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Lung Texture Analysis Predicts Clinical Progression In A Cohort Of Patients With Dermatomyositis And Scleroderma-related Interstitial Lung Disease

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Abstract:
Background: Development of interstitial lung disease (ILD) in patients with dermatomyositis and scleroderma is both common and associated with significant morbidity and mortality. High-resolution computed tomography (HRCT) is routinely used for diagnosis and management of ILD but is limited by interrater variability in identification of abnormalities. We sought to evaluate whether Lung Texture Analysis (LTA), an automated quantifiable measurement of lung fibrosis on HRCT scans, obtained from baseline CT scans can predict progression in patients with dermatomyositis- or scleroderma-related ILD.
Methods: We identified a cohort of patients with dermatomyositis-ILD and/or scleroderma-ILD (n=121) at Stanford University Hospital who received care between January 1, 2005, and November 10, 2021. Clinical demographics, spirometry, HRCT scans, and vital status were extracted by querying the Electronic Health Record (EHR). All viable inspiratory HRCT scans were processed in IMBIO's Caliper (Minnesota, MN). We evaluated the prognostic utility of the LTA metric "total ILD percentage" from the baseline HRCT scan in predicting 12-month progression (defined as composite of 10% decline in forced vital capacity [FVC], lung transplantation, or death) using Cox proportional hazards regression. Models were adjusted for age, sex, and baseline FVC obtained within 3 months of HRCT scan.
Results: 13% (16/121) of patients experienced progression within 12 months. The LTA metric "ILD total percentage" significantly predicted progression at 12 months (HR: 1.70 [95% CI 1.20-2.42]; p=0.003). After adjusting for age, sex, and FVC, ILD total percentage remained an independent predictor of progression (HR: 1.55 [95% CI: 1.05-2.30]; p=0.027). ILD total percentage was poorly correlated with FVC (R^2=0.18), suggesting information not captured in routine spirometry. Patients in the top quartile of "ILD total percentage" were more likely to have disease progression in the next 12 months (**Figure**).
Conclusion: In this single center cohort, quantitative LTA of baseline HRCT scans predicted progression at 12 months among patients with dermatomyositis- and scleroderma-related ILD independently of other variables including FVC. Our findings add to a growing body of literature on the potential utility of quantitative lung imaging to augment the management of patients with ILD.

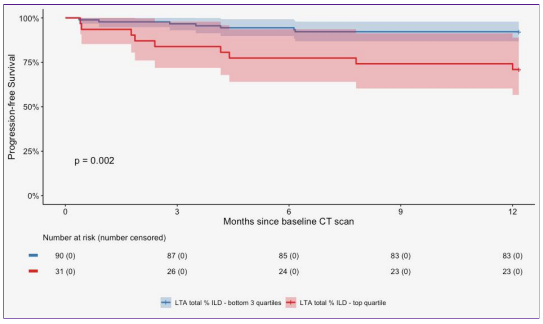

Figure. Kaplan-Meier survival curve depicting progression (10% decline in forced vital capacity, transplantation, or death) 12 months after the baseline CT scan when stratified by top quartile of total ILD percentage. Table shows number at risk and number censored.

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