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ORIGINAL RESEARCH ARTICLE

HIGH RESOLUTION COMPUTED TOMOGRAPHY AND CHEST RADIOGRAPHY FINDINGS AMONG INTERSTITIAL LUNG DISEASE PATIENTS

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ABSTRACT

Background: Interstitial lung disease (ILD) is a heterogeneous group of diffuse parenchymal lung diseases, characterized by restrictive physiology, impaired gas exchange, pulmonary inflammation and fibrosis. Chest radiograph (CXR) may appear normal during initial course of the disease and may show few abnormalities. High resolution computed tomography (HRCT) chest is a most accurate non-invasive, high spatial resolution descriptive imaging modality for evaluation of lung parenchyma. It assesses presence, location, type and characterization of ILD in appropriate clinical setting. Our aim was to study radiological patterns and its distribution in CXR and HRCT chest of ILD patients.

Methods: This was an observational, single centered, cross-sectional study conducted at author's place over the period of 6 months starting from January 2018 using convenient sampling method. Data analysis was done using students t-test for comparison of means and chi-square test for proportions.

Results: A total of 30 suspected or diagnosed patients of ILD were enrolled in our study and patterns found on CXR were correlated with that on HRCT chest. The number of findings in HRCT chest for a patient was significantly higher than CXR (Median number: 4 verses 2, P<0.001), commonest reticular opacity 50% in CXR and 56.6% HRCT. One subject had normal CXR.

Conclusion: HRCT was superior to CXR in detection of all basic patterns and their distribution associated with ILD as higher numbers of findings were detected by HRCT chest as compared to CXR. HRCT chest could characterize the abnormality and specify its location much more accurately.

INTRODUCTION

Interstitial lung disease (ILD) is a heterogeneous group of diffuse parenchymal lung diseases (DPLD), characterized by restrictive physiology, impaired gas exchange, pulmonary inflammation and fibrosis. 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.[1] ILD predominantly affects lung parenchyma characterized by alveolar, septal thickening, fibroblast proliferation, and pulmonary fibrosis. Although it primarily affects adults, few seen in young age e.g. Sarcoidosis, Pulmonary Langerhans's cell histiocytosis whereas idiopathic pulmonary fibrosis (IPF) usually presents between 40 to 70 years of age.[2] Diagnosis requires workup of clinical presentation, lifestyle, occupational history, exposures, and drug history forming the clinical context.[3]

The chest radiograph remains part of the initial assessment of ILD, but the patterns are often nonspecific and insensitive to early ILD. It has limited accuracy due to superimposition of structures and poor contrast resolution.[3] High Resolution Computed Tomography (HRCT) has higher sensitivity than CXR, is indicated among ILD suspicion patients. However, it has few limitations; 10-20% of patients can have a normal HRCT.[4]

The objective of the study was to study the findings of conventional CXR and HRCT chest among ILD patients, radiological patterns and disease distribution.

METHODS

An observational, descriptive, cross-sectional, single centred study was conducted at Chitwan Medical College Teaching Hospital (CMCTH) over the period of 6 months starting from January 2019. Approval was taken from Institutional Review Committee of CMCTH (Ref: CMC-IRC/076/077-007 on January 02, 2019). Informed consent was taken after explaining about the study.

All the patients who presented in our department with the diagnosis of ILD having CXR and HRCT chest, either inpatient or outpatient were enrolled in the study. Pregnant patients or those unwilling to participate were excluded.

HRCT chest scan was carried out in 64 slice CT machine using 120kV, 200mA with scan time per slice as 1-2 sec with

slice thickness 1-2 mm. All HRCT chests were interpreted by pulmonologist.

Data were collected using a structured proforma covering the relevant details. Then the data were filled in SPSS 16. Students t-test for comparison of means and chi-square test for comparison of proportions (percentage) was used and results were analysed.

RESULTS

A total of 30 patients were enrolled, the mean age was 56.00 ± 16.51 years (Range: 25 – 79 years). Out of which 17 were (56.7 %) female and 33.3 % of the patients were smokers, with median smoking pack years being 22.5. The median duration of illness was 5 months (Range: 0.5 – 48 months). A vast majority (90.0 %) of them presented with multiple complaints (≥2 complaints), the predominant complaints being dyspnoea (73.7 %) and cough (83.3 %).

Most common pattern associated with ILD was reticular opacity, which was observed in 50% on CXR and 56.6% on HRCT chest. The number of findings in HRCT chest for a patient was significantly higher than CXR findings (Median number: 4 vs. 2, p<0.001) (Table 1).

