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THE IMPORTANCE OF HIGH RESOLUTION COMPUTED TOMOGRAPHY IN DIAGNOSING INTERSTITIAL LUNG DISEASES

Radiodiagnosis

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ABSTRACT

Aim and Objectives: To evaluate the role of high resolution computed tomography in the diagnosis of interstitial lung diseases. To detect and study the various patterns of high resolution computed tomographic in interstitial lung diseases . To limit the differential diagnosis and to make the specific diagnosis.

Materials &Methods: The present study Role of HTCT in interstitial lung diseases is a prospective and analytical study, conducted in the Department of Radio Diagnosis, Alluri Sitarama Raju Academy Of Medical Sciences, Eluru during the period from October 2011 to September 2013, after obtaining approval by the ethical committee board.

The CT machine used is Siemens Somatum sensation 40-slice MDCT Scanner. The study group consisted of 50 patients, of this 27 were males (54%) and 23 were females (46%). Data collected from these patients included Demographic details, occupational history, smoking history and other history of risk factors, symptomatology, history of associated co-morbidities and conditions, relevant investigations like PFT, ABG and other relevant investigation reports.

Conclusion : HRCT, in the present era, is indispensable for the diagnosis, management, prognosis and follow up of the cases of interstitial lung disease.

KEYWORDS

ILD-Interstitial lung diseases, HRCT-High Resolution Computerized Tomography ERS-European Respiratory Society, ATS-American Thoracic Society.

Introduction

Interstitial lung diseases are a group of disorders caused by inflammation and scarring of alveoli and the pulmonary Interstitium. Pulmonary Interstitium is the network of connective tissue fibers that supports the lung. It includes alveolar walls, interlobular septa and the peribronchovascular interstitium. Interstitial lung diseases are characterized by alveolar septal thickening, fibroblast proliferation, collagen deposition and if the process remains unchecked, it will lead to pulmonary fibrosis. (HRCT) is the perfect imaging modality for characterization and diagnosis of interstitial lung diseases. It differs from conventional CT by using thin collimation (1 to 1.5mm) with high spatial frequency algorithm (Bone algorithm).

HRCT FINDINGS IN INTERSTITIAL LUNG DISEASES

Generally HRCT findings[19] can be classified into four large categories based on their appearances. These are:-

1. Linear & reticular opacities
2. Nodules & nodular opacities
3. Increased lung opacity
4. Abnormalities associated with decreased lung opacity.

Materials and methods :

The present study "ROLE OF HRCT IN INTERSTITIAL LUNG DISEASES" is a prospective and analytical study, conducted on 50 patients, of this 27 were males (54%) and 23 were females (46%).

Place of study: Department of Radio Diagnosis, Alluri Sitarama Raju Academy Of Medical Sciences, Eluru.

The CT machine used is **SIEMENS SOMATUM SENSATION 40-SLICE MDCT SCANNER.**

Duration of study: The study was carried during the period of October 2011 to September 2013, after obtaining approval by the ethical committee board.

SELECTION OF PATIENTS:

Inclusion criteria:

1) Clinical history suggestive of interstitial lung disease.
2) Known cases of interstitial lung disease.
3) Positive occupational history
4) Abnormal chest radiographs (with an interstitial pattern)
5) Abnormal restrictive pulmonary function tests.

Data collected from these patients included Demographic details, occupational history, smoking history and other risk factors, symptomatology, history of associated co-morbidities and conditions, relevant investigations like PFT, ABG and other relevant investigation reports.

Exclusion criteria:

Patients having acute lung injury, acute respiratory distress syndrome, acute respiratory tract infection and chronic infection like bronchial asthma, chronic obstructive lung disease, dyspnea due to cardiac causes.

Table 1 :SCANNING PARAMETERS:

Position	Supine
Scanner settings	KV(p): 120 – 140 mAs : 129 – 150
Collimation	1mm
Scan time	0.6 second.
Matrix size	512 x 512
Superior extent	Lung apices.
Inferior extent	Domes of diaphragm.
Reconstruction	High spatial frequency algorithm.
Windows setting Window width	1200 to 1600 HU.
Window level	-600 to -800 HU.
Contrast medium	No contrast medium was used.

RESULTS: Total 50 cases of Interstitial Lung Disease (ILD) were studied.

Table 2 : HRCT findings in interstitial lung diseases observed in 50 patients.

