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X-RAY AND HRCT CORRELATION IN INTERSTITAL LUNG DISEASES

Radiodiagnosis

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ABSTRACT

Interstitial lung diseases are diverse group of diseases that predominantly affect lung interstitium and share similar clinical and radiological manifestations. Most patients have non-specific respiratory complaints and first suggestion of disease is usually a chest radiograph. However, many patients of interstitial lung disease can have normal chest radiogram. In these patients, HRCT can detect abnormalities not visualised on the chest radiograph.
The aim of the study is study the various patterns of HRCT and X-ray in Interstitial Lung Diseases and to compare conventional chest radiography and HRCT in diagnosis of interstitial lung disease.

KEYWORDS

X-RAY, HRCT, ILD

Methods: The study was carried out at the Department of Radiology, Government Medical College and New Civil Hospital, Surat. A total of 40 patients from all age groups and either sex were selected. Patients with clinical suspicion of interstitial lung disease who presented to OPD of Medicine and pulmonary Medicine and who are referred to the Department of Radiodiagnosis, GMCS for further evaluation were subjected to both conventional chest radiograph and HRCT scan thorax and a detailed work up of these patients performed.

HRCT scans were performed in supine position in a SIEMENS SOMATOM EMOTION 6 Slice CT machine in suspended inspiration using a kVp of 130 and mAs of 100. The window width was set between 1200-1500 and window level at -600 to -700. The matrix used was 512 x 512 while the pitch was set at 1:1.

The patients also underwent chest radiography PA view at 60 kVp and 10-12.5 mAs in a SIEMENS HELIPHOS-D 500 mA X-ray machine.
Their clinical history, relevant past and occupational history and any laboratory data recorded.

The results of our investigation were evaluated using proportions and chi square test. The level of significance was 0.05. We compared the P Value with the level of significance. If P<0.05, we reject the null hypothesis and accept the alternate hypothesis. If >0.05, we accept the null hypothesis.

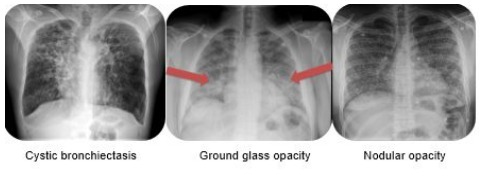
The results were tabulated, statistically analysed and compared with previous studies.

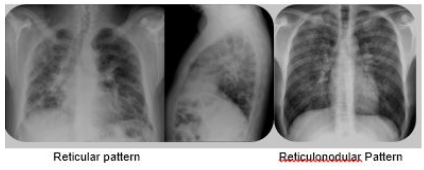
DISCUSSION :

- **X-ray findings of Interstitial Lung Diseases**

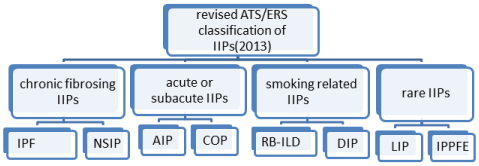
On plain radiography, the various interstitial lung diseases are classified according to the pattern of abnormality they produce. The basic patterns that are seen are-

- Air space or Alveolar consolidation
- Linear or septal
- Reticular
- Nodular
- Reticulonodular
- Ground Glass Opacity
- Emphysema
- Centrilobular
- Panlobular
- Paraseptal
- Bullous
- Bronchiectasis
- Cylindrical
- Varicose
- Cystic





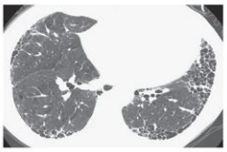
Recently ATS/ERS classification was updated in 2013.



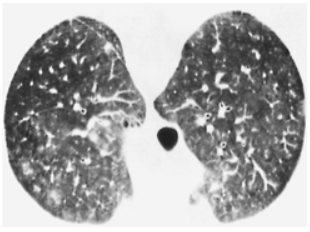
- **ABBREVATIONS USED IN THE CLASSIFICATION:**

1) IIP : Idiopathic interstitial pneumonia
2) IPF: Idiopathic pulmonary fibrosis
3) NSIP: Non specific interstitial pneumonia
4) AIP: Acute interstitial pneumonia
5) COP: Cryptogenic organizing pneumonia
6) RB-ILD: Respiratory bronchiolitis interstitial lung disease
7) DIP: Desquamative interstitial pneumonia
8) LIP: Lymphocytic interstitial pneumonia
9) IPPFE: Idiopathic pleura parenchymal fibro elastosis
10) ATS : American thoracic society
11) ERS: European respiratory society

