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Winter BTS 2018 Abstract
350 words (350)
1 table or figure (black and white)

Probing Diffusion and Perfusion in IPF with Hyperpolarised Xenon and Dynamic Contrast Enhanced MRI

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Introduction

In spite of recent advances in our understanding of the pathophysiology and treatment of idiopathic pulmonary fibrosis (IPF), clinical assessment remains challenging due to a paucity of clinically sensitive biomarkers. We present a longitudinal pilot study to assess the potential role of magnetic resonance imaging (MRI) techniques in assessing gas diffusion and perfusion in IPF.

Methods

Nineteen patients with IPF, but without echocardiographic evidence of pulmonary hypertension were recruited from a tertiary centre (mean age 71.4 years). All underwent magnetic resonance spectroscopy with inhaled hyperpolarised xenon (^{129}Xe) MRI. During breath-hold maneuvers, a high-resolution MR spectroscopy sequence acquired MR spectra of ^{129}Xe dissolved in the pulmonary tissue and plasma (TP) and red blood cell (RBC) compartments. Integrals of RBC and TP spectral peaks were expressed as the ratio RBC:TP. Fifteen participants returned at six months, and twelve returned at 12-months. Five participants died before completing follow-up. In addition, twelve participants agreed to undergo Dynamic Contrast-Enhanced MRI (DCE-MRI) with gadolinium at baseline. Eight returned at 12-months. Parametric maps of bolus transit time across the lungs were produced and a mean transit time across all pixels is reported (MTT). Pulmonary function tests were performed at each visit, including forced vital capacity (FVC) and diffusing capacity of the lungs for carbon monoxide (D_{LCO}).

Results

^{129}Xe RBC:TP correlated with both D_{LCO} (r=0.65; p=0.003) and MTT (r=-0.70; 0.008). This relationship with D_{LCO} was preserved at six (r=0.77; p=0.001) and twelve months (r=0.67; p=0.018). However, while D_{LCO} did not significantly change over 12-months (-0.5% median

change; p=0.791) both RBC:TP (-0.08 change; p=0.002) and MTT (1.69s change; p=0.031) demonstrated whole-lung changes. RBC:TP and MTT changes were not significantly correlated (p=0.091) On parametric maps, transit time was increased in basal and peripheral regions of lung tissue (Figure) and progressed in these areas over time.

Conclusion

Hyperpolarised ^{129}Xe spectroscopy and DCE-MRI have potential to probe diffusion and perfusion pathophysiology in IPF and are potentially more sensitive to change than existing whole-lung markers of gas exchange. Regional lung mapping is likely to yield highly sensitive metrics, possibly for patient enrichment or detection of treatment response in early intervention studies.

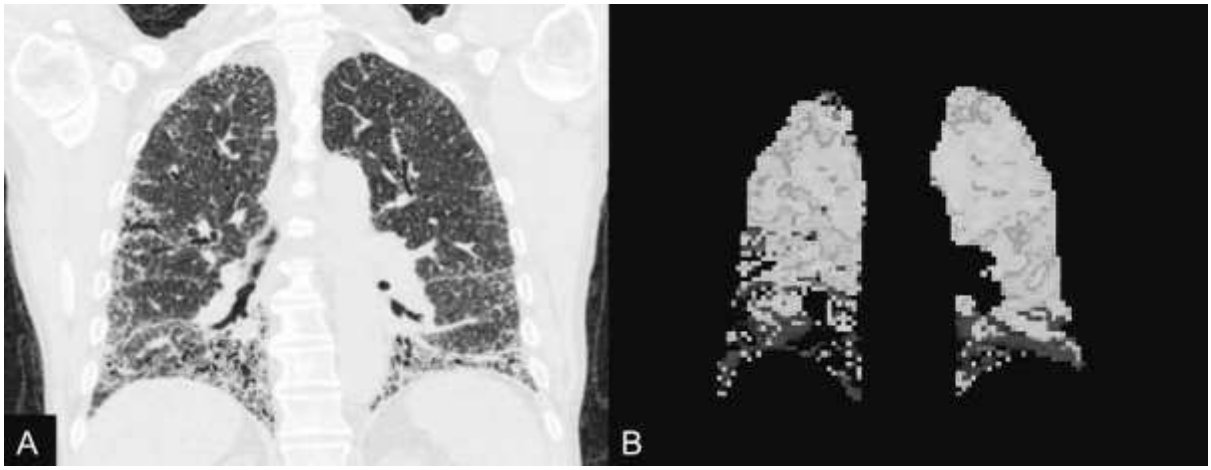

Figure Legend:
Coronal computed tomography slice (A) and parametric pulmonary transit time map derived from dynamic contrast-enhanced magnetic resonance imaging (B). Flow of contrast is slower among regions of reticulation and honeycombing.