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Dr. Sanjay A Prajapati
Assistant Professor,
Department of Radiodiagnosis,
Banas Medical College and
Research Institute, Palanpur,
Gujarat, India

Dr. Pinakin N Patel
Assistant Professor,
Department of Radiodiagnosis,
Banas Medical College and
Research Institute, Palanpur,
Gujarat, India

Dr. Paresh C Parikh
Assistant Professor,
Department of
Ophthalmology, Banas
Medical College and Research
Institute, Palanpur, Gujarat,
India

Correspondence
Dr. Pinakin N Patel
Assistant Professor,
Department of Radiodiagnosis,
Banas Medical College and
Research Institute, Palanpur,
Gujarat, India

Role of high-resolution computed tomography in characterization of interstitial lung disease in rural tertiary care centre

Dr. Sanjay A Prajapati, Dr. Pinakin N Patel and Dr. Paresh C Parikh

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Abstract

Aim: The purpose of the current research was to investigate the function of high-resolution computed tomography in the context of interstitial lung disease.

Materials and Methods: There were sixty patients who participated in the research. Data for the study collected from patients clinically suspected to have interstitial lung disease. All of the patients who came to department of Radiology, Tertiary Care Teaching Institute of India with a diagnosis of ILD and had a chest CXR and HRCT were included in the study. HRCT chest scan was carried out in 64 slice CT machine using 120 kV, 200 mA with scan time per slice as 1-2 sec with slice thickness 1-2 mm. A pulmonologist analysed each and every HRCT chest that was performed.

Results: The age range of the patients was from 22 to 84 years. Of the total number of patients, 34 were female, and 23 of them were smokers. The illness lasted for a median of twelve months, with a range that went from one to twenty-four months. 92% of them presented with multiple complaints, with dyspnoea (69.1%) and cough (78.1%) being the most common complaints. The number of findings reported by an HRCT chest examination for a patient was significantly higher than the findings reported by a CXR. When it came to the distribution of diseases that were diagnosed by HRCT chest, the most common type was diffuse parenchymal lung diseases with a known cause (49.9%).

Conclusion: HRCT is superior to other imaging modalities due to its high spatial resolution. In terms of detecting all fundamental patterns and the distribution of those patterns, HRCT was found to be superior to CXR. When diagnosing ILD, a chest radiograph is a nonspecific initial investigation that is performed.

Keywords: Computed tomography, cough dyspnoea, interstitial lung disease

Introduction

Interstitial lung disease (ILD) is a broad term that encompasses a wide range of disease entities, each of which can be distinguished by their clinical manifestations, characteristic CT (computed tomography) findings, progression of the disease, and respective treatments. The diagnosis of pathologic tissues has become less important as a result of the advancements that have been made in imaging. Instead, a comprehensive history that includes the progression of symptoms over time, a history of exposure (occupational, environmental, and smoking, for example), a personal and family history of auto-immune and connective tissue disease, and findings on high-resolution computed tomography (HRCT) scans of the chest can lead to a definitive diagnosis, which eliminates the need for a biopsy^[1, 2].

There are three different radiographic patterns that can be used to diagnose interstitial lung diseases: reticular pattern, nodular pattern, and reticulonodular pattern. Additionally, lymphatics and veins are found within the interlobular septae, in addition to connective tissue. For example, interlobular septae will become thickened and irregular appearances of the pleural surfaces will occur as a consequence of diseases that involve these structures. These diseases include interlobular fibrosis, lymphangitis carcinosis, and pulmonary oedema. Accurately distinguishing interstitial pulmonary fibrosis (IPF) from other types of interstitial lung disease (ILD) is of the utmost importance because IPF is characterised by a distinct treatment paradigm and prognosis^[3, 4].

An HRCT, which stands for high-resolution computed tomography of the chest, is the primary diagnostic tool involved. The HRCT can be diagnostic in the majority of cases, depending on the clinical circumstances, and there is no need for any additional work-up to

be performed. Surgical lung biopsy may be necessary in certain instances, particularly when there is a lack of certainty regarding the diagnosis. Honeycombing, thickened interlobular septa, reticular, nodular, or ground glass area of attenuation, subpleural lines, and architectural distortion are some of the findings that can be observed on HRCT performed on patients who have interlobular lung disease (ILD) [1, 5, 6].

Other applications of HRCT in ILD, in addition to its detection and characterisation, include the detection of co-existing diseases, the detection and evaluation of complications, the provision of a guide to the type and location of lung biopsy, and the completion of follow-up evaluations to determine how well the patient is responding to treatment. In many cases, the need for surgical biopsy has been eliminated as a result of advancements in HRCT scanning, which have made it possible to make an accurate diagnosis. As an additional benefit, HRCT scanning may be of assistance in determining the prognosis and identifying the progression of the disease [7, 8]. In light of this, the purpose of the current research was to investigate the function of high-resolution computed tomography in the context of interstitial lung disease.

Materials and Methods

This particular study is a prospective and observational study that was carried out in the department of radio diagnosis, which is affiliated with the medical college, as well as the hospital that is being studied. The patients who were referred to the department were the subjects of the statistical study. As a whole, there were sixty patients who participated in the research. The research was carried out over the course of a single year.

The inclusion requirements The clinical history, physical examination, radiographic findings, and appropriate laboratory investigations are used to determine whether or not a patient has diffuse parenchymal lung disease. Cases involving people of all ages and genders are included.