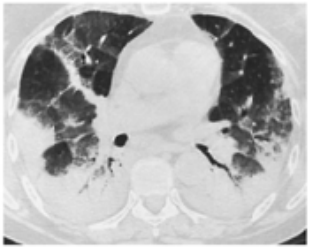
- **HRCT findings of Interstitial Pulmonary Fibrosis:**
- Findings of fibrosis(i.e., honeycombing, traction bronchiectasis, intralobular interstitial thickening, irregular interlobular septal thickening, irregular interfaces)
- Ground Glass Opacity(usually in areas showing fibrosis)
- Peripheral and sub pleuralpredominance of abnormalities
- Lower lung zone and posterior predominance



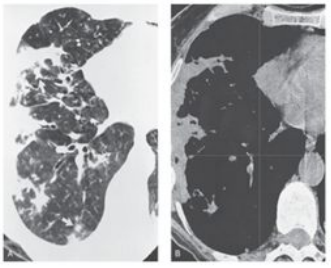
- **HRCT findings of Non-Specific Interstitial Pneumonia:**
- Ground glass opacity
- Findings of fibrosis(i.e., traction bronchiectasis and bronchiolectesis, intralobular interstitial thickening, irregular interlobular septal thickening, irregular interfaces) common but mild
- Honeycombing uncommon and mild
- Lower lung zone predominance of ground glass opacity and reticulation
- Basal and peripheral predominance of ground glass opacity and reticulation
- Relative sub pleural sparing in dorsal regions of lower lobes



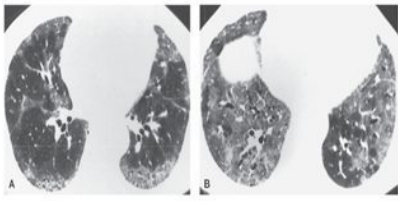
- **HRCT findings of Acute Interstitial Pneumonia:**
- Extensive bilateral ground glass opacities
- Airspace consolidation
- Architectural distortion
- Combination of first three findings
- Consolidation predominantly basilar and dependent



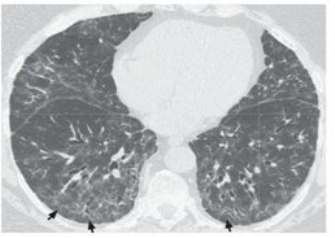
- **HRCT findings of Cryptogenic Organizing Pneumonia:**
- Sub pleural and/or peribronchovascular distribution (60%-80%)
- Bronchial wall thickening, dilatation in abnormal areas
- Patchy bilateral air space consolidation
- Ground glass opacity(60%) or crazy paving
- Perilobular opacities (60%)
- Small nodular opacities, often centrilobular



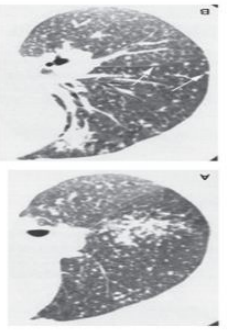
- **HRCT findings of Respiratory Bronchiolitis Interstitial Lung Disease:**
- No visible abnormality
- Centrilobular nodular opacities
- Patchy ground glass opacity
- Bronchial wall thickening
- Upper lobe predominance
- Findings of fibrosis usually absent
- Associated centrilobular emphysema



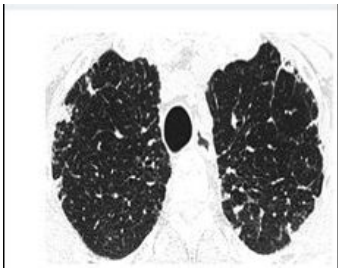
- **HRCT findings of Desquamative Interstitial Pneumonia:**
- Bilateral, patchy ground glass opacity
- Sub pleural and basal predominance
- Superimposition of first two findings
- Reticular opacities
- Honeycombing(uncommon)
- Associated centrilobular emphysema



- **HRCT findings of Lymphocytic Interstitial Pneumonia:**
- Ground glass opacity
- Poorly defined centrilobular nodules
- Subpleural nodules
- Interlobular septal thickening
- Thickening of peribronchovascular interstitium
- Cystic airspaces
- Lymph node enlargement



