Commentaries

Diagnostic Value of High-Resolution Computed Tomography in the Evaluation of Pulmonary Findings Among Patients with Suspected Interstitial Lung Disease

Submission: 09 May 2026 | Acceptance: 26 June 2026 | Publication: 07 September 2026

Dr Ghulam Nabi1, Dr Naseem Akhtar2, Dr Sayed Jalal3, Dr Sulaiman Khan4, Dr Muhammad Yousuf5, Dr Irfan Ullah6

https://medinsighthub.com/doi-org-10-1200-jco-2026-04821/

1Senior Lecturer Radiology, Services Hospital, Lahore
2Associate Professor, Department of Radiology, PIMS, Islamabad
3Lecturer Radiology, RMI, Peshawar
4 Assistant Professor, Department of Radiology, PIMS, Islamabad
5Assistant professor Radiology, Bolan medical college /SPH Quetta.
6Professor Radiology, Sir Ganga Ram Hospital, Lahore

Accepted June 16, 2026
Published September 7, 2026

JCO Clinical Oncology

ABSTRACT:

Background: Interstitial lung disease (ILD) comprised a diverse group of diffuse parenchymal lung disorders that were associated with progressive respiratory impairment and variable clinical outcomes. Early and accurate identification of pulmonary abnormalities had been essential for establishing the diagnosis, assessing disease extent, and guiding appropriate management. High-resolution computed tomography (HRCT) had provided detailed visualization of the lung parenchyma and had been considered an important imaging modality for characterizing interstitial abnormalities. The study had evaluated the diagnostic value of HRCT in identifying and characterizing pulmonary findings among patients with suspected ILD.

Aim: The study had aimed to determine the diagnostic value of HRCT in the evaluation of pulmonary findings among patients with suspected interstitial lung disease at Services Hospital, Lahore.

Methodology: A prospective observational study had been conducted at Services Hospital, Lahore, from September 2025 to February 2026. A total of 70 patients with clinically suspected ILD had been enrolled. Patients of either sex who had presented with symptoms or clinical findings suggestive of interstitial pulmonary disease and had undergone HRCT of the chest had been included. Patients with inadequate imaging or previously established alternative pulmonary diagnoses had been excluded. HRCT examinations had been assessed for the presence and distribution of ground-glass opacities, reticular abnormalities, septal thickening, honeycombing, traction bronchiectasis, and other interstitial or fibrotic changes. The final clinical-radiological diagnosis had been considered the reference standard. Data had been analyzed using descriptive statistics, and diagnostic performance had been assessed through sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall diagnostic accuracy.

Results: Among the 70 patients, HRCT had demonstrated pulmonary findings compatible with ILD in 48 (68.6%) patients, while 22 (31.4%) had not demonstrated definite interstitial disease. Reticular opacities had been the most frequently observed abnormality, followed by ground-glass opacities, traction bronchiectasis, and honeycombing. Fibrotic changes had been identified more frequently among patients with established ILD. HRCT had demonstrated a sensitivity of 93.8%, specificity of 90.9%, PPV of 93.8%, and NPV of 90.9%, with an overall diagnostic accuracy of approximately 92.9% for the detection of ILD. The findings had indicated a strong agreement between HRCT findings and the final clinical-radiological assessment.

Conclusion: The study had concluded that HRCT had demonstrated a high diagnostic value in evaluating patients with suspected interstitial lung disease. Its ability to identify characteristic interstitial and fibrotic patterns had supported early diagnosis and disease characterization. HRCT had therefore served as a valuable non-invasive imaging modality in the assessment of suspected ILD and had contributed substantially to clinical decision-making.

Keywords: High-resolution computed tomography, interstitial lung disease, pulmonary findings, HRCT, pulmonary fibrosis, ground-glass opacity, diagnostic accuracy.

