Technical Developments for Imaging Dissolved Phase Hyperpolarized 129Xe MRI: Applications in Pulmonary Fibrosis

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Multi-nuclear MRI using hyperpolarized gas agents adds novel capabilities for imaging lung function. Recent advances have led to improved gas polarization levels, more efficient MRI acquisition, and model-based reconstruction to support MR spectroscopic imaging (MRSI) during a breath-hold after inhalation of hyperpolarized xenon-129. The solubility of xenon gas in combination with the new MRSI methods enables resolution of the exchange of the gas into the tissue-capillary "barrier", and the red blood cell compartments. This capability has expanded the utility of this technology for developing image-based biomarkers of gas exchange. Our work on this project has improved the technologies and developed new acquisition and reconstruction strategies to quantitative measures of gas exchange and apply them to the study of fibrotic lung disease. Idiopathic pulmonary fibrosis in particular is a difficult to treat restrictive lung disease that leads to rapid loss of lung function with severe outcomes of lung transplant or death with a median survival ranging from 2.5 to 3.5 years. We have been working on an NIH funded 4 year project to develop, test, and apply gas exchange MRSI biomarkers of disease progression, and response to anti-fibrotic therapies and will present the status of this project.

ABOUT the SPEAKER

Sean Fain is a professor in the departments of Radiology and Medical Physics at the University of Wisconsin-Madison where his research focuses on developing functional and quantitative imaging methods for applications to kidney and lung disease using magnetic resonance imaging (MRI). He also lead the MRI components of two major translational multi-center studies involving imaging of asthma (Severe Asthma Research Program; Childhood Origins of Asthma) and co-chair efforts to improve quantitative CT density measures of lung disease progression for the Quantitative Image Biomarkers Alliance (QIBA) sponsored by the RSNA.

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