S.No	HRCT findings	IPF	HP	MILIARY TB	LC	RA	NSIP	PCP	DIP	CPE	AP	SLE	PSS	WG	SAR	SILICOSIS	TOTAL	%
1	Reticular	13	6	3	3	3	2	1	1	1	1	2	1	-	1	-	38	76

2	Nodular	-	5	6	4	1	1	-	-	-	-	-	-	1	1	1	20	40
3	Ground glass opacity	5	9	2	1	3	3	2	1	1	1	1	1	1	-	1	32	64
4	Honey-combing	13	3	-	1	3	-	-	-	-	-	-	-	-	-	-	20	40
5	Cyst/cystic air spaces	5	1	-	-	1	-	1	-	-	-	-	1	-	-	-	9	18
6	consolidation	-	2	-	-	-	-	2		-	-	1	-	1	-	1	7	14
7	Bronchiectasis	10	3	-	-	2	1	-	-	-	-	-	-	-	-	-	16	32
8	Fissural thickening	2	-	1	1	-	-	-	-	1	-	-	-	-	-	1	6	12
9	Emphysema	2	-	-	-	-	-	-	1	-	-	-	-	-	-	-	3	6
10	Cavity	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	2	4
11	Fibrotic strands	5	2	1	2	2	1	-	-	-	-	1	-	-	-	-	17	34
12	Pleural thickening	-	-	2	1	1	-	-	-	-	-	1	-	-	-	1	6	12
13	Pleural effusion	-	1	-	2	2	-	-	-	1	-	2	-	1	1	1	11	22
14	Lymphadenopathy	-	2	2	2	-	-	-	-	-		-	-	-	1	1	8	16

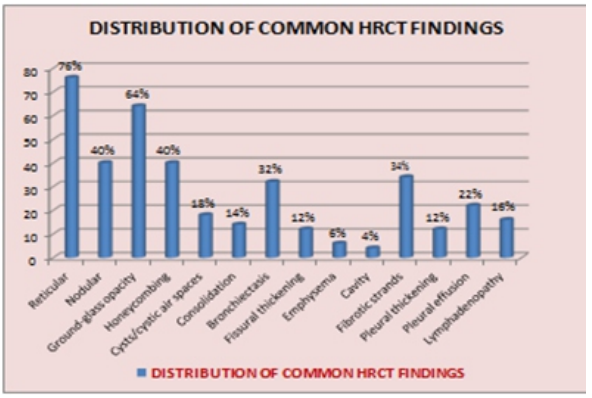

Figure1: HRCT findings in interstitial lung diseases observed in 50 patients.

DISCUSSION :

An accurate diagnosis of ILD is vital to direct appropriate therapy, determine prognosis and also to design clinical trials of other ILD's[17]. Significant history of smoking was found in 82% of cases which correlates with King TE, Jr. et al study. In present study 22% of patients presented with normal chest radiograph, where as in Epler et al, and Carrington and Gaenster et al, it is 10%.HRCT here proved superior to chest radiograph.

HRCT showed a range of abnormalities among patients thought to have ILD.76% of patients in our study showed reticulations which is similar to Zerhouni et al, where 89% showed reticular striations.66% of cases of this study showed ground glass opacity while Leung An et al noted it in 54% cases.

In cases of idiopathic pulmonary fibrosis,HRCT shows posterior basal and sub pleural areas most affected (100%).Middle lobes and anterior segments of upper lobes were involved in 4 patients suggesting disease process begins in posterior basal region and progresses to upper regions of lungs.These findings were correlated with findings of Lim MK et al and Battista G etal[1,2].

Intralobular interstitial thickening producing fine reticular pattern and Honeycombing, seen in all patients predominantly in subpleural and basal regions.These were commonest finding in our study which is corresponding with findings of Nishiyama O et al[3].

The study included 9 (18%) patients of hypersensitivity pneumonitis of which 3 (33.3%) were of subacute type and 6 (66.6%) were of chronic type.

Out of 6 chronic cases, 100% showed patchy or diffuse areas of ground -glass opacities.Middle lung zones and anterior parts are commonly involved with relative sparing of apical and basal regions in these cases, which is consistent with BD Adler et al.[20] Findings of fibrosis were seen in two patients and were seen predominently in subpleural and peribronchovascular distribution with irregular pattern correlating with the findings of Zampatori M et aland Bd Adler et al.[4,5]

Study included 6 (12%) cases of miliary tuberculosis, out of which one cases showed normal chest radiography.All six (100%) cases on HRCT showed randomly distributed nodules, ranging between 1 to 5 mm.Perivascular and subpleural are commonly involved regions which is consistent with findings of Hong SH et al[18] and Voloudaki AE et al[6].

