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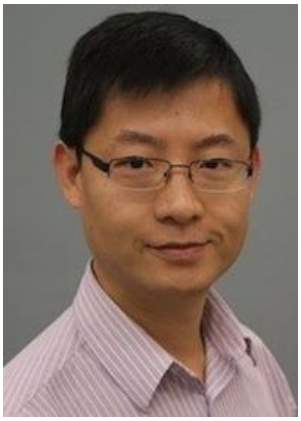

"Magnetic Resonance Imaging of Pathological Changes in Liver Microstructure: Characterization, Validation, and Clinical implications"

Abstract

Cell size and density are essential characteristics of the liver that vary with disease and over time. These variations provide diagnostic biomarkers for normal and pathological processes. For example, inflammation can cause shifts in mean cell size as small inflammatory cells infiltrate the liver. Decreased cell size and increased cell density compared to the surroundings are key pathological features of early hepatocellular carcinoma (HCC). Additionally, hepatocytes undergo significant changes in size during apoptosis and polyploidization. However, current measurements of cell sizes and densities are only possible through invasive liver biopsies, which are subject to sampling bias and may not reliably reflect the spatial heterogeneity of the entire liver.

To address this limitation, we propose MRI cytometry, a multi-compartment diffusion MRI-based method combining measurements of water diffusion rates over different time scales, corresponding to probing cellular microstructure at different distances. This approach overcomes the limitations of traditional biopsy-based methods and allows for non-invasive measurements of cell sizes and densities in the liver. This presentation will introduce the theoretical basis of MRI cytometry, its validation, clinical implementation, and potential applications in the diagnosis of liver diseases. The use of MRI cytometry has the potential to significantly advance our understanding of liver pathologies, reduce the need for biopsies, and improve patient outcomes through earlier and more accurate diagnoses.