



Comparative Accuracy of HRCT and Chest Radiography in the Diagnosis of Interstitial Lung Diseases: A Hospital Based Study

KEYWORDS

Chest radiography, High Resolution Computed Tomography, interstitial lung diseases, sensitivity, specificity.

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ABSTRACT

Background: Interstitial lung diseases can be diagnosed by using various methods. Early diagnosis of ILD can help the physician to improve the patient's condition and decrease the morbidity and mortality. Chest radiographs and HRCT can be used to detect these diseases. The present study was conducted to compare the accuracy of chest radiography and HRCT in the detection of various interstitial lung diseases.

Materials and Methods

This study was conducted in Department of Radiodiagnosis, Sree Mookambika Institute of Medical Sciences, Kulasekharam, Tamilnadu. A total of 40 patients were included in the study. This study was ethically approved by Institutional Human Ethics Committee. This study was conducted during the period of December 2015 to November 2016. Based on the study protocol; a total 40 patients were included in the study. All patients' demographic and clinical data were collected and recorded in the performa sheet. All the selected patients were subjected to PA chest radiograph and HRCT for the detection of lung disease.

Results

Out of 40 cases, 4 were normal and 36 patients showed evidence of interstitial lung disease. Females outnumbered males in this study. Most of the patients were aged between 50-60 years. 4 cases showed normal findings in HRCT and 36 cases showed abnormalities in HRCT. But chest radiographs showed 7 normal cases and 33 abnormal cases. Sensitivity and specificity were less with radiographs compared to HRCT in the detection of interstitial lung disease.

Conclusion

Chest radiographs and HRCT imaging were compared for detection of interstitial lung diseases. The study concluded that HRCT is more specific and sensitive than chest radiographs in the detection of interstitial lung diseases.

Introduction

HRCT has been the major diagnostic advance for the past two decades in diagnosis of interstitial lung disease [1]. 1980s and early 1990s saw extensive research in diagnostic HRCT imaging. However, it was the introduction of refinements of the narrow beam collimation and high spatial resolution reconstruction algorithm boosted up the potential of CT for diagnostic usage in ILD [2,3]. Correlative studies were started in the year 1990. They correlated HRCT images with histopathology findings and concluded that HRCT was the gold standard non invasive test for diagnosis of ILDs. With these studies, there was massive increase in use of HRCT in the detection of ILDs [4]. Radiographs tell us not more than a careful clinical examination in majority of the cases. But HRCT gives a better idea about the disease condition and progression of disease [5]. HRCT dominates in recent literature about the imaging of ILD. HRCT showed more sensitivity and specificity than chest radiographs in the diagnosis of ILDs [6]. With this background, the present study was planned and conducted to compare the specificity, sensitivity and positive predictive value of HRCT and chest radiographs in patients with ILDs.

Materials and Methods

This study was conducted in Department of Radiodiagnosis, Sree Mookambika Institute of Medical Sciences, Kulasekharam, Tamilnadu, during the period of December 2015 to November 2016. A total 40 patients were included in the study. The study protocol was approved by Institutional Research and Institutional Human Ethics Committee. The patients were selected by random sampling.

Inclusion criteria

- Chest pain
- Dyspnoea
- Cough
- Hemoptysis.
- Suggested for chest radiograph or HRCT

Exclusion criteria

- Recent surgeries of thorax and lungs
- Congenital abnormalities of ribs and lungs
- Pregnant women
- Carcinoma lung.

Those patients fulfilled the inclusion and exclusion criteria were included in the study. A total of 40 patients were included in the study. The study procedure, purpose and other details were explained to all the patients. Informed consent was taken from patients included in the study. The procedures of performing HRCT and chest radiograph were explained to each patient in detail. Patients were demonstrated the procedure of breath holding in deep inspiration while taking chest radiographs and during acquisition of HRCT scans. All patients were subjected to PA view chest radiograph and HRCT imaging. PA view chest radiographs were taken with Siemens 300 mA X-ray unit of Department of Radiodiagnosis. Patients were told to hold breath in deep inspiration during exposure. A FFD of 180 cm was used, with a voltage of 90 kVp and current of 5 mAs. HRCT imaging was done with the Siemens Somatom Scope16 machine of Department of Radiodiagnosis. Scans were obtained with patient at supine position, with maximum inspiration, using 2 mm collimation, voltage of 130 kV, tube current of 50mA, at 1cm interval. In few patients, additional images were taken at maximum expiration. The observations were

recorded and compared [7-9].

Statistical analysis

The data was expressed in number and percentage. Microsoft Excel (2007) was used to calculate the number, percentage, sensitivity, specificity and positive predictive value of chest radiographs and HRCT in diagnosis of interstitial lung diseases.

