Abstract ID: 18407    Title: Combined Effects of Pulsed Non-Thermal Focused Ultrasound and Radiotherapy for Prostate Cancer Treatment

Purpose: Recent studies have shown non-thermal effects of pulsed focused ultrasound (pFUS) on tumor growth control. This study is to investigate the combined effects of non-thermal pFUS and radiotherapy (RT) for prostate cancer treatment.

Methods: Animal prostate tumor model was developed by implanting LNCaP cells in mice prostates. Tumor-bearing mice were randomly assigned to 3 groups (n=8): (1) pFUS; (2) pFUS+RT; (3) control. MR-guided pFUS treatment was performed using InSightec ExAblate 2000 system with a 1.5T GE MR scanner. Non-thermal sonications were delivered by keeping the body temperature <42°C as measured real-time by MR thermometry. Prostate tumors in groups 1 and 2 were exposed to pFUS (1MHz, 25W focused ultrasound; 1Hz pulse rate with a 10% duty cycle) for 60 sec for each sonication. Each tumor was covered entirely using 4-8 sonication spots. Prostate tumors in group 2 also received 2 Gy radiation dose within 30 minutes after pFUS treatment using Siemens Artiste (6MV photon energy, 300MU/min dose rate). Following the treatment, mice were scanned weekly using MRI for tumor volume measurement.

Results: Tumor volumes in the control group showed exponential increase from 121±5 mm³ on treatment day to 172±9, 247±15, 344±28, and 500±42 mm³ at 1, 2, 3, and 4 weeks post treatment, respectively. In contrast, tumor volumes in the pFUS group were 33% (p<0.05), 29% (p<0.05), 14%, and 15% smaller, and the pFUS+RT group were 31%, 31%, 26%, 33% smaller (p<0.05) at week 1, 2, 3, and 4 post treatment, respectively. Both pFUS and pFUS+RT groups showed significant tumor growth delay in the first two weeks.

Conclusions: Our study showed that pFUS combined with radiotherapy can significantly delay the tumor growth. Radiation after pFUS treatment provided an additional benefit for tumor control (sponsored by Focused Ultrasound Surgery Foundation, Varian Medical Systems, DOD PC073127, DOD BC102806).