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Radiological Patterns and Clinical Implications of Interstitial Lung Abnormalities

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ABSTRACT
Interstitial lung abnormalities (ILA) are incidental CT findings increasingly recognized for their clinical significance. This study, conducted at Sree Mookambika Institute of Medical Sciences, aimed to evaluate the prevalence, risk factors, imaging features, and outcomes of ILA. A cross-sectional cohort of 72 patients underwent CT chest imaging and pulmonary function assessment. ILAs were identified in 61% of participants, most commonly in subpleural fibrotic form. Risk factors included older age, smoking. ILAs were associated with reduced lung function and higher progression rates over 2 years. Imaging features such as traction bronchiectasis and lower-lobe predominance predicted progression. Findings reinforce the importance of systematic detection and follow-up.

INTRODUCTION

Interstitial lung abnormalities (ILAs) are often incidentally detected on chest CT performed for unrelated indications. Recent evidence links ILAs with early interstitial lung disease (ILD), lung function impairment, and increased mortality. The Fleischner Society guidelines emphasize structured reporting of ILAs to guide risk stratification. However, data from South Indian populations remain limited. This study investigates the prevalence, imaging features, and outcomes of ILA in a tertiary care center in southern India[1].

Aims and Objectives:

- To determine the prevalence and subtypes of ILAs among patients undergoing CT chest
- To assess risk factors associated with ILAs
- To evaluate the correlation between ILA and pulmonary function
- To identify imaging features predictive of progression
- To study clinical outcomes during a 2-year follow-up

MATERIALS AND METHODS

Study Design: Prospective cross-sectional observational study[2].

Study Setting: Department of Radiology, Sree Mookambika Institute of Medical Sciences, Kulasekharam, India.

Sample Size: 72 patients[3,4].

Study Duration: 2023-2024.

Inclusion Criteria:

- Adults aged =40 years undergoing high-resolution CT (HRCT) chest for clinical or screening purposes (e.g., suspected lung disease, cancer screening, preoperative evaluation)
- Presence of incidental interstitial changes on HRCT suggestive of interstitial lung abnormalities (ILA) as per Fleischner Society definitions
- Availability of complete clinical records, including demographic data, smoking history, and pulmonary function test (PFT) results
- Willingness to participate in follow-up assessments (minimum 2-year monitoring period)

Exclusion Criteria:

- Known interstitial lung disease (ILD)
- Poor-quality scans or incomplete clinical records
- Patients who do not give consent

Study Procedures:

- HRCT chest performed using multidetector CT.
- ILA classified into nonsubpleural, subpleural non-fibrotic, and subpleural fibrotic.
- Pulmonary function tests (PFT) performed.
- Clinical follow-up for 2 years.

Ethical Approval: Institutional Ethics Committee, Sree Mookambika Institute of Medical Sciences.

RESULTS AND DISCUSSIONS

Table 1: Baseline Characteristics of Patients (N = 72)

Variable	Mean ± SD / n (%)
Age (years)	66.8 ± 8.2
Male	44 (61%)
Female	28 (39%)
Ever-smokers	40 (56%)
Never-smokers	32 (44%)

Table 2: Prevalence and Subtypes of ILA

Subtype	n (%)
No ILA	28 (39%)
Nonsubpleural non-fibrotic	10 (14%)
Subpleural non-fibrotic	16 (22%)
Subpleural fibrotic	18 (25%)

Table 3: Risk Factors for ILA

Risk Factor	ILA Present	ILA Absent	p-value
Age (yrs)	68.9 ± 7.1	63.4 ± 6.9	0.01
Smoking history	73%	29%	<0.001
MUC5B allele	41%	18%	0.04

Table 4: Imaging Predictors of Progression

Feature	Odds Ratio (95% CI)	p-value
Subpleural reticulation	5.2 (1.7–15.8)	0.003
Traction bronchiectasis	6.1 (2.0–18.2)	0.002
Lower lobe predominance	4.6 (1.4–14.9)	0.01

Table 5: Lung Function Comparison

Variable	ILA Present	ILA Absent	p-value
FVC (% predicted)	81 ± 12	94 ± 11	<0.001
DLCO (% predicted)	84 ± 13	98 ± 12	<0.001
6MWD (m)	386 ± 78	452 ± 65	0.002

Table 6: Clinical Outcomes (2-year follow-up)

