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RESEARCH ARTICLE

Abstract Page

HRCT patterns of Interstitial Lung Disease in patients with connective tissue disease.

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Abstract

Background : Interstitial Lung diseases frequently occur in patients with the connective tissue diseases (CTD). High Resolution Computerised Tomography (HRCT) scanning is capable of imaging lung with excellent spatial resolution and providing anatomical detail identical to that seen by gross pathological examination.

Aims: To evaluate High Resolution Computerised Tomography patterns of ILD in patients with CTD .

Methods and Material: In this prospective study, we evaluated HRCT chest patterns in 36 patients with various CTD between January 2008 and December 2008. The data were entered in MS Excel. Descriptive statistics, i.e., means, standard deviations, frequencies, and percentages, were used to describe the study variables.

Results: Out of 36 patients (33.33% females, 66.67% males with a mean age of 44 years), Systemic sclerosis was the most common CTD (44.44%) followed by Rheumatoid arthritis (33.33%), Mixed connective tissue disease (8.33 %) , Systemic lupus erythematosus (5.56%) Polymyositis/Dermatomyositis (5.56 %) and Sjogrens syndrome (2.28 %). In individual HRCT pattern, Reticular pattern is the most frequent presentation (80.6%) followed by Nodular pattern (58.3%) and Ground Glass Opacity(GGO) pattern(50%). Less common are Honeycombing and Traction bronchiectasis. In various combinations of HRCT pattern ReticuloNodular pattern forms the most

common presentation(38.9%).

Conclusions: HRCT of chest is used as simple, gold standard, non invasive diagnostic tool in diagnosing ILD.A variety of HRCT patterns can be seen in patients CTD - ILD.

Introduction:-

Connective tissue diseases (CTD) are a heterogeneous group of immunologically mediated inflammatory diseases. It is not surprising that, by virtue of their abundant connective tissue and blood supply, the lungs are frequently involved in these disorders. Consequently, CTD affect all areas of the lung (i.e., the airways, parenchyma, vascular system, and pleura), and do so in various degrees and combinations[1] due to autoimmune processes. At present HRCT chest scans have been refined and are increasingly recognised as diagnostic patterns in ILD. This has led to the increasing use of HRCT scans in conjunction with thorough clinical assessment[2]. The purpose of this study was to evaluate HRCT chest individual patterns and combination of individual patterns in patients with CTD.

Subjects and Methods:-

Study population:-

In this prospective study, we evaluated HRCT chest patterns in 36 patients with various CTD between January 2008 and December 2008. This study was approved by the local ethics committee. Inclusion criteria include serologically

positive CTD patients, clinically and radiologically confirmed cases of ILD, Age > 12 years and Sex- Both genders. Exclusion criteria include patient associated with history suggestive of Infection, Allergy and immunosuppression or associated with another respiratory disease, cardiovascular disease and malignancy , smokers and ILD due to other known cause or unknown cause.

Procedures had been explained to all patients and written informed consent was obtained from all participants. Medical clinical history has been taken with particular reference to any previous history of cardiopulmonary disease, cough, dyspnoea, sputum, chest pain and risk factors for lung disease, such as smoking. Then followed by comprehensive review of past medical, social, family, drug histories and occupational histories with an investigation of all potential environmental exposures and hazards were done. The patients were then subjected to the High-resolution computed tomography (HRCT) in supine position, holding a breath at deep inspiration, without contrast medium. An interdisciplinary approach involving pulmonologists, radiologists and rheumatologists was implemented on all ILD patients before a final diagnosis was concluded.

Statistical analysis:-

The data were entered in MS Excel. Descriptive statistics, i.e., means, standard deviations, frequencies, and percentages, were used to describe the study variables.

Results:-

In our study 55 patients were screened for CTD - ILD. Out of which 36 patients were taken up for the study after satisfying eligible criteria. All were nonsmokers. Remaining patients were excluded from the study group based on exclusion criteria. In our study population age group ranges from 16-74 years. Maximum number of patients presented between the ages of 36-45 years. The mean age distribution found in our study is 44 $\pm$ 13.79.Hence 95% of confidence interval lies in the range of 44± 4.5 , indicating that most of them fall in late fourth decade(Table1). The selected patients consisted of 66.67% Females and 33.33% males. Male: Female sex ratio is 1:2. Rheumatoid arthritis(RA) and Systemic sclerosis(SSc) form the bulk of the study population. Both constitute more than 75% of the cases. Followed by three cases of **M**ixed connective tissue disease (MCTD) and two cases each from Systemic lupus erythematosus(SLE) and Polymyositis/ Dermatomyositis(PM/DM) and one case of Sjogren's syndrome(Table 2). Reticular pattern is the most frequent presentation (80.6%) followed by Nodular pattern (58.3%) and Ground-glass opacity(GGO) pattern(50%). Less common are Honeycombing and Traction bronchiectasis(Table3). In our study population various combinations of Reticular, Ground glass, Honey combing, Traction bronchiectasis, and Nodular patterns seen. Of which ReticuloNodular(RN) pattern forms the most common presentation (38.9%)(Table4).

Discussion:-

Interstitial lung diseases (ILD) commonly complicate the management of connective tissue diseases. Approximately 15% of the patients who present with ILD have an underlying CTD[3]. Furthermore clinical symptoms like cough, dyspnoea, pulmonary hypertension or ILD may precede the clinical presentation of CTD by five years or more[3]. Finally it can result in significant morbidity and mortality.