Table 1: Patterns found in suspected cases of ILD on HRCT chest with chest radiograph correlation.

S. No.	Radiological findings	CXR N (%)	HRCT N (%)
1	Normal	1 (3.3)	0 (0.0)
2	Reticular opacities	15 (50.0)	17 (56.6)
3	Airspace opacities	1 (3.3)	
4	Traction bronchiectasis	1 (3.3)	13 (43.3)
5	Bronchiectasis	1 (3.3)	5 (16.7)
6	Ground glass haze	11 (36.7)	15 (50.0)
7	Fibrosis	4 (13.3)	8 (26.7)
8	Honeycombing	2 (6.7)	10 (33.3)
9	Nodules	5 (16.7)	7 (23.3)
10	Consolidation	4 (13.3)	5 (16.7)
11	Lung cyst		1 (3.3)
12	Decreased lung volumes	3 (10.0)	2 (6.7)
13	Pleural effusion	1 (3.3)	4 (13.3)
14	Septal thickening		14 (46.7)
15	Lymphadenopathy	3 (10.0)	13 (43.3)
16	Dilated pulmonary artery		3 (10.0)
17	Others		3 (10.0)

Distribution of diseases as diagnosed by HRCT chest, most common was DPLD of known cause (53.3%) among which connective tissue disease related ILD were frequent (26.7%) (Table 2).

Table 2: Distribution of underlying diseases by HRCT chest findings

DPLD classification	Frequency (%)
DPLD of known cause	16 (53.3 %)
Drug induced PF	1 (3.3 %)
Hypersensitivity pneumonitis	4 (13.3 %)
CTD-ILD*	8 (26.7 %)
Silicosis	1 (3.3 %)
Disseminated TB	1 (3.3 %)
IBD-associated	1 (3.3 %)
Idiopathic Interstitial Pneumonia	10 (33.3 %)
IPF	7 (23.3 %)
Smoking related PF	1 (3.3 %)
AIP	1 (3.3 %)
NSIP	1 (3.3 %)
Granulomatous DPLD	4 (13.3 %)
Sarcoidosis	4 (13.3 %)

**4 cases were Rheumatoid Arthritis (RA) associated, 3 were scleroderma associated*

The diagnosis of DPLD according to the pattern present in CXR and HRCT chest are shown in the Figure 1 and 2 respectively. Reticular pattern is mostly seen in CXR whereas Usual Interstitial Pneumonia (UIP) pattern is common in HRCT chest.

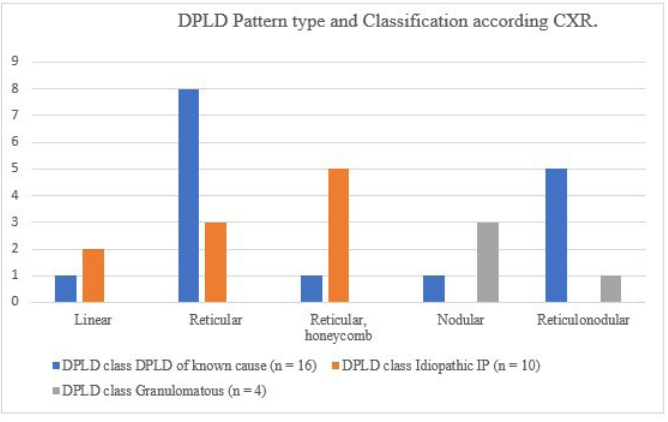

Figure 1: DPLD Pattern type and Classification according CXR

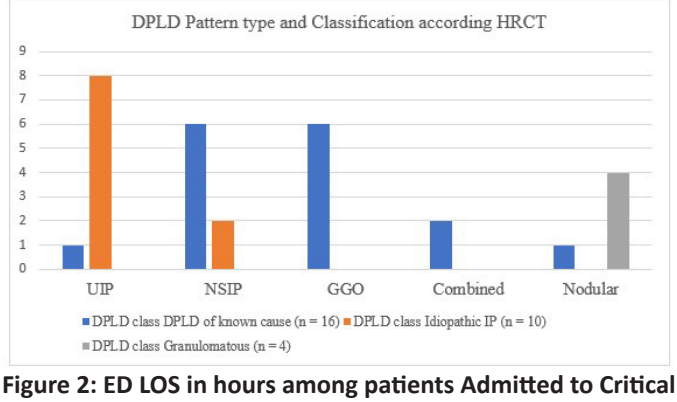

Figure 2: ED LOS in hours among patients Admitted to Critical Areas

DISCUSSION

A total 30 patients with ILD who presented to our department over a period of six months were included. Predominantly were females 56.7 % of mean age being 56.00 ± 16.51 years (Range: 25–79 years). Similar kind of results were seen in S. Annapurna et al study (Age 60-80 years; F>M); Bhat et al (Age 22-85 years (mean = 53.5 years), 56% F).[2,5] In contrast Siddhant S. Lolge et al study (60% M, age 24-74 years) and Agrawal MK et al study (40 patients 65% M, age 30-74 years) showed male predominance.[6,7]