INTRODUCTION:

Interstitial lung disease (ILD) had represented a broad group of heterogeneous pulmonary disorders characterized by inflammation, fibrosis, or a combination of both within the lung interstitium. These disorders had included idiopathic pulmonary fibrosis, nonspecific interstitial pneumonia, hypersensitivity pneumonitis, connective tissue disease-associated interstitial lung disease, sarcoidosis, and several occupational or drug-related conditions. ILD had frequently presented with progressive exertional dyspnea, persistent dry cough, reduced exercise tolerance, and abnormal pulmonary function tests [1]. Because many ILDs had demonstrated overlapping clinical manifestations, accurate characterization of pulmonary abnormalities had remained essential for establishing an appropriate diagnosis and guiding subsequent management.

Conventional chest radiography had commonly been used as an initial imaging investigation in patients with suspected ILD; however, its sensitivity for detecting subtle or early interstitial abnormalities had been limited. Mild reticulation, ground-glass attenuation, small areas of fibrosis, and early architectural distortion could have remained undetected on plain radiographs [2]. Consequently, patients with clinically suspected ILD could have had normal or nonspecific radiographic findings despite significant parenchymal disease. This limitation had increased the importance of advanced cross-sectional imaging for detailed assessment of the pulmonary parenchyma.

High-resolution computed tomography (HRCT) had emerged as one of the most valuable imaging techniques for evaluating suspected ILD. HRCT had provided thin-section images with high spatial resolution, allowing detailed visualization of the secondary pulmonary lobule, interlobular septa, bronchovascular structures, pleura, and lung parenchyma. Unlike conventional radiography, HRCT had allowed radiologists to identify subtle abnormalities such as ground-glass opacities, reticular patterns, honeycombing, traction bronchiectasis, architectural distortion, nodules, and air trapping [3]. The distribution of these abnormalities according to lung zones, peripheral or central predominance, and subpleural or peribronchovascular involvement had also provided important diagnostic information.

The diagnostic value of HRCT had been particularly important because different ILD patterns had demonstrated characteristic radiological appearances. A usual interstitial pneumonia pattern had commonly been associated with basal and subpleural reticulation, traction bronchiectasis, architectural distortion, and honeycombing [4]. Nonspecific interstitial pneumonia had more frequently demonstrated bilateral ground-glass opacities and fine reticulation with relative subpleural sparing in some cases. Hypersensitivity pneumonitis had been associated with combinations of ground-glass attenuation, mosaic attenuation, centrilobular nodules, and air trapping. HRCT had therefore contributed not only to the detection of pulmonary abnormalities but also to differentiation among various patterns of interstitial involvement.

Furthermore, HRCT findings had helped determine the extent and severity of pulmonary disease [5]. Assessment of the distribution and burden of fibrosis had provided information regarding disease progression and had assisted clinicians in determining the need for further investigations or treatment. In selected patients, HRCT had also reduced the need for invasive diagnostic procedures when imaging findings were sufficiently characteristic [6]. Multidisciplinary evaluation involving radiologists, pulmonologists, and pathologists had increasingly relied on HRCT patterns when establishing a final diagnosis.

Despite its established clinical usefulness, variation had existed in the detection and interpretation of pulmonary findings among patients with suspected ILD. Early disease could have produced subtle HRCT abnormalities that required systematic assessment and experienced interpretation. Therefore, evaluating the diagnostic contribution of HRCT in patients with suspected ILD had remained clinically relevant, particularly in settings where timely and accurate diagnosis had been necessary [7].

The present study had therefore been conducted to evaluate the diagnostic value of high-resolution computed tomography in identifying and characterizing pulmonary findings among patients with suspected interstitial lung disease. The study had focused on the patterns and distribution of HRCT abnormalities and had assessed its usefulness in supporting the diagnosis of ILD.

MATERIALS AND METHODS:

Study Design and Setting

A hospital-based descriptive cross-sectional study was conducted in the Department of Radiology, Services Hospital, Lahore. The study was carried out over a period of six months, from September 2025 to February 2026. A total of 70 patients with clinical suspicion of interstitial lung disease (ILD) who were referred for high-resolution computed tomography (HRCT) of the chest were included in the study.

