ORIGINAL RESEARCH PAPER
Volume - 11 | Issue - 05 | May - 2022 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

HIGH RESOLUTION CT IMAGING IN THE EVUALTION OF INTERSTITIAL LUNG DISEASES AND IT'S COMPARISION WITH CHEST X-RAY

Radio Diagnosis

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ABSTRACT

Introduction: Interstitial lung disease(ILD) is one of the evolving disease that's needs to be diagnosed by various modalitites and treated in today's modern era. Some of the diseases are associated with significant morbidity and mortality. Thus, we aimed to determine the radiological findings of various Interstitial lung disease in HRCT Thorax and compare it with Chest x-ray to get a idea on how much chest x-ray and HRCT Thorax is effective in diagnosis of Interstitial lung disease for better outcome of disease. **Method:** A cross sectional study was conducted on 120 patients with strong clinical suspicion of interstitial lung disease who were referred to the department of Radiodiagnosis, S.N Medical College Agra after taking detailed clinical history 120 patients underwent Chest X-ray and MDCT (64 Slice) examination of the thorax for evaluation of interstitial lung disease(ILD).

Result: The main observation in our study was that higher number of patients with findings were detected by HRCT thorax in comparision to Chest -Xray. We were able to detect higher no. of patients with findings of septal thickenings, nodular opacities in HRCT Thorax in comparision to X-ray Chest and this difference between the two methods was found to be statistically significant ($P<0.05$). We were able to detect higher no. of patients with findings of reticular opacity, ground glass opacity, Traction bronchiectasis, honeycombing in HRCT Thorax in comparision to X-ray Chest and the difference between the two methods was not statistically significant ($P>0.05$). **Conclusion:** The conclusion of this study is that HRCT Thorax is much more sensitive than conventional chest radiography in the assessment and diagnosis of patients with interstitial lung diseases.

KEYWORDS

Interstitial lung disease, Chest X-ray , HRCT Thorax

INTRODUCTION:

Interstitial lung diseases are a diverse group of diseases which affect the lung interstitium and share similar clinical and radiological manifestations. They are a 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]. Although the majority of these disorders also involve the air spaces, the predominant abnormality is usually thickening of the interstitium which may be due to the accumulation of fluid, cells, or fibrous tissue [2]. The chest radiograph remains part of the initial assessment of ILD, but the radiographic pattern is often nonspecific, observer variation is considerable and it is relatively insensitive to early ILD [3, 4].

As the name implies this disease group affects the pulmonary interstitium more than the alveolar spaces or airways, although exceptions exist. When responding to any injury, an autoimmune mediated inflammation from a systemic connective tissue disease or unknown injury the lung must respond to the damage and repair itself [5]. The principal causes of diffuse interstitial lung disease are: Connective tissue disorders/ collagen vascular diseases Idiopathic pulmonary fibrosis is the most common interstitial lung disease in adults and generally has a poor prognosis [3] around 15% of patients with interstitial lung disease had an underlying connective tissue disorder [4].

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 [6]. The basic pattern of interstitial lung diseases on plain chest radiograph is: Air space or alveolar consolidation Linear or septal Reticular Nodular Reticulonodular Ground glass opacity [7]. The indications for HRCT are as follows: To confirm or exclude diffuse lung disease in patients with normal or equivocal radiographic appearances and/or functional abnormalities To evaluate disease reversibility, particularly in patients with fibrosing lung disease [8, 9].

OBJECTIVES:

The purpose of study was to evaluate the efficacy of high resolution computed tomography (HRCT) thorax and conventional chest radiography in diagnosis of interstitial lung diseases and to compare the two modalities in detection of interstitial lung diseases.

MATERIALS AND METHODS:

The cross sectional study was carried out in department of Radiodiagnosis for a period of 2 years from October 2019 to September 2021 and included 120 patients attending indoor and outdoor of departments of Sarojini Naidu medical college and hospital, Agra with strong clinical suspicious of ILD. In this study the aim was to evaluate the efficacy of high resolution computed tomography (HRCT) thorax and Chest X-ray in interstitial lung diseases using proportions and chi squared test by an online statistical calculator.

A total of 120 patients underwent Chest X-ray and MDCT (64 Slice)examination of the thorax for various indications of lung pathology. We compared the P-Value with the level of significance. If $P<0.05$, we reject the null hypothesis and accept the alternate hypothesis and result was considered as statistically significant. If $P\geq0.05$, we accept the null hypothesis and accept the alternate hypothesis and result was considered as not statistically significant .

