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Original Research Paper

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HRCT THORAX EVALUATION IN PATIENTS WITH CONNECTIVE TISSUE DISORDER AND ITS RELATION WITH THEIR CLINICAL PRESENTATION IN TERTIARY CARE HOSPITAL IN CENTRAL INDIA: A CROSS SECTIONAL STUDY

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ABSTRACT

Background: Connective tissue disorders (CTDs) are systemic autoimmune diseases that frequently involve the lungs, with interstitial lung disease (ILD) being the most significant pulmonary manifestation. High-resolution computed tomography (HRCT) has emerged as the gold standard in evaluating CTD-related lung disease. This study aimed to assess HRCT findings in CTD patients and correlate them with clinical presentation. **Methods:** This hospital-based cross-sectional study was conducted at a tertiary care centre in Central India over 12 months. A total of 92 patients with CTDs (RA, SLE, SSc, PM/DM, Sjögren's syndrome, and MCTD) underwent HRCT thorax and clinical evaluation. Demographics, symptoms, pulmonary function tests, and HRCT findings were analyzed. Statistical correlations between radiological patterns and clinical features were performed. **Results:** The mean age of the cohort was 48.7 ± 13.2 years, with a female predominance (62%). Dyspnea (75%) and cough (61%) were the most common symptoms. The most frequent HRCT pattern was nonspecific interstitial pneumonia (NSIP, 35.9%), followed by usual interstitial pneumonia (UIP, 23.9%). HRCT abnormalities correlated strongly with reduced diffusion capacity (DLCO) and severity of dyspnea. Subclinical ILD was identified in 12 asymptomatic patients. Pleural effusions and esophageal dilatation were notable ancillary findings in SLE and SSc, respectively. **Conclusion:** HRCT provides critical insights into the extent and type of pulmonary involvement in CTDs, frequently identifying subclinical ILD. Correlation of HRCT with clinical and functional parameters underscores its role in diagnosis, prognostication, and management planning in CTD patients.

KEYWORDS : Connective tissue disorders, HRCT, Interstitial lung disease, Usual interstitial pneumonia, Nonspecific interstitial pneumonia, Clinical correlation

INTRODUCTION

Connective tissue disorders (CTDs) encompass a diverse group of autoimmune diseases characterized by multisystem involvement, with pulmonary complications being among the most common causes of morbidity and mortality. Pulmonary involvement includes interstitial lung disease (ILD), pulmonary hypertension, airway disease, and pleural involvement. Among these, ILD is the most frequent and clinically significant manifestation.

Although chest radiography and pulmonary function tests (PFTs) provide useful information, high-resolution computed tomography (HRCT) has become the gold standard for detecting early and subtle lung changes. HRCT not only delineates parenchymal abnormalities but also provides prognostic information by differentiating between reversible inflammation and irreversible fibrosis.

Previous studies have demonstrated that CTD-associated ILD varies depending on the underlying autoimmune disease. For example, systemic sclerosis commonly demonstrates nonspecific interstitial pneumonia (NSIP), rheumatoid arthritis is more likely to show usual interstitial pneumonia (UIP), while Sjögren's syndrome is associated with lymphocytic interstitial pneumonia (LIP). The relationship between radiological findings, clinical symptoms, and lung function, however, often shows discordance, with many patients having significant HRCT changes despite minimal or absent symptoms.

In the Indian context, limited data exists on HRCT patterns in CTDs, and regional variations may exist due to genetic and environmental factors. This study was conducted to evaluate HRCT thorax findings in CTD patients at a tertiary care centre in Central India and to analyze their correlation with clinical presentation.

MATERIALS AND METHODS

This was a cross-sectional observational study conducted in the Department of Radiodiagnosis at a tertiary care hospital in Central India between August 2023 and July 2024. Ninety-two patients diagnosed with CTDs as per ACR/EULAR criteria were included. The study population comprised cases of rheumatoid arthritis (RA), systemic lupus erythematosus (SLE), systemic sclerosis (SSc), polymyositis/dermatomyositis (PM/DM), Sjögren's syndrome, and mixed connective tissue disease (MCTD).

