Purpose: Dynamic Contrast Enhanced Magnetic Resonance Imaging (DCE-MRI) is a technique that non-invasively collects data related to the vasculature of tissue. Quantitative information is derived from the time course concentration of contrast agent in a supplying vessel, known as the arterial input function (AIF). The AIF should have a high temporal resolution, but it often compromises spatial resolution. The phase of MRI signal varies linearly with the concentration of a contrast agent, is independent of the hematocrit and is expected to have an increased signal to noise ratio (SNR) when compared to magnitude based data. The use of phase data from projection images satisfies the requirement for high temporal resolution and may be used to reconstruct a 2D image if projected along different axes.

Methods: Data was collected using a 7.0 T Bruker MRI system. 1-D Projection and 2-D FLASH images were collected on a phantom for varying concentrations of Gadolinium. Phase information was determined directly from the free induction decay (FID) and unwrapped where appropriate.

Results: Calibration of the phase data (2-D FLASH acquisition) verified that the phase increased linearly with the concentration of contrast agent with a slope of (1.183 ± 0.015) rad/mM. A small phase drift was present ((0.014± 0.019) rad/100 min), but had neglible impact on the calibration curve. The concentration of contrast agent as determined from the projection data was in good agreement with the 2D analysis with a slope of (1.187 ± 0.027) rad/mM.

Conclusions: Projection based imaging will significantly increase the temporal resolution of DCE-MRI studies. The linear relationship between the phase and concentration of contrast agent was consistent between the 2-D FLASH and projection acquisitions. The results of this study suggest that projection based imaging may be used to accurately estimate the AIF.