Identification of Radiological Progressive Pulmonary Fibrosis in Clinically Stable Patients Using e-Lung Quantitative CT Algorithm: Results from the REVISE PPF Study.

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Objective

To evaluate whether e-Lung can identify radiologic evidence of PPF in patients deemed clinically stable.

Introduction

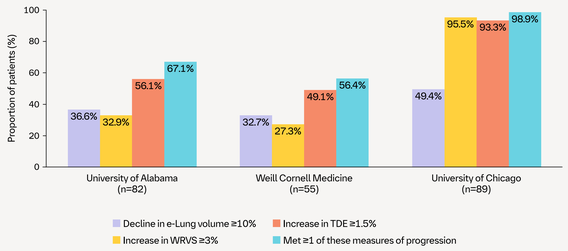
- Visual assessment of CT scans is subjective and subject to inter-observer variability.[1]
- e-Lung (Brainomix) is an artificial intelligence-powered quantitative CT tool that provides an objective assessment of imaging abnormalities.[2] Features analyzed by e-Lung include lung volume (based on whole lung), weighted reticulovascular score (WRVS) (percentage of lung periphery comprising reticulation and honeycomb walls) and total disease extent (TDE) (percentage of lung comprising ground-glass opacities, reticulovascular structures and honeycomb walls).[2]
  - e-Lung volume correlates strongly with FVC in patients with IPF.[3]
  - An increase in WRVS ≥3% has been associated with an increased risk of mortality in patients with IPF.[2]
  - An absolute difference of -1.5 in the change from baseline in TDE (%) at week 52 was observed between the nintedanib and placebo groups of the INBUILD trial in patients with PPF.[4]

Methods

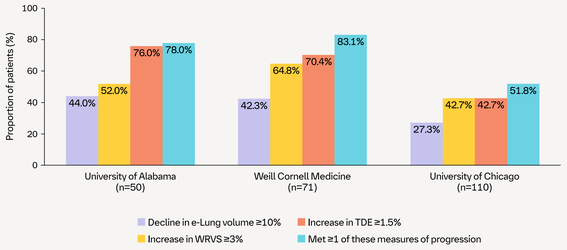
- The Retrospective EValuation In the US of e-Lung in PPF (REVISE PPF) study used data from three specialist ILD centers: the University of Alabama, Weill Cornell Medicine and the University of Chicago.
- We assessed the proportions of patients with ILD progression based on e-Lung parameters (decline in e-Lung volume ≥10%; increase in WRVS ≥3%; increase in TDE ≥1.5%) in:
  - patients with fibrotic ILDs (other than IPF) who were deemed to be clinically stable based on local assessment and had ≥2 CT scans <2 years apart
  - patients with PPF who had ≥2 CT scans <2 years apart prior to the identification of PPF. The definition of PPF was determined by local sites based on clinical standard of care and the ATS/ERS/JRS/ALAT guideline.[5]
- We evaluated associations between ILD progression based on the e-Lung parameters above and the risk of death from the first CT scan to the end of follow-up using Cox models. The University of Alabama and Weill Cornell Medicine cohorts were pooled for these analyses due to the small numbers of deaths.

Results

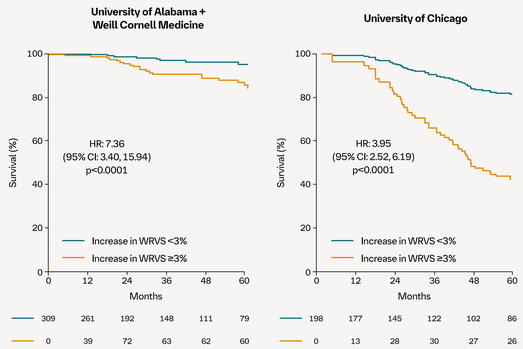
Proportion of patients with progression based on e-Lung parameters in patients deemed clinically stable



Proportion of patients with progression based on e-Lung parameters prior to identification of PPF

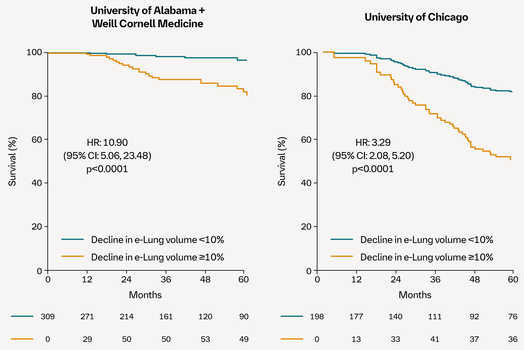


Survival over 5 years by increase in WRVS <3% vs ≥3%



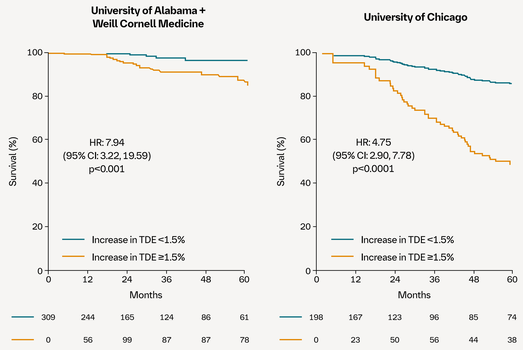
Analyzed in patients with PPF with ≥2 CT scans <2 years apart prior to identification of PPF and patients deemed clinically stable with ≥2 CT scans <2 years apart.

Survival over 5 years by decline in e-Lung volume <10% vs ≥10%



Analyzed in patients with PPF with ≥2 CT scans <2 years apart prior to identification of PPF and patients deemed clinically stable with ≥2 CT scans <2 years apart.

Survival over 5 years by increase in TDE <1.5% vs ≥1.5%



Analyzed in patients with PPF with ≥2 CT scans <2 years apart prior to identification of PPF and patients deemed clinically stable with ≥2 CT scans <2 years apart.

Conclusions

- In a real-world, multi-center setting, e-Lung parameters showed radiologic evidence of progression in 51-83% of patients prior to PPF being identified in clinical practice.
- Progression based on thresholds of e-Lung parameters was significantly associated with mortality in patients with fibrotic ILDs not deemed to have PPF.
- These data suggest that applying e-Lung to routinely acquired CT scans could identify PPF in patients thought to have stable ILD.

Abbreviations
CI, confidence interval. CT, computed tomography. FVC, forced vital capacity. HR, hazard ratio. ILD, interstitial lung disease. IPF, idiopathic pulmonary fibrosis. PPF, progressive pulmonary fibrosis. TDE, total disease extent. WRVS, weighted reticulovascular score.

References
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