Results

Out of 40 cases included in the study, 3 cases showed no pathology, proved by lung biopsy. 37 cases showed evidence of interstitial lung disease. In chest radiography, 33 patients were found to have features of ILD, while 7 patients were found normal. Out of 3 normal cases, radiographs gave false features of ILD in 2 cases. Out of 37 abnormal cases, radiographs gave false diagnosis of normalcy in 6 cases. Chest radiographs were having sensitivity of 83.78%, specificity of 33.33% and positive predictive value of 93%. In HRCT imaging, 36 patients were found to have features of ILD, while 4 patients were found normal. Out of 3 normal cases, HRCT gave false features of ILD in 1 case. Out of 37 abnormal cases, HRCT gave false diagnosis of normalcy in 2 cases. HRCT imaging was having sensitivity of 94.59%, specificity of 66.66% and positive predictive value of 94%. Chest radiographs showed less sensitivity, specificity and positive predictive value compared to HRCT imaging. These results were significant.

Discussion

Chest radiography and HRCT are the investigations used in suspected cases of interstitial lung diseases [10,11]. In present study, HRCT could able to detect higher number of patients with ILD compared to chest radiography. Out of 37 cases of ILD in our study, chest radiographs could able to detect abnormality in 31 cases, where as HRCT found abnormality in 35 cases. Chest radiographs were appearing completely normal in few patients suffering from ILD. In our study, 6 of the diseased 37 patients had no abnormalities in their chest radiographs. However, HRCT was able to show changes in these patients. Therein lies the inherent lack of sensitivity of chest radiography in the diagnosis of the ILD. We compared the diagnostic accuracy of HRCT scans and chest radiography in diagnosing interstitial lung disease. We found a sensitivity of 94.59% and specificity of 66.66% for HRCT in diagnosing the interstitial lung diseases. We found a sensitivity of 83.78% and specificity of 33.33% for chest radiographs in diagnosing the interstitial lung diseases. Hence, HRCT is more sensitive and specific than chest radiographs in diagnosing interstitial lung diseases. The most common abnormality seen on chest radiographs was reticular opacities. However, HRCT managed to detect reticular opacities in 94% of the cases, thereby implying a much greater sensitivity in the identification of these densities. Furthermore, in the detection of these reticular opacities, although conventional chest radiography was able to differentiate between medium and coarse opacities, their detection of fine reticular opacities was a cause of concern. HRCT detected fine reticular opacities in the lungs when the chest radiograph revealed no such abnormalities.

Our results regarding sensitivity and specificity of HRCT and chest radiographs in diagnosing ILD were compared with similar study conducted by Padley et.al in 1991, who found a sensitivity of 94% and specificity of 96% for HRCT in diagnosing ILDs. They found a sensitivity of 80% and specificity of 82% for chest radiographs in diagnosing ILDs. Thus our findings regarding sensitivity of HRCT and chest radiographs in diagnosing ILD correlates well with the findings of Padley et al. The disparity in the results regarding specificity of HRCT and chest radiographs in diagnosing ILDs, between two studies, can be attributed to far lesser sample size in our study [12]. The present study has showed HRCT is the better in the detection of ILDs compared to chest radiography.

Conclusion

HRCT is the important and major tool for the detection of ILDs. It

showed high sensitivity, specificity and positive predictive value compared to chest radiographs. HRCT give better idea about the disease condition which helps the physician to treat the patient in better way to reduce the morbidity and mortality.

Table-1: Distribution of patients based on chest radiography diagnosis

Diagnosis	Normal		ILDs		Total	
	Number	Percent age (%)	Number	Percent age (%)	Number	Percent age (%)
Normal	1 (TN)	33.33	6 (FN)	16.22	7	17.50
Abnormal	2 (FP)	66.67	31 (TP)	83.78	33	82.50
Total	3	100.00	37	100.00	40	100.00

(TN: True negative, FN: False negative, FP: False positive, TP: True positive)

Table-2: Distribution of patients based on HRCT diagnosis

Diagnosis	Normal		ILDs		Total	
	Number	Percent age (%)	Number	Percent age (%)	Number	Percent age (%)
Normal	2 (TN)	66.67	2 (FN)	5.41	4	10.00
Abnormal	1 (FP)	33.33	35 (TP)	94.59	36	90.00
Total	3	100.00	37	100.00	40	100.00

Table-3: Comparison of chest radiography and HRCT diagnosis

Diagnosis	Normal		ILDs		Total	
	Chest radiography	HRCT	Chest radiography	HRCT	Chest radiography	HRCT
Normal	1	2	6	2	7	4
Abnormal	2	1	31	35	33	36
Total	3	3	37	37	40	40

Table-4: Comparison of sensitivity, specificity and positive predictive value between the chest radiography and HRCT

Observation (%)	Chest radiography	HRCT
Sensitivity	83.78	94.59
Specificity	33.33	66.66
Positive predictive value	93.33	93.33

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