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# Computed tomography-based radiomics decodes prognostic and molecular differences in interstitial lung disease related to systemic sclerosis

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Shareable abstract (@ERSpublications)
**CT-based radiomics decodes phenotypic, prognostic and molecular differences in SSc-ILD, and predicts progression-free survival with a significant impact on future clinical decision making in SSc-ILD** https://bit.ly/3zPaMOn

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## Abstract

***Background*** Radiomic features calculated from routine medical images show great potential for personalised medicine in cancer. Patients with systemic sclerosis (SSc), a rare, multiorgan autoimmune disorder, have a similarly poor prognosis due to interstitial lung disease (ILD). Here, our objectives were to explore computed tomography (CT)-based high-dimensional image analysis ("radiomics") for disease characterisation, risk stratification and relaying information on lung pathophysiology in SSc-ILD.

***Methods*** We investigated two independent, prospectively followed SSc-ILD cohorts (Zurich, derivation cohort, n=90; Oslo, validation cohort, n=66). For every subject, we defined 1355 robust radiomic features from standard-of-care CT images. We performed unsupervised clustering to identify and characterise imaging-based patient clusters. A clinically applicable prognostic quantitative radiomic risk score (qRISSc) for progression-free survival (PFS) was derived from radiomic profiles using supervised analysis. The biological basis of qRISSc was assessed in a cross-species approach by correlation with lung proteomic, histological and gene expression data derived from mice with bleomycin-induced lung fibrosis.

***Results*** Radiomic profiling identified two clinically and prognostically distinct SSc-ILD patient clusters. To evaluate the clinical applicability, we derived and externally validated a binary, quantitative radiomic risk score (qRISSc) composed of 26 features that accurately predicted PFS and significantly improved upon clinical risk stratification parameters in multivariable Cox regression analyses in the pooled cohorts. A high qRISSc score, which identifies patients at risk for progression, was reverse translatable from human to experimental ILD and correlated with fibrotic pathway activation.

***Conclusions*** Radiomics-based risk stratification using routine CT images provides complementary phenotypic, clinical and prognostic information significantly impacting clinical decision making in SSc-ILD.