%                | 105                    | 70.9%               |
| 4      | Pleural Effusion            | 7                       | 4.7%                 | 140                    | 94.6%               |
| 5      | Consolidation               | 4                       | 2.7%                 | 144                    | 97.3%               |
| 6      | Honeycomb Appearance        | 68                      | 45.9%                | 80                     | 54.1%               |
| 7      | Patchy Ground Glass Pattern | 137                     | 92.6%                | 11                     | 7.4%                |

Out of 148 patients, 24.3% patients were found having parenchymal abnormality.12.8% patients were found to have nodules on their CT chest. Consolidation of lungs is more focused on chest X-ray but was also come under our consideration in CT chest. Honey comb appearance on CT makes the percentage of 45.9%). Patchy Ground Glass was among the highest frequent variables that makes 92.6%



Picture 1: Patient showing normal CXR



Picture 2: Patient with normal CXR showing bronchiectasis and ground glass appearance on HRCT presenting with ILD.

## Discussion

It was cross-sectional study, conducted in the Radiology Department of Gulab Devi Chest Hospital, Lahore that included 148 patients. The data was collected using consecutive technique from September 2018 to November 2018. Interstitial lung disease (ILD) relates to a miscellaneous class of disorder such as interstitial pneumonia, idiopathic pulmonary fibrosis and hypersensitivity pneumonitis (HP). Although it is uncommon in children's lungs are commonly influence organ in the course of chronic granulomatous disease (CGD). ILD usually consists of boundary scale in younger group as compared to adults, although it is not very common in children. ILD causes are asthma, respiratory allergy may be due to environmental changes air borne and air pollution. Further reasons of ILD are coal mine, dust lung disease, smoking, silica dust, rheumatoid arthritis, chronic obstructive pulmonary disease (COPD).

Study presented by Arun A, et al (Arun A, Yeganagi M, Mittal S) in 2017 on interstitial lung disease (ILD) which can be detected by several techniques, out of 40 patients 36 patients were found symptomatic and 4 were asymptomatic and study concluded HRCT as more accurate technique to diagnose ILD as compared to CXR. Christopher J. Ryerson et al conducted study on prevalence and prognosis of unclassifiable interstitial lung disease (ILD). The study concluded Uncategorized interstitial lung disease (ILD) depicted just about 10% of Interstitial lung disease reports and has a miscellaneous clinical methodology which can be projected by medical and radiological inconstant (Ryerson, 2012).

.Thomas Frauenfelder et al conducted study on screening for interstitial lung disease in systemic sclerosis. Primitive detection of interstitial lung disease (ILD), recently the major reason of mortality in systemic sclerosis (SSc), is necessary. The overhead explained chest HRCT protocol steadily calculates precise mild SSc-ILD in clinical exercise, with the benefit of a much less radiation dose assimilate with standard whole chest HRCT (Oikonomou, 2013).

Arun A et al conducted HRCT as more reliable and specified modality for the diagnosis of ILD, because they found 7 patients normal while reading their chest radiographs but they were diagnosed with ILD after HRCT, alike our study HRCT is concluded as more spaeified imaging protocol for diagnosis of ILD, because large number of patients participated in our study were found asymptomatic and had normal radiographs. The only difference from Arun A el was inclusion of asymptomatic patients. Therefore our study highly supports the above mentioned studies, and we only took those patients that were presented with the symptoms of ILD but were having normal CXR, so HRCT were performed to confirm that either patient is infected with ILD or not.

Frequency was found among 148 patients of symptomatic ILD and among all those patients included in the study, HRCT was found more accurate technique to diagnose the disease. As patch ground glass appearance, honey comb appearance, centrilobular appearance, nodules, parenchymal abnormality and pleural effusion were only or found more accurately on HRCT and was among those variables that scored high in the frequency column and confirmed the accuracy of HRCT in the diagnosis of ILD.

## Conclusion

After the inclusion of 148 patients with the presentation of symptomatic interstitial lung disease but having normal chest X-ray and confirmation of diagnosis on high resolution computed tomography (HRCT), it can be concluded that HRCT is more accurate and highly reliable technique or diagnostic tool to diagnose interstitial lung disease as compared to chest X-ray.

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