Inclusion criteria were patients above 18 years of age with confirmed CTDs who underwent HRCT thorax as part of evaluation. Patients with pre-existing chronic lung diseases unrelated to CTDs, active pulmonary infection, or pregnancy were excluded. Ethical approval was obtained, and informed consent was taken.

HRCT was performed on a 128-slice CT scanner with 1–1.5 mm slice thickness, high spatial frequency reconstruction, and multiplanar reformats. Lung and mediastinal windows were assessed. HRCT patterns including NSIP, UIP, organizing pneumonia (OP), LIP, and diffuse alveolar damage (DAD) were identified. The extent of disease was categorized as minimal (<10%), mild (10–25%), moderate (26–50%), or severe (>50%).

Clinical data included demographics, CTD subtype, duration, respiratory symptoms, and PFT parameters (FVC, DLCO). Statistical analysis was performed using SPSS v25. Categorical variables were compared using Chi-square tests, and correlations were assessed with Pearson/Spearman coefficients. A p-value <0.05 was considered significant.

RESULTS

The study included 92 patients with a mean age of 48.7 ± 13.2 years (range 19–74), of whom 62% were females. The most common CTD was rheumatoid arthritis (25%), followed by systemic lupus erythematosus (20%) and systemic sclerosis

(20%).

Dyspnea was the most common respiratory symptom (75%), followed by cough (61%). Mean FVC was 69.3 ± 14.1% predicted, while mean DLCO was 62.7 ± 16.4%. HRCT revealed abnormalities in 83 patients (90.2%).

The most common HRCT pattern was NSIP (35.9%), followed by UIP (23.9%), OP (15.2%), LIP (9.8%), and DAD (5.4%). Ground-glass opacities were noted in 64.1%, reticulations in 44.6%, traction bronchiectasis in 39.1%, and honeycombing in 29.3%. Ancillary findings included pleural effusions (19.6%) and esophageal dilatation (26.1%).

Subclinical ILD was detected in 12 patients who were asymptomatic but had HRCT changes. In contrast, 9 patients had normal HRCT findings, of whom 7 were asymptomatic and had preserved DLCO values.

DISCUSSION

This study highlights the crucial role of HRCT in evaluating pulmonary involvement in CTDs. The female predominance and mean age in the fifth decade are consistent with autoimmune disease epidemiology worldwide. Dyspnea and cough were the leading symptoms, yet HRCT identified ILD even in asymptomatic individuals, underlining the value of baseline imaging.

Our finding of NSIP as the predominant pattern aligns with prior studies, particularly in systemic sclerosis and SLE. UIP was more common in RA, reflecting its fibrotic and progressive nature. The correlation of UIP with reduced DLCO reinforces its prognostic significance. Detection of LIP in Sjögren's syndrome and DAD in PM/DM also matched global trends.

Indian studies on CTD-ILD are limited. Similar to Galhotra et al. and Malhotra et al., our results confirm the predominance of NSIP, while also adding data on subclinical ILD, esophageal dilatation, and pleural effusions. The clinical–radiological discordance observed underscores the importance of HRCT over symptoms or PFTs alone.

Strengths of this study include a relatively large sample size and comprehensive correlation with symptoms and PFTs. Limitations include its single-centre design, lack of histopathological confirmation, and cross-sectional nature without longitudinal follow-up. Future multicentric studies with serial HRCT and AI-based quantification tools are warranted to refine diagnostic and prognostic models.

Overall, our study emphasizes HRCT as an indispensable tool in diagnosing, staging, and monitoring ILD in CTDs. It enables early detection, guides therapy, and helps predict prognosis.

CONCLUSION

HRCT thorax is a sensitive modality for detecting pulmonary manifestations in CTDs, frequently identifying ILD even before symptoms develop. The predominance of NSIP and UIP patterns reflects the varied spectrum of CTD-ILD. HRCT correlates well with functional impairment, supports risk stratification, and provides vital prognostic information. Routine HRCT evaluation should be incorporated into the diagnostic and monitoring protocols for CTD patients in India.

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