RESULTS :

All 120 patients were subjected to both Chest X-ray and HRCT scan thorax . The results was then evaluated using proportions and chi-squared test. The level of significance was 0.05 in the test. The spectrum of diseases that are included our study was : Rheumatoid arthritis (28%), idiopathic interstitial lung disease (25 %), sarcoidosis (16%), silicosis (3 %),hypersensitivity pneumonitis (6 %), asbestosis (4%), coal worker pneumoconiosis (2%), systemic sclerosis (6%), systemic lupus erythematosis (4%), sjogren syndrome (2 %), mixed connective tissue disorder (2 %), other (2%).

Results for the detection of septal thickening:

Table II: Septal Thickening

Septal thickening	HRCT Thorax		X-Ray Chest		Total	χ2	Total
	n	%	n	%			
Present	64	53%	28	23%	92	22.8	0.017 *
Absent	56	47%	92	77%	148		
Total	120	100%	120	100%	200		

*denotes significant association

Higher no. of patients with septal thickening were detected in HRCT thorax method compared to X-ray chest method and this difference between the two methods was found to be statistically significant (P<0.05).

Results for the detection of reticular opacity

Table III : Reticular Opacities

Reticular opacity	HRCT thorax		X-ray chest		Total	χ2	Total
	n	%	n	%			
Present	103	86 %	95	79%	197	2.29	0.12
Absent	17	14%	25	21%	43		
Total	120	100%	120	100%	240		

Higher no. of patients with reticular opacity were detected in HRCT thorax compared to chest X-ray but the difference between the two methods was not statistically significant (P>0.05)
Results for the detection of nodular opacity:

Table IV : Nodular Opacity

Reticular opacity	HRCT thorax		X-ray chest		Total	χ2	Total
	n	%	n	%			
Present	72	60 %	42	35 %	114	15.0	0.01*
Absent	48	40 %	78	65 %	126		
Total	120	100%	120	100%	240		

*denotes significant association.

Higher no. of patients with nodular opacity were detected in HRCT thorax compared to chest X-ray and this difference between the two methods was found to be statistically significant (P<0.05).

Results for the detection of ground glass opacity:

Table V : Ground Glass Opacity

Ground glass opacity	HRCT Thorax		Xray Chest		Total	χ2	Total
	n	%	n	%			
Present	62	52%	52	43%	114	1.67	0.19
Absent	58	48%	68	57%	126		
Total	120	100%	120	100%	240		

Higher no. of patients with ground glass opacity were detected in HRCT Thorax compared to chest X-ray but the difference between the two methods was not statistically significant (P>0.05).

Results for the detection of Traction bronchiectasis:

Table VI: Traction Bronchiectasis

Traction bronchiectasis	HRCT Thorax		Xray Chest		Total	χ2	Total
	n	%	N	%			
Present	53	44%	40	33%	93	2.96	0.08
Absent	67	56%	80	67%	147		
Total	120	100%	120	100%	240		

Higher no. of patients with traction bronchiectasis were detected in HRCT thorax compared to chest X-ray but the difference between the two methods was not statistically significant (P>0.05).

Results for the detection of honeycombing:

Table VII : Honeycombing

Honeycombing	HRCT Chest		X-Ray Chest		Total	χ2	Total
	n	%	n	%			
Present	44	37%	31	26%	75	5.27	0.07
Absent	76	63%	89	74%	165		
Total	120	100%	120	100%	240		

Higher no. of patients with honeycombing were detected in HRCT thorax compared to chest X-ray but the difference between the two methods was not statistically significant (P>0.05).

DISCUSSION:

The main observation in our study was that higher number of patients with radiological findings were detected by HRCT thorax as compared to Chest X-ray. Chest X-ray may appear completely normal in some patients suffering from interstitial lung diseases. In our study, 8 out of the 120 patients(7%) had no abnormalities in their chest radiographs. However HRCT was able to show reticular changes in these patients.
The most common abnormality seen on chest X-ray was reticular opacities which was observed in 79 % of the cases and HRCT Thorax managed to detect reticular opacities in 86% of the cases, thereby implying a much greater sensitivity in the identification of reticular opacities.

