

Purpose: MR guided focused ultrasound (MRgFUS) has been investigated for ablative therapy and drug enhancement for gene therapy and chemotherapy in our institution. The aim of this work is to explore the feasibility of pulsed focused ultrasound (pFUS) for non-thermal cancer therapy using an in vivo animal model.

Methods: An InSightec ExAblate 2000 with a 1.5T GE MR scanner was used in this study. Suitable ultrasound parameters were investigated to perform non-thermal sonications, keeping the temperature below 42°C as measured in real time by MR thermometry. LNCaP cells (10⁶) were injected into the prostates of male mice (n=20). When tumors reached the volume of 100±50mm³ on MRI, the tumor-bearing mice (n=8) were treated with pFUS (US frequency 1MHz; 25W acoustic power; pulse frequency 1Hz; 0.1 duty cycle) for 60sec. A total of 4-6 sonications were used to cover the entire tumor volume under MR image guidance. The animals were allowed to survive for 4 weeks after the treatment. The tumor growth was monitored on MRI and compared with the control group (n=12).

Results: Significant tumor growth delay was observed in the tumor-bearing mice treated with pFUS. The mean tumor volume for the pFUS treated mice remained the same 1 week after the pFUS treatment while the mean tumor volume of the control mice grew 42% over the same time. Two weeks after the pFUS treatment the cont

Conclusions: Our results demonstrated that non-thermal pFUS has a great potential for cancer therapy. Further experiments are needed to derive optimal ultrasound parameters and fractionation schemes to maximize the therapeutic effect. This work is supported by Focused Ultrasound Surgery Foundation, Varian Medical Systems, DOD PC073127 and DOD BC102806. Technical support from InSightec is acknowledged.