Time-Resolved Contrast-Enhanced Peripheral MR Angiography with Projection Reconstruction

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Contrast-enhanced Peripheral MR Angiography requires broad coverage from the abdominal bifurcation to the distal extremity, and high temporal resolution to catch the complex contrast dynamics. Here we investigated the application of time-resolved projection reconstruction to contrast enhanced peripheral MR Angiography. It has been proved that the combination of undersampled projection reconstruction in-plane and Cartesian slice encoding through-plane (PR-TRICKS) improves the temporal resolution without degradation in spatial resolution. The slice resolution could be further improved by acquiring the high frequency slice encodings during the post contrast phase (PR-HyperTRICKS). The combination of time-resolved PR-HyperTRICKS acquisition and bolus chase technique provides high resolution peripheral MR Angiograms. SNR can be improved using a matched filtering combination of the time-resolved data without mask subtraction. Frequency-dependent segmentation based on 2D cross-correlation analysis and contrast arrival time roughness cut suppresses the background and venous signal, thus improves the image CNR. A non-linear anisotropic filter is also investigated to further improves the image SNR and CNR. This thesis presents both the acquisition strategies for peripheral MR Angiography, and the image processing algorithms to gain high SNR and CNR.