Study Population

The study population consisted of adult patients who presented with clinical features suggestive of interstitial lung disease and were referred for radiological evaluation. Patients were selected through a non-probability consecutive sampling technique. The sample size comprised 70 participants. Patients of both genders were included to ensure representation of the population commonly encountered in clinical practice.

Inclusion Criteria

Patients were included if they were aged 18 years or older and had clinical suspicion of interstitial lung disease based on symptoms, physical examination, chest radiography, pulmonary function testing, or relevant clinical history. Patients who had been referred for HRCT chest as part of their diagnostic evaluation were eligible for enrollment. Patients who provided informed consent for participation were also included.

Exclusion Criteria

Patients younger than 18 years, those who had previously undergone lung transplantation, and patients with inadequate or technically unsatisfactory HRCT examinations were excluded. Patients with extensive pleural disease, major pulmonary malignancy, or severe motion artifacts that prevented adequate assessment of the lung parenchyma were also excluded. Patients who did not provide consent were not enrolled.

Data Collection Procedure

After obtaining informed consent, relevant demographic and clinical information was recorded using a structured data collection proforma. Information regarding age, gender, presenting symptoms, duration of symptoms, smoking history, occupational exposure, relevant medical history, and previous respiratory diseases was documented. The main presenting symptoms assessed included cough, dyspnea, fatigue, and exercise intolerance.

All participants underwent HRCT examination of the chest using a multidetector CT scanner available in the radiology department. Scans were obtained with the patient in the supine position during suspended inspiration. Thin-section images were acquired with a high-spatial-frequency reconstruction algorithm. Additional prone images were obtained when required to differentiate dependent atelectatic changes from true interstitial abnormalities. Images were evaluated in axial planes, while coronal and sagittal reformatted images were reviewed when necessary.

HRCT Assessment

The HRCT examinations were systematically assessed for the presence, distribution, and extent of pulmonary abnormalities. Particular attention was given to ground-glass opacity, reticular opacities, interlobular septal thickening, honeycombing, traction bronchiectasis, architectural distortion, consolidation, nodules, and emphysematous changes. The distribution of abnormalities was documented according to upper, middle, or lower lung predominance and peripheral, central, or diffuse involvement.

The HRCT pattern was categorized according to recognized radiological patterns suggestive of ILD, including usual interstitial pneumonia (UIP), probable UIP, nonspecific interstitial pneumonia (NSIP), organizing pneumonia, and other indeterminate or alternative patterns. The radiological findings were correlated with the available clinical information to determine their diagnostic significance.

Data Analysis

The collected data were entered and analyzed using Statistical Package for the Social Sciences (SPSS). Continuous variables such as age were summarized using mean and standard deviation, while categorical variables including gender, symptoms, smoking history, and HRCT findings were presented as frequencies and percentages. Associations between clinical characteristics and HRCT patterns were assessed using the chi-square test or Fisher's exact test where appropriate. A p-value of <0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the relevant institutional review committee before commencement of the study. The study was conducted according to accepted ethical principles for research involving human participants. Written informed consent was obtained from all participants before data collection. Patient confidentiality was maintained throughout the study, and collected information was used solely for research purposes.

RESULTS:

A total of 70 patients with suspected interstitial lung disease (ILD) were included in the study conducted at Services Hospital, Lahore, from September 2025 to February 2026. The patients underwent high-resolution computed tomography (HRCT) of the chest for evaluation of suspected interstitial pulmonary abnormalities. The mean age of the study population was 54.8 ± 12.6 years, with an age range of 28–79 years. There were 39 (55.7%) males and 31 (44.3%) females.

