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CHARACTERIZATION OF INTERSTITIAL LUNG DISEASE PATTERNS USING HIGH RESOLUTION COMPUTED TOMOGRAPHY IN CLINICALLY SUSPECTED CASES: A CROSS-SECTIONAL STUDY AT A TERTIARY HOSPITAL IN NORTH WESTERN RAJASTHAN

Radio-Diagnosis

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ABSTRACT

AIMS & OBJECTIVES:

1. To characterize and classify various Interstitial Lung Diseases (Idiopathic Interstitial Pneumonias) IIP based on their HRCT appearance.
2. To characterize the various HRCT patterns of Interstitial Lung Disease such as :honeycombing Bronchiectasis, bronchiolectasis, reticulation, etc.

MATERIALS & METHODS: This study was conducted at department of Radio-diagnosis & modern imaging S.P. Medical College & A.G. of P.B.M Hospitals, Bikaner. It is a multi-disciplinary tertiary care referral hospital. Based on the average institutional caseload of suspected ILD patients undergoing HRCT chest at our tertiary care centre, a total of 80 patients were included in the study. **RESULTS:** For a period of 15 months, HRCT of chest was performed on 80 patients, who were clinically suspected to have interstitial lung diseases. Out of 80 patients, 46 patients were male and 34 patients were female. In this maximum number of patients had Usual interstitial pneumonia UIP (34), followed by Nonspecific interstitial pneumonia NSIP (16), Hypersensitivity pneumonitis HSP(13), Idiopathic pulmonary fibrosis, IPF(11), Cryptogenic organizing pneumonia COP(5) and Respiratory bronchiolitis related interstitial lung disease RB-ILD was seen in only 1 patient. Desquamative interstitial pneumonia DIP and Lymphocytic interstitial pneumonia LIP are very rare interstitial pneumonias. **CONCLUSION:** The present study included 80 patients with interstitial lung disease (Idiopathic Interstitial Pneumonias) of differing age groups. Most of the patients had vague complaints of breathlessness, cough or dry cough. All patients had an HRCT scan taken at variable slice intervals which were reconstructed using high spatial frequency algorithm. The HRCT patterns each Idiopathic Interstitial Pneumonias were studied. UIP and IPF affect the basal and peripheral areas of the lung.

KEYWORDS

Interstitial; Lung; Disease; Radiology; CT; GGO

INTRODUCTION:

Interstitial lung diseases are a diverse group of diseases, which affect the lung interstitium and share similar clinical and radiological manifestations. They are heterogeneous group of disorders of the lower respiratory tract that are characterized by both acute and chronic inflammation and a generally irreversible and relentless process of fibrosis in the interstitium and the alveolar walls [1]. The term "interstitial" can be misleading as most of these conditions also affect the airway spaces and even the blood vessels, but it is the predominant and primary involvement of the interstitium that characterizes those [2].

The interstitial lung diseases are a heterogeneous group of many acute and chronic pulmonary disorders. Though individually rare, as a group, they are a common clinical problem. Though they are grouped together, there are great variations in the risk factors for their development, their pathological processes, the relevant therapies and the associated prognosis, making an accurate diagnosis very essential [3].

The last century experienced remarkable advances in the classification, diagnosis and understanding of the pathogenesis of the interstitial lung diseases. Most recently, genetic medicine, the use of new technologies (e.g.microarrays, mass spectroscopic analysis of proteins, and laser capture microdissection) and the development of animal models have had a major impact on understanding the pathogenesis and potential molecular targets for interfering with fibrogenesis [4].

Interstitial lung diseases are characterized by anatomical distortion of peripheral airways and interstitium, determined by a first stage of alveolitis followed by a stage of fibrosis. The natural history of several interstitial lung diseases is characterized by slow and progressive destruction of alveolar-capillary functional units, often with respiratory failure and death. For their smoldering evolution and non-specificity of symptoms (exertional dyspnea and cough), they may remain undiagnosed and not treated for a long time [5,6].

Idiopathic pulmonary fibrosis is the most common interstitial lung disease in adults and generally has a poor prognosis3. Idiopathic pulmonary fibrosis (IPF)/usual interstitial pneumonia (UIP) is not a very well-understood entity. Current explanations of the natural history and pathogenesis of IPF/UIP are controversial, and ongoing research continues to investigate multiple hypotheses [7]. Around 15% of patients with interstitial lung disease have an underlying connective tissue disorder [8]. Although interstitial lung diseases are more common in adults, certain forms such as hypersensitivity pneumonitis and idiopathic interstitial pneumonias are seen in children as well [9]. In children, common diseases associated with interstitial lung diseases include viral respiratory tract infections (RSV, parainfluenza, etc.), gastroesophageal reflux, idiopathic pulmonary fibrosis, pulmonary hemosiderosis, eosinophilic pneumonia, pneumonitis associated with AIDS etc [9-12].

Although there are several interstitial lung diseases, only a few handful of about 10-12 account for more than 90% of them. Among the well over 100 distinct entities of ILDs, a limited number of disorders, including idiopathic pulmonary fibrosis, sarcoidosis, and connective tissue disease-related ILDs, account for most ILDs encountered clinically [13]. For the physician, the distinctive sign of interstitial lung disease is the evidence of diffuse pulmonary opacities on chest X rays or a suggestive pattern on pulmonary function tests. Hence, HRCT is currently the most sensitive tool for non-invasive imaging of the lung parenchyma in patients with suspected ILD[14].

