Progress Report

Translational studies of the effects of pulsed HIFU using a modified clinical MR guided focused ultrasound device

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Funding from the FUSF grant arrived at The Methodist on August 26th of 2008. By that time, we had already been actively working on this project for approximately one month. To date, money from this grant has been used mainly to support a postdoc, purchase and house animals, pay a veterinary technician, and pay for MR scanner time on the InSightec equipped scanner.

To date, we have been able to do a total of 43 sonications in 10 treatment sessions and 20 follow-up MR imaging sessions, in 6 different rabbits. Histology has been collected on two of these animals. This is somewhat behind the ambitious schedule set out in our proposal, mainly due to the unanticipated morbidity that results from bringing rabbits under anesthesia for extended periods several days running. This issue plagued our initial 6 months of work, resulting in significantly less data than we had hoped for, and sidetracking a number of our animals into an IACUC investigation of the problem. In fact, the issue was ultimately determined to be related to physiological susceptibility of the rabbit model to lung inflammation, and having nothing to do with our treatments. The problem has been partially resolved by limiting the follow-up MRI imaging sessions to less than 30 minutes, which is just sufficient to get the dynamic contrast enhanced data we need from it. As a result of this work, we were able to show that the pulsed mode HIFU treatments that were successful in mouse models need to be adjusted for true bulk tissue treatments, and that cavitation does not appear to be a major factor in these effects. We are currently preparing a manuscript containing these early findings. As well, we plan to make use of FUSF funds to carry out an additional set of 6 treatment sessions (3 rabbits) by the end of June.

As well as animal studies, our initial work included phantom and engineering work to enable the InSightec system to work properly in pulsed mode such as required for our studies. This involved changing the means of collecting spectra to enable cavitation monitoring during each individual pulse, altering and testing the electronic steering 'sub-sonication' settings to allow efficient treatment of larger treatment volumes in pulsed mode, and working with InSightec engineers to implement a new mode of treatment involving both mechanical and electronic steering for efficient treatment of large tissue regions without overheating. This mode remains to be tested in vivo.