Purpose: To develop a post-processing method for correction of arterial input function (AIF) distortion in T1-weighted dynamic contrast enhanced (DCE) imaging used for perfusion quantification of the liver.

Methods: The T2* effect at 3T can suppress the first-pass peak of AIF sampled from aorta in DCE-MRI acquisition due to high concentration of Gd-DTPA during the first pass. To correct the distorted AIF, the first pass of AIF is modeled as a smooth function with a single peak by minimizing the least squares error in fitting the dual-input single compartment kinetic model of the liver. Spline is used to interpolate data points from knot points. The method was evaluated by simulated data with different degrees of saturation in the first pass of AIF, and applied to DCE-MRI of the liver in 12 patients. Hepatic perfusion estimated from original and corrected AIFs were compared.

Results: The simulation shows that AIF saturation causes systemically errors in hepatic perfusion quantification. The AIF correction significantly improves perfusion measurement for a variety of degrees of saturation and image noise. In the DCE-MRI of the 12 patients, there is an average of 35% saturation in the peak of AIF compared with corrected ones. The corrected AIF improves hepatic arterial perfusion by -20% and portal venous perfusion by 24%.

Conclusions: The proposed method can correct saturation in the first pass of AIF due to the T2* effect at high-concentration of Gd-DTPA, and improve hepatic perfusion quantification. This approach might have the potential for evaluation of liver response to treatment in the patients with hepatic cancers.The work is supported in part by PO1CA59827 and RO1CA132834.