



HRCT Evaluation of Interstitial Lung Diseases in South Indian Population

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Abstract

Background: *The social strain with increasing incidence of Interstitial lung disease [ILD] has manifested in recent times. Environmental pollution with toxic fumes and inorganic dust lead to alveolitis, interstitial inflammation and fibrosis. Organic dusts exposure results in hypersensitivity pneumonitis while radiation and certain drugs like amiodarone, anti-cancer drugs can lead to ILD. It has become imperative that ILD be detected at an early state so that progression of the disease can be interrupted early and patient leads a longer productive life. Early diagnosis in patients with persistent dyspnoea, unexplained fatigue and stress related respiratory distress with High resolution computed tomography [HRCT] aids in providing appropriate therapy and follow up.*

Results: *The mean age group of study population of 46 cases was 58 years. Interlobular thickening and peribronchial fibrosis were additional features on HRCT suggestive of ILD seen in significant number of cases which was not detected by chest X ray. The sensitivity of chest X ray making radiological diagnosis of ILD was 78.26% while sensitivity by HRCT was 100% provided that all the cases included in this study was supported by clinical diagnosis of ILD as there were no lung biopsy taken in the study population to make a definitive diagnosis of the same.*

Conclusion: *HRCT can avoid tormenting procedure of open lung biopsy in diagnosing many cases of ILD. Even with equivocal results, HRCT can guide surgeon for lung biopsy site and aid diagnosis of ILD. HRCT in the present era, is indispensable for the diagnosis, prognosis and management and follow up of the cases of interstitial lung disease*

Study Design: *Hospital based prospective & analytical study.*

Introduction

Interstitial lung disease [ILD], which comprises chronic non-malignant, non-infectious diseases of lower respiratory tract characterized by

inflammation and derangement of alveolar walls, include more than 200 separate diseases of known and unknown causes.

The causes of ILD have increased manifold during recent times. The recent increase in number of

causes of ILD may be attributed to a number of reasons. Environmental pollution being one of the important aetiologies, increased amount of exposure to toxic fumes and inorganic dusts in work environments and cities lead to alveolitis, interstitial inflammation and fibrosis. Also, exposure to organic dusts results in the condition of hypersensitivity pneumonitis. Increased exposure to radiation or to certain drugs like amiodarone, gold containing drugs, anti-cancer drugs like busulfan or bleomycin can lead to ILD. Besides these, there is a larger group of ILD whose cause remains unknown. In view of these, it has become imperative that ILD be detected at an early state so that progression of the disease can be interrupted as early as possible and patient leads a longer productive life.

In the days gone by, chest X-ray used to be the only tool in hands of radiologists and medical personnel to diagnose the ILD and it was usually in advanced stages that ILD would manifest radiologically. As a result a number of patients would have to undergo the tormenting procedure of open lung biopsy for diagnosing ILD.

But all these have now changed with the advent of HRCT. By using thin sections in HRCT one can easily diagnose ILD even when chest radiography is equivocal or normal. In certain cases where confident diagnosis cannot be made, HRCT helps choosing a proper biopsy site.

In view of above, the need for HRCT in patients with persistent dyspnoea, unexplained fatigue and stress related respiratory distress has increased. Early diagnosis aids in providing appropriate therapy to needy patients much earlier to the same becoming manifest on chest radiography. HRCT has also helped a lot of patients by avoiding them to undergo ordeal of open lung biopsy, which only adds on to the morbidity, which the patients already have. In a group of patients open lung biopsy could be life threatening in cases with low blood oxygen saturation. In such patient's HRCT has come to play a very important role. Hence every patient even with mild dyspnoeic features may need to be followed up with a HRCT.

Objectives

To study the utility of high resolution computed tomography in the diagnosis of interstitial lung disease.

Material and Methods

This study is a prospective and analytical study conducted in the Department of Radio Diagnosis of a multi-speciality teaching hospital over a time period of 1 year, after obtaining approval by the ethical committee board.

The department has the availability of SIEMENS SOMATOM EMOTION single slice CT scan. We receive a variety of medical and surgical cases for radio diagnosis and thus aiding in the management of these cases.

