Abstract accepted for presentation at ATS 2024

Association of quantitative lung fibrosis (QLF) score with the severity and progression of progressive pulmonary fibrosis (PPF)

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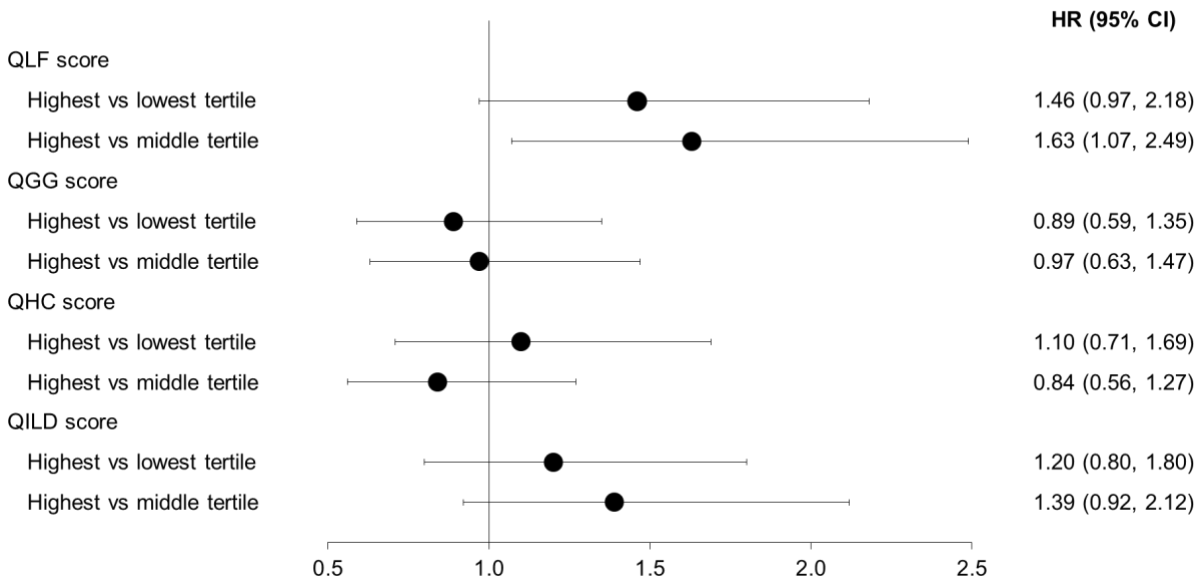
Rationale: The prognostic value of quantitative measures of lung fibrosis on HRCT in patients with PPF is not well established. We evaluated associations between HRCT-derived scores and disease severity and progression among patients with PPF in the ILD-PRO Registry.
Methods: Patients had an ILD other than IPF, reticular abnormality and traction bronchiectasis, and met criteria for ILD progression within the prior 24 months. HRCT images taken closest to enrollment were analyzed using a previously developed machine learning algorithm to derive the following scores expressed as percentages of total lung involvement: quantitative lung fibrosis (QLF); quantitative ground glass (QGG); quantitative honeycomb (QHC); quantitative ILD (QILD: sum of QLF, QGG and QHC scores). Associations between tertiles of each score and lung function and oxygen use at enrollment were evaluated using linear and ordinal logistic regression, respectively. Cox proportional hazards models were fit to evaluate time from enrollment to disease progression (≥10% relative decline in FVC % predicted, death, or lung transplant) as a function of each score.
Results: Among 395 patients, mean (SD) time from HRCT image analyzed to enrollment was 6.4 (5.6) months. Thresholds for the highest tertiles of QLF, QGG, QHC, and QILD scores were 20.5%, 28.0%, 0.48%, and 51.4%, respectively. At enrollment, patients in the highest vs. lowest tertile of QLF, QGG, and QILD scores had significantly lower FVC % predicted (mean [95% CI]

differences −18.6 [−22.6, −14.6], −8.6 [−12.9, −4.3], and −16.8 [−20.8, −12.7], respectively), lower DLCO % predicted (mean differences −17.5 [−21.0, −14.0], −5.9 [−9.9, −2.0], and −14.7 [−18.3, −11.0], respectively), and increased odds of oxygen use (odds ratios 10.4 [6.0, 18.1], 2.4 [1.5, 3.9], and 8.6 [5.0, 14.8], respectively). There were no significant differences in these measures between the highest and lowest tertiles of QHC score. Over a median follow-up of 17.3 months, 133 patients (33.7%) experienced disease progression. Patients with QLF scores in the highest tertile had an increased risk of disease progression compared with patients in the middle or lowest tertile (HR [95% CI] 1.63 [1.07, 2.49] and 1.46 [0.97, 2.18], respectively) (Figure). There were no significant associations between QGG, QHC, or QILD scores and progression.

Conclusions: Among patients in the ILD-PRO Registry, quantification of fibrotic reticulation or ground glass on HRCT was associated with physiologic impairment and oxygen use. A higher QLF score was associated with an increased risk of short-term disease progression, supporting its use as a biomarker in patients with PPF.

Figure. Association of HRCT-derived scores, expressed as a percentage of total lung involvement, with disease progression (composite of ≥10% relative decline in FVC % predicted, death, or lung transplant). The quantitative lung fibrosis (QLF) score is based on fibrotic reticulation. The quantitative ILD (QILD) score is the sum of QLF, quantitative ground glass (QGG) and quantitative honeycomb (QHC) scores.



Disclosures: The IPF-PRO/ILD-PRO Registry is supported by Boehringer Ingelheim Pharmaceuticals, Inc (BIPI) and run in collaboration with the Duke Clinical Research Institute (DCRI) and enrolling centers. Writing assistance, which was contracted and funded by BIPI, was provided by Fleishman-Hillard, London, UK. Aparna C Swaminathan, Megan L Neely, Jamie L Todd, Scott M Palmer and Jeremy M Weber are faculty members of the Duke Clinical Research Institute (DCRI), which receives funding support from BIPI to coordinate the IPF-PRO/ILD-PRO Registry. Scott M Palmer also reports research funding to the Duke Clinical Research Institute from Bristol Myers Squibb and consulting fees from Bristol Myers Squibb. Timothy PM Whelan is a site investigator and member of the Steering Committee for the IPF-PRO/ILD-PRO Registry. Grace Hyun J Kim reports grants from Boehringer Ingelheim and Genentech; consulting fees from Voiant Clinical (formerly known as MedQIA); and is the developer of patent UC-2015-0324982-A1. Jonathan Goldin is the founder of Voiant Clinical (formerly known as MedQIA), which performed the quantitative imaging analyses for this

project. Peide Li, Thomas B Leonard and Craig S Conoscenti are employees of Boehringer Ingelheim.