
Proceedings Paper:
Weatherley, N. orcid.org/0000-0001-5589-2219, Chan, H.-F. orcid.org/0000-0002-5382-2097, Stewart, N. et al. (9 more authors) (2017) Late breaking abstract - Hyperpolarised gas MRI demonstrates sub-clinical progression in IPF over 6 months. In: European Respiratory Journal. ERS International Congress 2017, 09-13 Sep 2017, Milan, Italy. European Respiratory Society .

https://doi.org/10.1183/1393003.congress-2017.oa4642

ERS 2017 late-breaking abstract manuscript

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Proposed Authors:

Dr Nicholas Weatherley
Mr Ho-Fung Chan
Dr Neil Stewart
Dr Graham Norquay
Dr Madhwesha Rao
Dr Guilhem Collier
Mr Matthew Austin
Mr Laurie Smith
Dr Helen Marshall
Prof Stephen Renshaw
Dr Stephen Bianchi
Prof Jim Wild

Hyperpolarised gas MRI demonstrates sub-clinical progression in IPF over 6 months

Prognostication in idiopathic pulmonary fibrosis (IPF) is challenging and drug testing expensive due to insensitivity of existing biomarkers.

18 IPF subjects underwent hyperpolarised gas magnetic resonance imaging (MRI). 12 returned at six months. Diffusion-weighted MRI generated apparent diffusion coefficient of 3-Helium gas (3He-ADC), to quantify intra-acinar gas diffusivity. 129-Xenon spectroscopy generated red blood cells (RBC) and tissue plasma (T/P) signals. The ratio (RBC:TP), is taken as a metric of gas exchange. Same-day carbon monoxide gas diffusion (D_{LCO}) was measured.

Baseline mean 3He-ADC and RBC:TP correlate with D_{LCO} (r=-0.538 p=0.021; r=0.677 p=0.002, respectively). At six months, no individual exhibited a decline in D_{LCO} ≥15%, nor was the population change statistically significant, whereas RBC:TP declined significantly (Figure 1). Mean 3He-ADC did not change overall, but ADC maps qualitatively demonstrate increased gas diffusivity in several subjects (Figure 2).

MRI metrics of microstructural assessment and gas exchange are regionally quantifiable. These may provide early warning of functional deterioration before it is detectable by D_{LCO}.

Figure 1: D_{LCO} vs. Xe spectroscopy over 6-month follow up

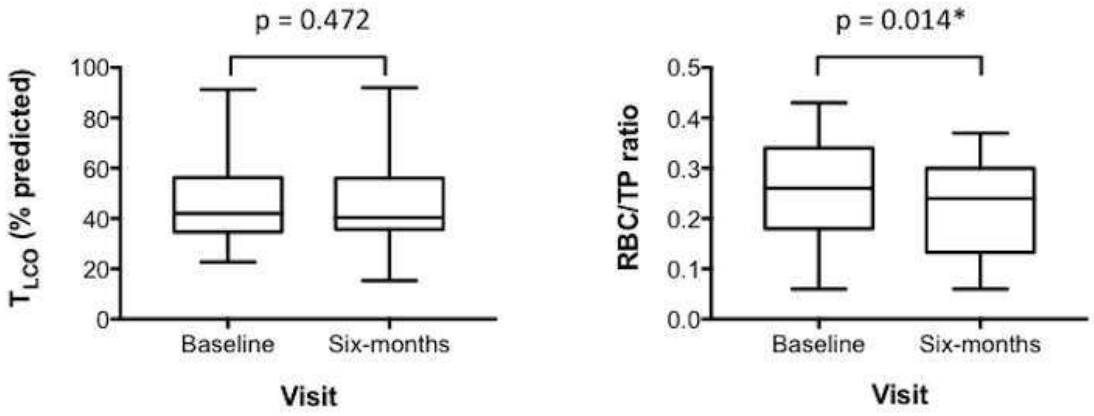

Figure 2: Example of regional changes in 3He-ADC at six months