The criteria for exclusion

- Patients with known lung cancers and patients with diffuse parenchymal lung disease who have been treated in the past are not eligible to participate in the present study.
- Individuals who are either pregnant or breastfeeding at the time of the study.
- Individuals who are unwilling to provide informed consent before the study begins.

All of the patients who came to our department with a diagnosis of ILD and had a chest CXR and HRCT were included in the study. These patients could have been inpatients or outpatients. HRCT chest scan was carried out in 64 slice CT machine using 120 kV, 200 mA with scan time per slice as 1-2 sec with slice thickness 1-2 mm. A pulmonologist analysed each and every HRCT chest that was performed.

Statistical analysis

The information was gathered by means of a structured proforma that included all of the pertinent particulars. Then the data were filled in SPSS 16. Student's t-test for comparison of means and chi-square test for comparison of proportions (percentage) was used and results were

analyzed.

Results

There was a total of sixty patients who participated in the study, with the average age being 53.00 years with a standard deviation of 11.16 years. The age range of the patients was from 22 to 84 years. Of the total number of patients, 34 were female, and 23 of them were smokers.

The illness lasted for a median of twelve months, with a range that went from one to twenty-four months. 92% of them presented with multiple complaints, with dyspnoea (69.1%) and cough (78.1%) being the most common complaints. The vast majority of them presented with multiple complaints. Most common pattern associated with ILD was reticular opacity, which was observed in 48% on CXR and 51.2% on HRCT chest. The number of findings reported by an HRCT chest examination for a patient was significantly higher than the findings reported by a CXR. When it came to the distribution of diseases that were diagnosed by HRCT chest, the most common type was diffuse parenchymal lung diseases with a known cause (49.9%). Connective tissue disease-related interstitial lung disease was the most common type (22.12%). Both the chest computed tomography (CXR) and the high-resolution computed tomography (HRCT) were used to make diagnoses of diffuse parenchymal lung diseases. In contrast to the Usual Interstitial Pneumonia (UIP) pattern, which shows up frequently in HRCT chest, the Reticular pattern is most frequently observed in CXR.

Table 1: Gender wise Distribution of study participants

Gender	Number	Percentage (%)
Male	26	43.3
Female	34	56.5
Total	60	100

Discussion

It is estimated that approximately forty to sixty percent of adults who are affected by interstitial lung disease (ILD), which is the largest cause of death and hospitalisation among this population. Despite the life-threatening nature of ILD and the availability of existing therapies, there are no clinical practice guidelines that recommend screening for ILD [9, 10].

ILD is a relatively broad category of diseases that can present with a variety of findings on HRCT, some of which overlap with one another. It is often possible to make a specific diagnosis of interstitial lung disease (ILD) in a given patient by utilising the various findings of an HRCT and the location of these findings within the lung. The HRCT is a non-invasive imaging modality that can be used to evaluate the parenchyma of the lungs [11].

Despite the fact that pulmonary function tests (PFTs) are frequently utilised as a screening test for ILD, research has demonstrated that these tests are neither sensitive nor specific for the detection of ILD in this population despite their widespread use. It is a chronic, progressive, fibrosing interstitial lung disease of unknown aetiology that primarily affects elderly patients. Idiopathic pulmonary fibrosis (IPF) is associated with a progressive progression of the disease [12].

Accurately distinguishing interstitial pulmonary fibrosis (IPF) from other types of interstitial lung disease (ILD) is of the utmost importance because IPF is characterised by a

distinct treatment paradigm and prognosis. An HRCT, which stands for high-resolution computed tomography of the chest, is the primary diagnostic tool involved. The HRCT can be diagnostic in the majority of cases, depending on the clinical circumstances, and there is no need for any additional work-up to be performed. Included in this study were a total of sixty patients diagnosed with ILD who presented themselves to our department over the course of one year.

The average age of the participants was 51.00 years, with a standard deviation of 11.12 years. The findings of the study conducted by S. Annapurna *et al.*^[13] (Age 60-80 years; females were more prevalent than males) and Bhat *et al.*^[14] (Age 22-85 years (mean = 53.5 years), 56% females) were comparable. The CXRs of 30.7% of patients in the study by C. K. Onyambu and colleagues were normal, whereas the CXRs of only two patients that we observed were normal. Among the four patients, Palve *et al.* found that the CXR was completely normal.

Specifically, this is where the inherent lack of sensitivity of conventional chest radiography comes into play when it comes to the diagnosis of these conditions. During the course of our research, the most frequently observed variations in CXR were reticular opacities, GGO, and nodules. In a similar manner, S. Annapurna and colleagues observed that the CXR showed a number of different patterns, including reticular opacities, increased opacity, and nodular opacities. Due to the low irradiation dose and availability of CXR, it appears normal in 10-40% of patients. The diagnostic yield was achieved in 23% for radiography in ILDs, whereas it was 49% for HRCT in ILDs. The study conducted by Florence Jeny and colleagues reveals that CXR has been helpful in detecting intraluminal disc defects (ILDs).

Conclusion

HRCT is superior to other imaging modalities due to its high spatial resolution. In terms of detecting all fundamental patterns and the distribution of those patterns, HRCT was found to be superior to CXR. When diagnosing ILD, a chest radiograph is a nonspecific initial investigation that is performed. The different patterns of disease and how they are distributed in the lungs could be demonstrated by HRCT using this technique.

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