Another similarity with S. Annapurna et al was higher numbers of findings detected by HRCT chest as compared to chest radiographs HRCT chest can detect disease processes much earlier in their evolution and could characterize the abnormality location much more accurately.[5] HRCT chest scans are essential to the diagnostic work-up since each ILD form is characterized by a specific pattern of abnormalities and a confident diagnosis can often be arrived by HRCT chest alone or in correlation with the clinical symptoms.[5]

Most common findings were reticular opacities (56.6%) detected in HRCT chest compared to CXR but the difference between these two methods were not significant. Other common findings detected frequently in HRCT chest were traction bronchiectasis (43.3%), honey combing (33.3%), septal thickening (46.7%), ground glass opacity (GGO) (50.0%), nodules (23.3%). Similar findings were observed by C. K Onyambu et al, where predominant reticular opacities (56.1%), honeycombing (37.8%), GGO (26.8%) pattern on HRCT chest among ILD patients.[8] S. Annapurna et al study revealed septal thickening (n= 37; 64%) followed by bronchiectasis (n=26;52%) and GGO (n=24;48%) in HRCT chest.[5]

In C. K Onyambu et al study 30.7% of patients had a normal CXR.8 Where as we observed only 1(3.3%) had normal CXR. Palve et al observed CXR completely normal in 2/30 (6.6%). Therein lies the inherent lack of sensitivity of conventional chest radiography in the diagnosis of these conditions.[3]

The most common findings in CXR during our study were reticular opacities (50%), GGO (36.7%), nodules (16.7%). Similarly, S. Annapurna et al noted various patterns on CXR were reticular opacities (n=21; 42%), increased opacity (n=10; 20%) and nodular opacities (n=6; 12%).[5] In Siddhant S. Lolge et al study CXR findings were reticular opacities (n=21; 70%), nodular opacity (n=9; 30%), GGO (30%).[6]

The spectrum of diseases diagnosed were Idiopathic Pulmonary Fibrosis (IPF) (n=8; 26.7%), Connective tissue disease related ILD (CTD-ILD) (26.7%), Hypersensitivity Pneumonitis (HP) (13.3%) and Sarcoidosis (13.3%) most commonly. Among CTD-ILD most common was Rheumatoid Arthritis (RA) (4/8) and scleroderma (3/8). Siddhant S. Lolge et al observed Sarcoidosis (23.3%), RA (10%), IPF (23.3%), HP (6.7%).[6] Bhat et al study revealed common presentation in HRCT chest as IPF (32%), RA (26%), followed by scleroderma (20%) cases.[2]

The spectrum of diseases included in Agrawal MK et al study was IPF (25%), HP (17.5%), Sarcoidosis (15%), RA (10%), Silicosis (10%) and others.[7] In Meraj Rentia et al study spectrum of diseases was IPF (25%), idiopathic NSIP (16.5%), RA (14.5%), lymphangitis carcinomatosis (8.33%), asbestosis (6.25%), HP (6.25%) were common out of which 2 of 48 patients (4.16%) had normal CXR.[9]

Florence Jeny et al study reveals that CXR has been helpful in detecting ILDs, due low irradiation dose and availability it appears normal in 10-40% of patient's, diagnostic yield was achieved in 23% for radiography versus 49% for HRCT in ILDs.[10]

This study was limited by small sample size, single-centre design also HRCT findings less diagnosed and cross checked by the radiologist in the CT scanner console.

CONCLUSION

The present study concluded CXR being the modality for preliminary diagnosis and screening of patients is relatively insensitive modality for the diagnosis. HRCT chest proved to be an ultimate modality for near to accurate diagnosis of the pathology. It may even obviate the need for a lung biopsy. HRCT was found superior to CXR in detection of all basic patterns and their distribution. Chest radiograph is nonspecific initial investigation to diagnose ILD. HRCT could demonstrate the different patterns of disease and their distribution in lungs.

CONFLICT OF INTEREST

None

FINANCIAL DISCLOSURE

None

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