AbstractID: 12678 Title: Rapid T1 mapping of Myocardium and Left Ventricle Blood for Small Animals using Saturation Recovery Look-Locker Method

Purpose:
Dynamic contrast enhanced MRI (DCE-MRI) has been increasingly used to delineate cardiac patho-physiological conditions such as tumor and infarction. The time course of contrast agent in tissue and blood is required for quantitative analysis. However, the sampling of contrast agent dynamics is challenging for small animal models because of the fast heart beat and blood circulation. Current study aims to develop and validate a rapid T_1 mapping method for simultaneous quantification of myocardium and blood contrast agent concentrations in small animal DCE-MRI studies.

Method and Materials:
An ECG-triggered saturation recovery Look-Locker (SRLL) method was developed for T_1 estimation by sampling the initial portion of the longitudinal magnetization recovery curve. Monte-Carlo simulations were conducted for error analysis and parameter optimization. Validation was performed on both phantom and mouse heart in vivo (n=7). SRLL and keyhole sampling scheme was also jointly applied in a manganese enhanced MRI experiment to show its practical utility.

Results:
Simulations showed that SRLL can provide accurate T_1 estimation despite of heart rate fluctuation and field inhomogeneity. This was validated in both phantom and in vivo mouse heart by a strong agreement between T_1 measured by SRLL and by the standard inversion recovery Look-Locker method. The myocardium and blood T_1 values were also consistent with the literature. No significant changes in SRLL measured T_1 were found by the application of keyhole method. In the manganese enhanced MRI experiment, T_1 continuously decreased during $MnCl_2$ injection and remained unchanged during the 15 min post infusion period.

Conclusion:
Our results indicate that SRLL can provide a robust measurement of myocardium and blood T_1 in mice at high spatial ($195x390\ \mu m^2$) and temporal (3 min) resolutions. The application of keyhole can further reduce the imaging time to less than 2 min.

Conflict of Interest: N/A