- **HRCT findings of Idiopathic Pleura Parenchymal Fibro Elastosis:**
- Subpleural reticulation
- Pleural thickening
- Upper lobe predominance
- Superimposition of the first three findings
- Superior retraction of the hila
- honeycombing



RESULT

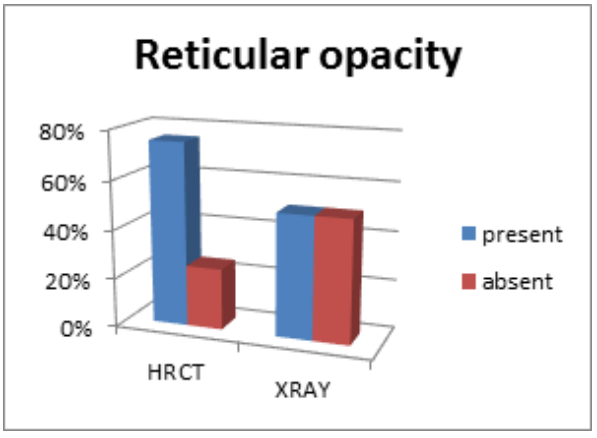
TABLE I: COMPARATIVE FINDINGS IN X RAY AND HRCT

		Plain radiograph	HRCT
1	Air space consolidation	12	1
2	Septal thickening	12	32
3	Reticular opacities	20	30
4	Honeycombing	-	22
5	Nodular opacities	16	30
6	Distribution of nodules (perilymphatic, centrilobular or random)	Not Applicable	Applicable
7	Ground glass opacity	-	22
8	Bronchiectesis	-	21
9	Mosaic attenuation	-	1
10	Hilar and mediastinal lymphadenopathy	6	20

The comparative tables between xray and HRCT in the detection of different findings are given below

TABLE IV: RETICULAR OPACITIES

Reticular opacity	HRCT		XRAY		Total	X^2	Total
	n	%	n				
Present	30	75%	20	50%	50	5.3333	0.0209
Absent	10	25%	20	50%	30		21338
Total	40	100%	40	100%	80		



Higher number of samples with reticular opacity were detected in HRCT method compared to X ray method but the difference between the two methods was not statistically significant(P>0.05).

TABLE V : NODULAR OPACITIES Results for the detection of nodular opacity:

Nodular opacity	HRCT		XRAY		Total	X^2	Total
	n	%	n				
Present	30	75%	16	40%	46	10.0255	0.0015
Absent	10	25%	24	60%	34		44
Total	40	100%	40	100%	80		

The main observation in our study was that higher number of samples with findings were detected by HRCT as compared to conventional radiography. Even when both modalities were able to detect the findings, HRCT could characterise the abnormality and specify its location much more accurately. As well as early diagnosis by HRCT helps a lot in improvement of morbidity and mortality of the patients affected with interstitial lung diseases.

The chest radiograms can appear completely normal in patients suffering from interstitial lung diseases. Therein lies the inherent lack of sensitivity of conventional chest radiography in the diagnosis of the conditions. In our study, 2 out of 40 patients(5%) 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 radiographs was reticular opacities which was observed in 73% of the cases. However HRCT managed to detect reticular opacities in 90% of the cases, thereby implying a much greater sensitivity in the identification of these densities.

Nodular opacities are another very common manifestation of interstitial lung diseases. In our study, 37% had nodular opacities in their chest radiographs. While HRCT showed evidence of nodular opacity in 63% of cases. The appearance of the nodules themselves can be an indicator as to whether they are interstitial or air space nodules. Interstitial nodules tend to be sharply marginated while air space nodules poorly defined. The distinction of nodules is much better appreciated on HRCT scans than on chest radiograms.

CONCLUSION:

HRCT is able to detect abnormalities in patients when the clinical signs are minimal or even when the chest radiograph appears completely normal.HRCT appears to be a better modality of investigation than conventional chest radiography in the diagnosis of interstitial lung diseases. HRCT was able to detect abnormalities even in cases when the chest radiograph was normal, thereby emphasizing the inherent lack of sensitivity of chest radiography. Clinicians should therefore give patients the benefit of HRCT even when chest radiogram appears normal. When HRCT findings are characteristic in appropriate clinical settings, HRCT may even obviate need for a lung biopsy.

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