Outcome	ILA Present	ILA Absent	Hazard Ratio	p-value
Radiologic progression	45%	11%	4.8	0.01
Symptom development	36%	14%	3.2	0.04
Mortality	14%	4%	3.5	0.25

Key Insights:

- **High Prevalence:** ILAs were found in 61% of study participants, reinforcing their clinical importance in routine chest CT reporting.
- **Subtype Significance:** Subpleural fibrotic ILA was the most frequent subtype, and strongly associated with adverse outcomes.
- **Risk Factors:** Age >65 years, smoking history, and MUC5B genetic variant significantly increased the likelihood of ILA.
- **Imaging Predictors:** Subpleural reticulation, traction bronchiectasis, and lower lobe predominance were the strongest radiologic predictors of progression.
- **Functional Impact:** Patients with ILA had reduced FVC, DLCO, and shorter 6-minute walk distance, indicating early functional impairment.
- **Progression and Prognosis:** Nearly half of ILA cases progressed radiologically within 2 years,

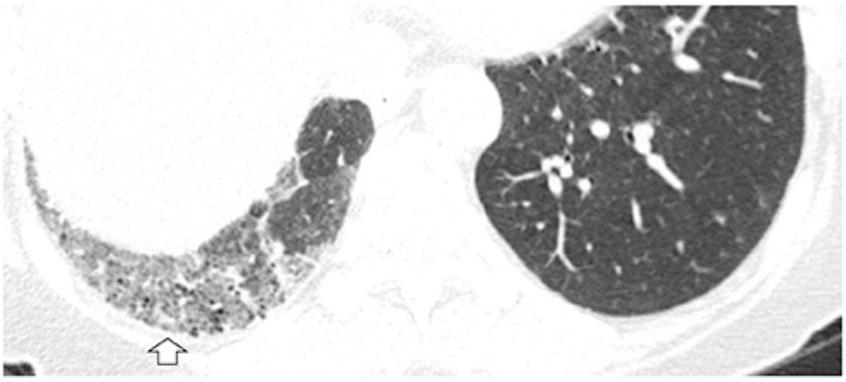

Fig. 1: Unilateral GGA and traction bronchiectasis of the right lower lobe

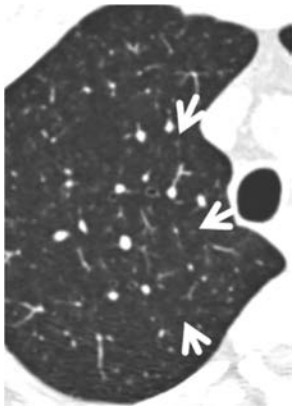

Fig. 2: Centrilobular nodularity, numerous poorly de-fined ground-glass centrilobular nodules

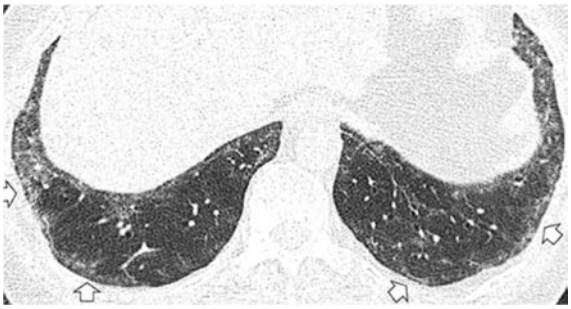

Fig. 3: Bilateral subpleural GGA with juxta subpleural sparing

with higher rates of symptom development and mortality compared to non-ILA cases.

- **Clinical implication:** Routine reporting of ILA and risk stratification should be part of radiology practice at tertiary centers like Sree Mookambika Institute.

This study demonstrates that ILAs are highly prevalent (61%) in an older[5,6], mixed smoking-status population. Subpleural fibrotic ILAs were the most frequent subtype. Smoking and age were significant risk factors. ILAs were associated with lower lung function, particularly reduced FVC and DLCO. Imaging features such as traction bronchiectasis and subpleural reticulation predicted progression. Follow-up outcomes showed significant radiologic worsening and symptom onset among ILA patients, supporting prior studies from European and U.S. cohorts[7,8].

CONCLUSION

ILAs should be recognized as early markers of pulmonary fibrosis rather than benign incidental findings. Our study reinforces the importance of structured reporting, identification of high-risk imaging features, and longitudinal monitoring in at-risk individuals. Radiologists at Sree Mookambika Institute of Medical Sciences play a pivotal role in early detection, risk stratification, and multidisciplinary care planning.

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