In a study done by **Grammatina et al.** they described different patterns of diffuse pulmonary nodules as a clue to various diseases. A diffuse pattern of pulmonary nodules, ranging from a few millimeters to 1 cm in diameter, may indicate interstitial or airspace diseases. Interstitial nodules tend to be sharply marginated while air space nodules poorly defined . This distinction of nodules is much better appreciated on HRCT scans than on chest radiograms. The predominant location of the nodules may provide a clue to the underlying condition. For example, fissural or pleural surfaces are frequently involved in sarcoidosis. Upper lobe predominance suggests silicosis or coal workers' pneumoconiosis; whereas lower lobe preponderance is more likely in asbestosis and bronchocentric predominance suggests sarcoidosis. Multiple lung nodules may have a random or centrilobular pattern. Nodular opacities very common manifestation of interstitial lung diseases. [10]. In our study we also found the same findings with prevalence of nodular opacities in 35 % of patients in their chest radiographs. While HRCT showed evidence of nodular opacities in 60% of the cases.

In a study done by **Eva Criado et al.** they concluded that pulmonary sarcoidosis may manifest with various radiologic patterns: Bilateral hilar lymph node enlargement is the most common finding, followed by interstitial lung disease. At high-resolution CT, the most typical findings of pulmonary involvement are micronodules with a perilymphatic distribution. Nodules can be classified as perilympahtic, random and centrilobular based on their distribution on HRCT. Perilympahtic nodules occur in relation to lung lymphatics and in clinical practice are usually the result of sarcoidosis. The maximum that chest radiography could offer in this context was to show a subpleural distribution of the nodule. This highlights the increased specificity of HRCT over conventional radiography. [11].In our study also we found the same findings with perilymphatic distribution of nodules in sarcoidosis was well appreciated.

In a study done by **Bryant moeller et al** and published in annals of the American thoracic society he founds 470 patients of ILD (37%) with honey combing. 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. On HRCT, honeycombing was much more accurately diagnosed by the presence of thick walled cysts, usually measuring 3mm to 10mm in diameter, typically occurring in many layers in subpleural region. [12] In our study also we found the same findings with honeycombing was seen in 37% of the cases on HRCT Thorax while chest x-ray could detect them in only 26%.

In a study done by **P. Madhu et al** on study conducted on 30 patients they were able to detect tractional bronchiectasis in 30% of cases in chest xray and 40% of cases in HRCT Thorax. This finding or the absence of it was much better appreciated on HRCT than conventional radiography[13]. In our study also we found the same findings with tractional bronchiectasis was visible in 33 % of the cases on chest radiography. HRCT however managed to detect traction bronchiectasis in 44 % of cases, **Sumikawa H, et al** in 2006 found UIP has a characteristic appearance that usually facilitates distinction from other types of chronic IIPs at thin-section CT. The most useful finding when differentiating UIP from NSIP was the extent of honeycombing in UIP. The basal and subpleural distribution of honeycombing in UIP was well appreciated on HRCT. However appreciation of the same on Chest Xray was difficult. [14].In our study also we found the same findings while differentiating UIP from other Interstitial lung disease with prevalence of honeycombing was seen in 37% of the cases on HRCT Thorax while chest x-ray could detect them in only 26%.

CONCLUSION:

The main result of the study was that higher number of patients with various findings were detected by HRCT Thorax than Chest X-ray.

In the detection of nodular opacity and septal thickening the p value was less than 0.05 meaning the difference was statistically significant and the inference that we are getting is that HRCT Thorax is more effective in compare to Chest X-ray in detection of nodular opacity and septal thickening in Interstitial lung disease and also the difference was statistically significant.

In the detection of reticular opacities, ground glass opacity, tractional bronchiectasis, honeycombing the p value was more than 0.05 meaning the difference was not statistically significant and the inference that we are getting is that HRCT Thorax is more effective in compare to Chest X-ray in detection of in Interstitial lung disease but the difference was not statistically significant.

Finally when we compare both Hrct Thorax and Chest X-ray in efficacy of diagnosis of interstitial lung disease, our study conclude that HRCT Thorax is much more effective than chest x-ray in diagnosis of Interstitial lung disease because of its superiority in diagnosis of various findings .Ultimately all patients with clinical suspicion of ILDs should benefit from an HRCT scan of the thorax.

Hence, HRCT seems to be the investigation of choice for the evaluation of the parenchymal abnormalities in interstitial lung diseases and thereby make a more specific and accurate diagnosis of the particular disease.

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