Systemic sclerosis(SSc) is the CTD with the largest percentage of patients afflicted with ILD (40–80 %, depending on method of ascertainment). Along with pulmonary Hypertension (PH), ILD is a major cause of death in this disease[4,5] . The predominant abnormalities in SS - ILD consist of areas of ground-glass attenuation, poorly defined sub pleural nodules, reticular pattern of attenuation, honeycombing, and traction bronchiectasis[6]. In Kim et al study[7] of longitudinal CT series in 40 patients with SS, a variety of radiological features were found including GGO (100%), irregular linear opacity (90%), small nodules (70%), honeycombing (33%), traction bronchiectasis (68%), bilateral pleural thickening (45%), and enlarged mediastinal lymph nodes (15%). In our study, Systemic sclerosis(SSc) is the CTD with the largest percentage 44.44% of all CTD patients and ReticuloNodular pattern is the most common presentation.

While Rheumatoid Arthritis(RA) occurs more commonly in females (female to male ratio 3:1), RA-ILD is more frequent in males. RA-ILD manifests most commonly in the Reticulation, traction bronchiectasis and honeycombing pattern, and less commonly with ground-glass opacity and nodular pattern. HRCT findings consist of irregular linear hyper attenuating areas caused by a combination of intralobular lines and irregular thickening of interlobular septa.

Honeycombing is seen more markedly near the diaphragm. HRCT demonstrates interstitial lung disease in patients with and without clinical evidence of the disease (69%–80% and 20%–29%)[8]. In a study by Akira et al, three major radiographic patterns of disease have been identified in symptomatic patients who developed lung disease prior to or following the diagnosis of RA[9]. These included reticulation with or without honeycombing (66% patients), centrilobular branching lines with or without bronchial dilatation (17%), and consolidation (17%).

In an evaluation of high-resolution CT findings among 50 patients with Sjogren's syndrome, there is an increased prevalence of lymphocytic interstitial pneumonitis, which is seen radiographically as a reticulonodular pattern predominantly involving the lower lobes[10]

Kozuka et al. found that the predominant abnormalities in MCTD include areas of ground glass attenuation with subpleural micronodules[11]. Saito et al. compared the pulmonary manifestations of MCTD, SSc, systemic lupus erythematosus (SLE) and polymyositis using HRCT. Ground glass opacities were found in 4/35 MCTD patients, which was significantly lower than found in other connective tissue diseases. In that study, the predominant HRCT pattern of MCTD was the interlobular septal thickening (82.9%)[12].

To date, only few investigators have assessed the prognosis of ILD in PM/DM patients, nevertheless ILD is still considered to have a high morbidity due to reduced functional pulmonary reserve.

Reticulonodular pattern was frequently observed in our study. Though there were various HRCT combination patterns, GGO alone in the absence of honeycombing was predominant next to RN pattern. Ground-glass opacities represent the interstitial processes with a higher amount of cellularity and suggest the disease is highly responsive to treatment**.** Reticulation, traction bronchiectasis and honeycombing appearance depict the fibrotic changes and progressive ILD. Our HRCT study can suggest the underlying pathologic category in the absence of FNAC/Biopsy material and has assumed a greater role in the diagnosis and management of CTD-ILD.

The main limitations of our study were the small number of subjects and only CTD - ILD patients were included.

Conclusion-

ILD in this study was mainly diagnosed by chest HRCT, which can be used to distinguish different patterns, in the absence of pathologic material. Overall, HRCT is the most sensitive parameter to detect the early interstitial changes in patients with CTD. Crucial monitoring of pulmonary disease is important because the sequelae of ILD does not always pursue the systemic disease activity.Therefore, it is imperative for physicians to look for early ILD pattern to assess favourable outcome pertaining to morbidity and mortality in CTD - ILD .

Table 1 : Age

Age Group (Years)	No of Patients	Percentage (%)
<35	**9**	**25**
36-45	**11**	**30.56**
46-55	**7**	**19.44**
>55	**9**	**25**
TOTAL	**36**	**100**

Table 2:

Disease	Female N(%)	Male N(%)	Total N(%)
Scleroderma	**12(62.5)**	**4(25)**	**16(44.44)**
RA	**5 (41.66)**	**7(33.33)**	**12(33.33)**
MCTD	**3(100)**	**0**	**3(8.33)**
SLE	**2(100)**	**0(0)**	**2(5.56)**
Sjogren's syndrome	**1(100)**	**0(0)**	**1(2.78)**
DM/PM	**1(50)**	**1(50)**	**2(5.56)**
Total	**24(66.67)**	**12(33.33)**	**36(100)**

Table 3: Individual patterns in HRCT

HRCT pattern	No of patients	Percentage(%)
Reticular	**29**	**80.6**
Ground glass opacity	**18**	**50**
Honeycombing	**8**	**22.2**
Traction bronchiectasis	**5**	**13.9**
Nodular	**21**	**58.3**

Table 4:Combined HRCT patterns in connective tissue disorders

HRCT Features	SS	RA	MCTD	Sjogren	SLE	PM/DM	Total	Percentage(%)
RNHT	**2**	**3**					**5**	**13.9**
RN	**7**	**5**		**1**		**1**	**14**	**38.9**
RNH		**1**					**1**	**2.8**
RGN	**2**	**1**	**2**		**1**		**6**	**16.7**
RH	**1**	**2**					**3**	**8.3**
GGO	**4**		**1**		**1**	**1**	**7**	**19.4**
Total	**16**	**12**	**3**	**1**	**2**	**2**	**36**	**100**

R-Reticular, G-Ground glass, H-Honey combing , T-Traction bronchiectasis,N-Nodular

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