

Accelerated radial magnetic resonance imaging for breast lesion characterization

Catherine J. Moran

The high sensitivity of breast Magnetic Resonance Imaging (MRI) for detecting cancerous lesions is well established. However, ambiguity remains in the ability of breast MRI to distinguish benign from malignant lesions and achieving consistent fat suppression in the breast often proves challenging. Novel MRI data acquisition strategies may provide an opportunity to improve characterization of breast lesions while also improving the consistency of fat suppression. In this work, MRI methods based on radial data acquisitions are developed and investigated in breast MRI. Radial MRI data acquisition methods are highly efficient and have attractive undersampling properties. They have the potential to provide data with high isotropic spatial resolution, are well-tailored to meet the specific timing requirements of certain MRI methods, and allow for acceleration of scanning through the benign manifestation of undersampling artifacts. This thesis demonstrates the utility of undersampled radial acquisition for improved breast lesion characterization through isotropic depiction of fine morphological detail. This thesis also analyzes and develops methods for accelerating iterative fat-water separation. Resultant images demonstrate robust fat-water separation throughout the volume of interest and excellent morphological detail. While this work focuses on applications in breast MRI, the methods developed have the potential to be utilized across a number of anatomical regions.