mproved Temporal and Spatial Resolution in Time-Resolved Contrast-Enhanced Magnetic Resonance Angiography

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Three-dimensional contrast-enhanced magnetic resonance angiography (CE-MRA) has made great advances in recent years for detection of vascular disease and has several advantages over conventional x-ray digital subtraction angiography. Two general categories of acquisition strategies have been developed for CE-MRA. The first primarily acquires one high resolution imaging volume, but requires careful timing and does not depict contrast agent bolus dynamics. The second category includes time-resolved imaging techniques, which can display temporal information and is more robust with regard to acquisition timing. However, time-resolved 3D CE-MRA can suffer from tradeoffs attributed to limited temporal and spatial resolution.

Two techniques have been investigated in this work to increase spatial resolution in time-resolved acquisitions. One uses segmented echo-planar trajectories during the acquisition. Another technique combines undersampled projection-reconstruction k-space trajectories with a previously described method for time-resolved imaging with variable-rate k-space sampling. Effects of the acquisition strategy on image quality have been studied, and examinations have been performed in several vascular territories. In particular, high temporal resolution imaging with good spatial resolution was studied in the renal arteries. A vessel segmentation strategy was also investigated for separating arteries from other vascular structures. The technique has been shown to acquire contrast-enhanced magnetic resonance angiograms with high spatial and temporal resolution.