Patients presenting to the radiology department were selected for HRCT screening by the treating clinician's preference on the basis of any of the following criteria:

1. Known or suspected ILD
2. History of chronic dyspnoea and non-productive cough
3. History of exposure to organic/ inorganic dust
4. Known case of collagen vascular disease
5. Abnormal pulmonary function test
6. Abnormal Chest Radiograph

Those patients having acute lung injury, acute respiratory distress syndrome, acute respiratory tract infection and chronic infection like tuberculosis, bronchial asthma, chronic obstructive lung disease, dyspnea due to cardiac or renal causes and patients with primary or secondary neoplasm of lungs were excluded from the study.

Eligible candidates were then enrolled in the study. Demographic details, occupational history, smoking history and other history of risk factors, symptomatology, history of associated comorbidities and conditions, relevant investigations like chest radiograph finding, PFT, ABG and lung biopsy finding and clinical provisional diagnosis were noted in a predefined data sheet from the patient's file after obtaining an oral consent from the patient and the treating clinician.

Thin section (2mm) HRCT slices were taken at the areas showing abnormal shadows on chest radiograph. When the chest radiograph was normal, 2mm sections were taken at 10mm interval from the lung apices to the lung base. 110 – 130KvP and 100-200mAs were used on the CT machine.

The HRCT imaging was interpreted and counter confirmed by a certified radiologist of the department. The finding and the provisional diagnosis was noted in that patient’s datasheet. All data were compiled into Microsoft Excel 2007 spread sheet and analysis was accomplished using statistical method for calculations provided within “Substrate of statistical package for social science” software (version 16.0). The statistical analysis was used to calculate the percentage distribution, incidence, sensitivity and specificity of risk factors, HRCT finding and other investigatory finding in the diagnosis of ILD.

Observation

Age in years	Number	Percentage
>70	3	6.5%
66-70	9	19.56%
61-65	5	10.87%
56-60	7	15.22%
51-55	10	21.74%
46-50	7	15.22%
41-45	3	6.5%
<40	2	4.35%
Total	46	100%

Male	39	84.78%
Female	7	15.22%
Total	46	100%

Occupation	Number	Percentage
Farmer	29	63.04%
Poultry Business	19	41.30%
Industrial worker	5	10.87%

Indication	Number	Percentage
Known/suspected ILD	30	65.22%
Chronic dyspnoea/cough	36	78.26%
Exposure to organic/inorganic dust	21	45.65%
Known/suspected CVD	10	21.74%
Abnormal PFT	27	58.70%
Abnormal chest Xray	33	71.74%

Smokers	39	84.78%
Non Smokers	7	15.22%
Total	46	100%

Significant Smokers	32	82.05%
Non significant Smokers	7	17.95%
Total	39	100%

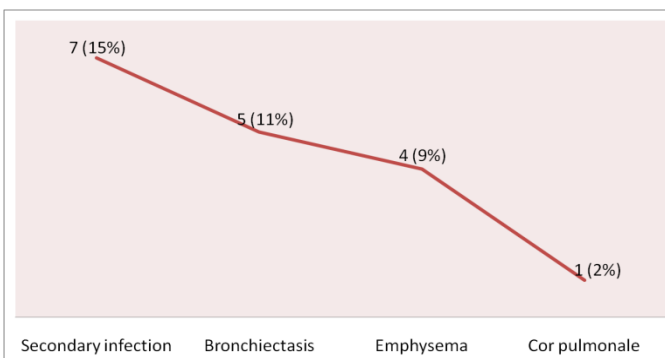
Etiology	Number	Percentage
Inorganic dust exposure	3	6.5%
Bird/animal dropping exposure	21	45.65%
Grain dust exposure	29	63.04%
Connective tissue disorder	10	21.74%
Others	1	2.17%

Connective tissue disorder	Number	Percentage
SLE	5	50%
RA	4	40%
Sarcoidosis	1	10%
others	0	0%
Total	10	100%

Features	Number	Percentages
Reticular shadows	22	47.83%
Ground glass opacity	14	30.44%
Reticulo nodular	12	26.09%
Honey combing	13	28.26%
Pleural thickening	2	4.35%
Pleural effusion	4	8.70%
Hilar lymph nodes	2	4.35%
Normal	10	21.74%

Features	Number	Percentage
Reticular striations	24	52.17%
Interlobular thickening	26	56.52%
Reticulo nodular	11	23.91%
Ground glass opacity	20	43.48%
Peribronchial fibrosis	13	28.26%
Honey combing	17	36.96%
Pleural thickening	6	13.04%
Pleural effusion	3	6.52%
Hilar lymph nodes	8	17.39%

Additional Features	Numbers	Percentages
Secondary infections	7	15.22%
Bronchiectasis	5	10.87%
Emphysema	4	8.70%
Cor pulmonale	1	2.17%



Results

The study includes 46 cases of possible diagnosis of interstitial lung disease diagnosed by HRCT. The mean age group of these cases is around 58 years

and a median age group of 57 years, which shows that the condition is a disease of the late middle age group. 85% of the study population was males, which shows that the condition is prevalent among males, possibility due to chronic exposure to environmental aetiologies.

