AbstractID: 7270 Title: A new temperature imaging scheme for MR-guided focused ultrasound breast tumor ablation

Water proton resonant frequency (WPRF) shift imaging has been used by most researchers for temperature monitoring during MR-guided focused ultrasound (FUS) ablation therapy. Currently, FUS ablation treatment for breast cancer is undergoing clinical trial at our site. Due to high percentage of fat content in the breast, WPRF shift imaging cannot provide adequate temperature monitoring for the treatment. In this study, we are developing a new temperature-imaging scheme to solve this problem. A prototype MR-compatible FUS ablation system and a 1.5T MR imaging system were used in the study. Experiments were conducted in a cadaver breast and tissue-mimicking bovine gelatin phantoms. A spin-echo sequence was modified and optimized to acquire three temperature images in 4 seconds with 16-cm FOV, 256×64 acquisition matrix, TR=100 ms, TE=20 ms and a 5-inch coil. Temperature images were acquired using this modified spin-echo sequence, and also a fast spin-echo and a fast gradient-echo sequences. All the images were compared based on acquisition time, spatial resolution, SNR, volume coverage and the capability for simultaneous WPRF shift imaging and T1 relaxation temperature mapping. The spin-echo sequence showed its overall superiority. Currently, we are implementing a spin-echo based MR imaging sequence, in which a gradient-echo readout was added after the regular spin-echo readout gradient, to simultaneously monitor both magnitude and phase change caused by temperature variation. It is anticipated that the new spin-echo based imaging sequence will provide sufficient contrast for temperature change in both fat and muscle tissues with required temporal resolution.