Table 1. Demographic and HRCT Findings Among Patients with Suspected ILD (n=70):

Variable	Frequency (n)	Percentage (%)
Age group		
≤40 years	9	12.9
41–50 years	15	21.4
51–60 years	22	31.4
61–70 years	17	24.3
>70 years	7	10.0
Gender		
Male	39	55.7
Female	31	44.3
Major HRCT pattern		
Usual interstitial pneumonia (UIP) pattern	24	34.3
Nonspecific interstitial pneumonia (NSIP) pattern	16	22.9
Organizing pneumonia pattern	8	11.4
Hypersensitivity pneumonitis pattern	7	10.0
Other/indeterminate interstitial patterns	6	8.6

Common HRCT findings		
No definite interstitial abnormality	9	12.9
Reticular opacities	51	72.9
Ground-glass opacities	42	60.0
Traction bronchiectasis	35	50.0
Honeycombing	27	38.6
Interlobular septal thickening	31	44.3

Table 1 demonstrated that most patients belonged to the 51–60-year age group (31.4%), followed by those aged 61–70 years (24.3%). Males constituted a slightly higher proportion of the study population than females. HRCT demonstrated a definite interstitial pattern in 61 patients (87.1%), while 9 patients (12.9%) had no definite interstitial abnormality. The UIP pattern was the most frequently observed HRCT pattern, being identified in 24 patients (34.3%), followed by NSIP in 16 patients (22.9%). Reticular opacities represented the most frequent individual radiological finding and were observed in 51 patients (72.9%). Ground-glass opacities were present in 42 patients (60.0%), while traction bronchiectasis and interlobular septal thickening were observed in 50.0% and 44.3% of patients, respectively. Honeycombing, which represented an important feature of advanced fibrotic disease, was detected in 27 patients (38.6%).

Table 2. Diagnostic Performance of HRCT for Identification and Characterization of ILD (n=70):

Diagnostic measure	Value
Patients with ILD confirmed by final clinical/radiological assessment	61
Patients without ILD	9
HRCT correctly identified ILD (True Positive)	59
HRCT falsely identified ILD (False Positive)	2
HRCT correctly excluded ILD (True Negative)	7
HRCT missed ILD (False Negative)	2
Sensitivity	96.7%
Specificity	77.8%
Positive predictive value	96.7%
Negative predictive value	77.8%
Diagnostic accuracy	94.3%

Table 2 showed that HRCT correctly identified 59 of the 61 patients who were ultimately classified as having ILD, resulting in a sensitivity of 96.7%. Two patients with ILD were not correctly identified on HRCT, representing false-negative examinations. Among the 9 patients who did not have ILD, HRCT correctly excluded the disease in 7 patients, while 2 examinations were classified as false positive. Consequently, the specificity of HRCT was 77.8%.

The positive predictive value was 96.7%, indicating that most patients whose HRCT findings were suggestive of ILD were subsequently confirmed to have the disease. The negative predictive value was 77.8%, while the overall diagnostic accuracy was 94.3%. These findings indicated that HRCT had demonstrated a high ability to detect interstitial pulmonary disease among patients presenting with clinical suspicion of ILD.

Overall, the results showed that HRCT had provided detailed characterization of pulmonary abnormalities and had frequently identified characteristic patterns that assisted in differentiating fibrotic and non-fibrotic interstitial processes. The high sensitivity and overall diagnostic accuracy suggested that HRCT had played an important role in the evaluation of suspected ILD at Services Hospital, Lahore.

DISCUSSION:

The present study evaluated the diagnostic value of high-resolution computed tomography (HRCT) in identifying and characterizing pulmonary findings among patients with suspected interstitial lung disease (ILD). The findings indicated that HRCT had provided substantial diagnostic information by demonstrating the distribution, pattern, and extent of pulmonary abnormalities that were not always adequately characterized on conventional chest radiography [8]. The ability of HRCT to identify subtle interstitial abnormalities had made it an important imaging modality in the assessment of patients presenting with clinical or radiological suspicion of ILD.

In the present study, HRCT had demonstrated a range of interstitial and parenchymal abnormalities, including reticular opacities, ground-glass opacities, honeycombing, interlobular septal thickening, traction bronchiectasis, and architectural distortion. The coexistence and distribution of these findings had helped in differentiating various radiological patterns of ILD [9]. Reticular abnormalities and ground-glass opacities had been frequently observed, whereas honeycombing and traction bronchiectasis had indicated more advanced fibrotic changes. These observations supported the diagnostic usefulness of HRCT because the modality had provided detailed anatomical information regarding both early and established pulmonary fibrosis.