MATERIALS & METHODS:

Study Area:

This study was conducted at department of Radio-diagnosis & modern imaging S.P. Medical College & A.G. of P.B.M Hospitals, Bikaner. It is a multi-disciplinary tertiary care referral hospital.

Source of Data:

Data for the study was collected from patients attending/referred to Sardar Patel Medical College and associated groups of Hospitals.

Study Design:

This is a cross-sectional, observational study.

Sample Size:
Since this was a hospital-based prospective descriptive imaging study and not a community-based prevalence study, general population prevalence of interstitial lung disease (ILD) was not considered appropriate for sample size estimation.

All consecutive eligible patients clinically suspected of ILD and referred for HRCT chest during the study period were included using a consecutive sampling technique.

Based on the average institutional caseload of suspected ILD patients undergoing HRCT chest at our tertiary care centre, a total of 80 patients were included in the study.

Study Population:
Clinically suspected cases of Interstitial Lung Disease (ILD) based on symptoms like chronic cough, dyspnea, or abnormal pulmonary function tests who are attending/referred to Sardar Patel Medical College and associated groups of Hospitals.

Period of data collection: 15 Months (October 2024 to January 2026).

Sample technique :
Consecutive sampling technique will be used in this study. Every patient suspected to have ILD who undergoes HRCT will be recruited after obtaining consent.

Eligibility Criteria
Inclusion Criteria:
1. All the patients with clinically suspected interstitial lung disease referred for HRCT were included in the study after taking their informed consent.

2. All adults >18 years and both the sexes, patients will be included in the study.

Exclusion Criteria:-
1. Patients with primary lung malignancy.
2. Hemodynamically unstable and unconscious patients.
3. All patients who will not consent to be a part of the study.

REPRESENTATIVE CASES:

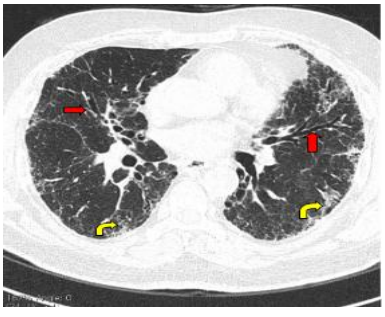

Fig-1 Axial HRCT images of 68-year-old man with progressive shortness of breath due to UIP. Both lung fields show subpleural interstitial thickening (curved yellow arrow) with traction bronchiectasis (red arrows).

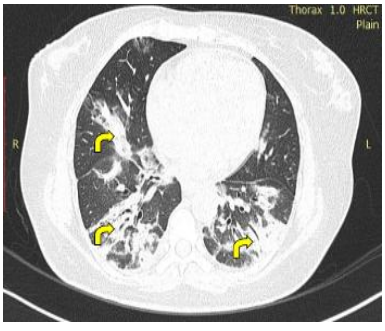

Fig-2: Axial HRCT images show patchy areas of consolidations (curved arrows) in both lung fields (both lower lobes and right middle lobe) in peribronchial location

RESULTS

For a period of 15 months, HRCT of chest was performed on 80 patients, who were clinically suspected to have interstitial lung diseases. Out of 80 patients, 46 patients were male and 34 patients were female.

In this maximum number of patients had UIP (34), followed by NSIP (16), HSP(13), IPF(11), COP(5) and RB-ILD was seen in only 1 patient. DIP and LIP are very rare interstitial pneumonias.

The age group of patients ranged from 30 to 90 yrs and most (40.3%) were found in the age group of 60-69 years followed by 20.8% in 70-79 and 19.4 % in 50-59 year age groups. The study included a total of 80 patients out of which 46(58.3%) patients were Male and 34(41.7%) patients were female.

Out of total of 80 patients 34(42.5%) patients showed HRCT pattern reflecting UIP, 16(20%) patients showed NSIP, 13(16.3%) patients had HSP, 11(13.8%) patients showed IPF as well as 5(6.3%) patients had COP while only 1(1.3%) patient showed changes of RB-ILD. Out of total of 80 patients 32(40%) patients came with cough, 22(27.5%) with breathlessness, 21(26.25%) with dry cough and 5(6.25%) with cough and fever.

SUMMARY & CONCLUSION:
The present study included 80 patients with interstitial lung disease (Idiopathic Interstitial Pneumonias) of differing age groups.

The normal anatomy of the secondary pulmonary lobule with its various morphological features was identified. The HRCT patterns each Idiopathic Interstitial Pneumonias were studied.

UIP and IPF affect the basal and peripheral areas of the lung.
They are c
haracterized on HRCT images by the presence of reticular opacities, often associated with traction bronchiectasis. Honeycombing is common. Ground-glass opacity is also common but is usually less extensive than the reticular pattern. Architectural distortion, which reflects lung fibrosis, is often prominent.

NSIP is characterized by ground glass opacities which is its salient feature and is associated with reticulation, bronchiectasis and lobar volume loss.

HSP is characterized by ground glass opacities with air trapping which are its salient features and associated findings like nodules, fibrosis and bronchiectasis.

COP is seen as patchy areas of consolidation (subpleural or peribronchial distribution) with ground glass opacities.

RB ILD is seen as patchy areas of ground glass opacities, centrilobular nodules and in later stages fibrosis.

Thus high resolution computed tomography is very effective in visualizing the distorted architecture of lung parenchyma in Idiopathic Interstitial Pneumonias. As compared to chest radiographs and conventional CT, HRCT is capable of detecting disease processes much earlier in their evolution.

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