Farming was popular among the study group (63%) with poultry business (41%) and industrial worker (11%) being their other occupational interest.

The most common indications for performing HRCT by the physicians were history of chronic cough and dyspnoea (78%) and suspicion or clinically diagnosed ILD (65%). 22% of cases had connective tissue disorder as an indication for HRCT. Among whom 50% cases had SLE, 40% cases had RA and 10 % cases had sarcoidosis.

The study group included 85% smokers with 82% having history of significant smoking. Among the possible aetiologies thought to develop this condition, exposure to grain dust in 63% cases, exposure to bird or animal dropping in 46% cases, connective tissue disorder in 22% cases and inorganic dust exposure in 7% cases were found. 1 patient (2%) had undergone radiotherapy for breast cancer which might have lead to the development of ILD at later stage.

The commonest chest X ray features appreciated was reticular shadows in 48% cases, followed by ground glass opacity in 30% cases, reticulo-nodular in 26% cases and honeycombing in 22% cases. Less commonly noted features were pleural effusion (9%), pleural thickening (4%) and hilar lymphnodes (4%).

The commonest HRCT features appreciated was interlobular thickening in 57% cases followed by reticular shadows in 52% cases, ground glass opacity in 44% cases, honey combing in 37% cases, peri-bronchial fibrosis in 28% cases and reticulo-nodular in 24% cases. Less commonly noted features were hilar lymph nodes in 17% cases, pleural thickening in 13% cases and pleural effusion in 7% cases.

Interlobular thickening and peri-bronchial fibrosis were additional features on HRCT suggestive of ILD seen in significant number of cases which was

not detected by chest X ray. Reticular shadows were detected in 48% cases by chest X ray while in 52% cases by HRCT, similarly ground glass opacity was seen in 30% cases by Chest X ray while in 44% cases by HRCT, honey combing in 28% cases on chest X ray and 37% cases by HRCT, hilar lymph nodes were detected in 4% cases by chest X ray while in 17% cases by HRCT. 1 case was falsely diagnosed to have pleural effusion on chest X ray which on HRCT was detected to have pleural thickening. Pleural thickening was detected in only 4% cases by chest X ray while 13% cases had pleural thickening on HRCT.

Other additional non ILD features detected on HRCT were secondary infection in 15% cases, bronchiectasis in 11% cases, emphysema in 9% cases and cor-pulmonale secondary to massive fibrosis in 2% cases.

Among the study population with diagnosis of ILD, 22% cases had a normal chest X ray finding with features suggestive of ILD detected by HRCT only. The sensitivity of chest X ray making radiological diagnosis of ILD was 78.26% while sensitivity by HRCT was 100% provided that all the cases included in this study was supported by clinical diagnosis of ILD as there were no lung biopsy taken in the study population to make a definitive diagnosis of the same.

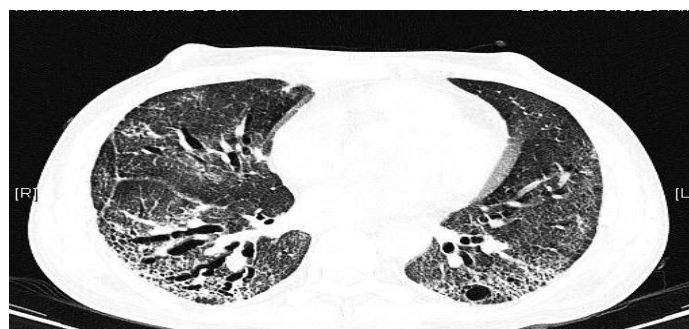


Fig.1. Axial HRCT at cardiac ventricular level shows interstitial & interlobular septal thickening with sub-pleural honeycombing and traction bronchiectasis.

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 the prognosis during patient follow up and assist their management.

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

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