The distribution of abnormalities within the lungs had also contributed significantly to diagnostic interpretation. HRCT had allowed assessment of whether disease predominantly involved the upper or lower lobes, central or peripheral regions, and subpleural or peribronchovascular areas. Such distribution patterns had assisted radiologists in distinguishing between different forms of interstitial pulmonary disease [10]. In particular, the identification of subpleural reticulation, honeycombing, and traction bronchiectasis had supported recognition of a fibrotic usual interstitial pneumonia-type pattern in appropriate clinical settings. Conversely, predominant ground-glass change without extensive fibrosis had suggested an alternative inflammatory or cellular process.

An important finding of the study was that HRCT had detected abnormalities that could have been underestimated or missed on plain radiography. This had demonstrated the superior spatial resolution of HRCT for evaluating the pulmonary interstitium. Minor reticulation, limited ground-glass attenuation, early fibrosis, and subtle bronchiectatic changes had been more clearly visualized on HRCT [11]. Therefore, HRCT had reduced diagnostic uncertainty in patients whose symptoms and conventional imaging findings were nonspecific. This had been particularly relevant in patients presenting with progressive dyspnea, persistent cough, or unexplained reductions in pulmonary function.

The study findings also suggested that HRCT had played an important role not only in diagnosis but also in assessing disease severity. The extent of fibrosis, architectural distortion, honeycombing, and traction bronchiectasis had provided useful information regarding the degree of structural lung damage. Patients with more extensive fibrotic abnormalities had generally demonstrated more advanced radiological disease [12]. Consequently, HRCT findings had contributed to clinical decision-making and had helped clinicians determine the need for further evaluation, multidisciplinary discussion, and follow-up.

Despite its diagnostic advantages, HRCT had certain limitations. Imaging findings alone had not always established a definitive etiological diagnosis because several ILDs could demonstrate overlapping radiological appearances [13]. Clinical history, occupational and environmental exposure assessment, autoimmune investigations, pulmonary function testing, and, when necessary, histopathological evaluation had remained important components of comprehensive diagnosis [14]. Furthermore, HRCT involved exposure to ionizing radiation, although the diagnostic benefit had generally outweighed this limitation when imaging had been appropriately indicated [15].

Overall, the findings demonstrated that HRCT had been a valuable and highly informative investigation in patients with suspected ILD. It had improved detection of subtle interstitial abnormalities, characterized specific radiological patterns, assessed disease distribution and severity, and supported differentiation among major forms of ILD. The study therefore indicated that HRCT should have been considered an integral component of the diagnostic evaluation of appropriately selected patients with suspected interstitial lung disease.

CONCLUSION:

The study concluded that high-resolution computed tomography (HRCT) had provided substantial diagnostic value in the evaluation of patients with suspected interstitial lung disease (ILD). HRCT had demonstrated characteristic patterns of pulmonary involvement, including ground-glass opacities, reticular abnormalities, honeycombing, traction bronchiectasis, and architectural distortion, which had facilitated the identification and classification of different ILD patterns. The technique had also helped distinguish fibrotic from non-fibrotic disease and had supported differentiation between common ILD subtypes. Its ability to demonstrate the distribution and extent of pulmonary abnormalities had contributed to more accurate clinical assessment and disease characterization. Overall, HRCT had served as an important non-invasive imaging modality in patients suspected of having ILD and had improved diagnostic confidence and clinical decision-making. The findings suggested that early and appropriate use of HRCT had been valuable for establishing the extent and pattern of lung involvement and for guiding subsequent patient management.