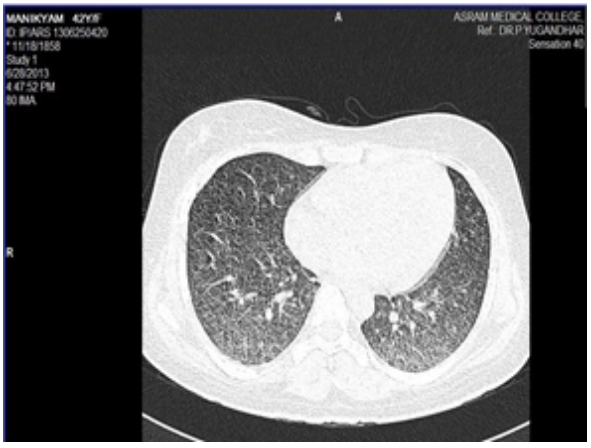

Figure 2: Miliary tuberculosis showing randomly distributed nodules

Three (75%) patients of rheumatoid arthritis showed patchy or diffuse areas of ground-glass opacity and subpleural honeycombing with reticular pattern, findings similar to Biederer J et al[8] and Kinoshita F et al.One (25%) patient showed small nodular opacities ,few of these nodules were cavitatory, correlating toMuller Lcissec et al.[7]

Two cases of pneumocystis carinii pneumonia were identified.These patients were seropositive for HIV.Predominant perihilar distribution of ground-glass opacities was observed along with visible vessels in these areas, is consistent with the findings of Bergin CT et al[9] and Kuhlman JE et al[10].

Study included one(2%) case of desquamative interstitial pneumonia. The patient was a chronic smoker.This case showed diffuse ground-glass opacity with focal areas of centrilobular emphysematous changes.

Study included one (2%) case of alveolar proteinosis showing diffuse ground glass opacities with interlobular interstital thickening giving a crazy paving pattern in bilateral perihilar regions similar to the findings of Holbert JM, Costello P et al[14].

Two (2%) case of systemic lupus erythematosus with lung involvement were identified which showed pleural effusion, thickening of interlobular septa and peribronchovascular interstitial thickening as reported by Fenlon HM et al[50] and Ooi GC et al.[13]

In Wegeners granulomatosis lungs showed multiple ill defined nodules in bilateral lung fields with a cavity formation in the left upper lobe, patchy ground glass opacities and areas of consolidation as described by Lee KS, Kim TS et al[11]

One (2%) case of sarcoidosis was included in this study. HRCT changes are homogeneously distributed and predominantly in upper

zones consistent with findings of Ziora D et al[15].

Silicosis was noted in a single case (2%). The patient's occupation was grinding for almost 30 years.Conglomerated nodular opacities which are predominantly in subpleural regions and seen in upper and posterior zones in this case, consistent with the findings described by Marchiori E et al[16]

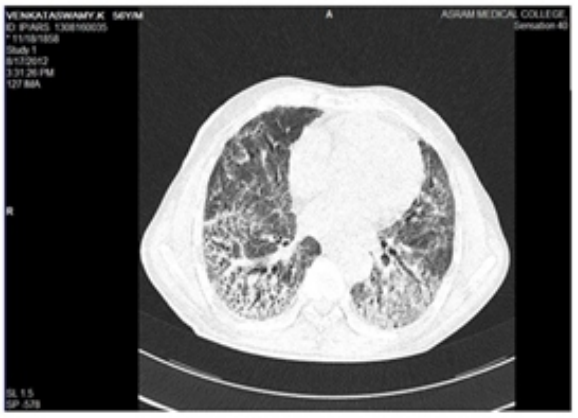

Figure 3: HRCT idiopathic pulmonary fibrosis

HRCT at the level of middle and lower lobes shows b/l reticular pattern, bronchiolectasis and honey combing with a posterior basal and subpleural predominance and diffuse minimal ground glass opacities-s/o **Idiopathic Pulmonary Fibrosis.**

Conclusion:

- HRCT is able to pick up changes within the interstitium even when chest radiograph are normal in suspected cases of ILD.
- It is far superior to chest radiograph in making a more definitive diagnosis and also in reducing the need for taking a confirmatory lung biopsy.
- Even with equivocal results, HRCT can guide surgeon for lung biopsy site and aid in the diagnosis of ILD.
- HRCT can be reliably used for assessing various patterns of interstitial lung diseases and helps in making a specific diagnosis.

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