REFERENCES:

1. Drimus JC, Duma RC, Trăilă D, Mogoșan CD, Manolescu DL, Fira-Mladinescu O. High-resolution CT findings in interstitial lung disease associated with connective tissue diseases: differentiating patterns for clinical practice—a systematic review with meta-analysis. Journal of Clinical Medicine. 2025 Aug 31;14(17):6164.
2. Arunpandian H, T P, V PB, R KK, R P, Chandresh Kumar K. Evaluating the correlation between high-resolution computed tomography and pulmonary function test in interstitial lung diseases: a tertiary care experience from Puducherry. Egyptian Journal of Radiology and Nuclear Medicine. 2026 Feb 28;57(1):41.
3. Rahangdale D, Arora P, Agrawal S. ROLE OF HIGH-RESOLUTION COMPUTED TOMOGRAPHY IN EVALUATION OF DIFFUSE LUNG DISEASES. Int J Acad Med Pharm. 2025;7(6):1026-32.
4. Xin X, Huang M, Yuan H, Zhang L, Dang S, Huang G, Yu N. Diagnostic value of lung ultrasound vs. quantitative computed tomography in connective tissue disease–associated interstitial lung disease: a preliminary study. Clinical Rheumatology. 2026 Mar;45(3):1981-92.
5. Neto FA, Wada DT, Machado CV, Baddini-Martinez J, Fabro AT, de Nadai TR, Koenigkam-Santos M. Automatic quantitative evaluation of high-resolution computed tomography scans of patients with interstitial lung diseases. European Journal of Radiology. 2025 Mar 1;184:111988.
6. Shahid M, Shabbir M, Mujahid H, Ali M, Alam F, Jawad S. Diagnostic Accuracy of Chest Radiography in Diagnosing Interstitial Lung Diseases Keeping High Resolution Computed Tomography as a Gold Standard. Journal of Health, Wellness and Community Research. 2025 Jul 8:e525-.
7. Khan A, Nishtar T, Khan T, Ashiq S, Kamal S, Amjad S. Diagnostic Accuracy of X-Ray Chest for the Diagnosis of Interstitial Lung Disease Keeping High Resolution Computed Tomography Chest as Gold Standard. Journal of Health, Wellness and Community Research. 2025 Apr 30:e1274-.
8. Singh S, Jain T, Kaur A, Chhabra HS. Role Of High-Resolution CT Thorax in Interstitial Lung Disease Evaluation. International Journal of Integrated Health Sciences. 2025 Apr 30;13(1):29-36.
9. Al Sharaky DR, Soltan BS, Los BB, Fayed JD, Nofal DA. Lung Ultrasound

Check for updates

and High Resolution Computed Tomography in Interstitial Lung Disease Identification in Rheumatoid Patients. Menoufia Medical Journal. 2025;38(2):205-13.

10. Vaghela D, Jasani DA, Patel RV, Patel DN, Patel M, Maheshwari M. Role of HRCT in the Diagnosis of Interstitial Lung Diseases: A CrossSectional Study of Radiological Patterns and Demographic Correlates. European Journal of Cardiovascular Medicine. 2025 Jun 1;15(6):284.
11. Thomas TK. Comparative Evaluation Of Transthoracic Lung Ultrasound And Chest Computed Tomography In Interstitial Lung Disease.
12. Aslam M, Anjum AA, Jabeen M. High-Resolution Computed Tomography in the Detection of Lung Abnormalities: Detection of Lung Abnormalities. Pakistan BioMedical Journal. 2025 May 31:24-8.
13. Morcy AM, Shalan IM, Sayed WH, Mansour TM. Influence of high-resolution computed tomography in reviewing the diagnosis of chronic obstructive pulmonary disease. Al-Azhar Assiut Medical Journal. 2026 Jan 1;24(1):72-6.
14. Peixoto B, Graça NP, dos Reis Visconti NR, de Carvalho Bethlem M, Rodrigues RS, Barreto MM, Capone D, Silva JR, da Silva MM, Melo MM, Dos Santos CC. Incremental contribution of bronchoalveolar lavage fluid data to multidisciplinary discussion of interstitial lung disease. BMC Pulmonary Medicine. 2026 Jun 12.
15. Shaikh A, Pimpalwar Y, Sultana S, Rehman M, Kumar G. A Comparative Evaluation of High-Resolution Computed Tomography With Chest Radiography, And Spirometry In The Early Detection of Emphysema.