

AbstractID: 10237 Title: Quality Assurance for MR Guided Focused Ultrasound as a Multi-Modality Platform for Cancer Therapy

Purpose: The purpose of this work is to develop an effective and efficient quality assurance (QA) program for the application of MR guided focused ultrasound (MRgFUS) as a multi-modality platform for cancer therapy.

Materials and Method: An MRgFUS system has been installed in our institution, which consists of an InSightec ExAblate 2000 high-intensity focused ultrasound (HIFU) system and a 1.5T GE MR scanner. This system has been FDA approved for the treatment of uterine fibroids clinically and is being investigated under local IRB approval for treating bone metastases, prostate and breast cancers and the enhancement of drug delivery for gene therapy and chemotherapy. In addition to the daily, monthly and annual calibration and commissioning measurements for the MRI unit special QA procedures were developed for the HIFU system including the mechanical motion of the couch and transducer, the safety system and patient panic buttons, the functionality of the temperature mapping and treatment software, the acoustic power output and the localization of the treatment focal spot.

Results: The MRgFUS system has been operational since the fall of 2006. Successful experiments have been performed on *in vitro* bio-samples and *in vivo* animal models for pre-clinical studies and for drug enhancement experiments. Patients with bone metastases have been treated successfully using the MRgFUS system for pain relief with a pre-treatment QA procedure. Patients tolerated the HIFU treatment well. No skin damage was observed after treatment. The pain scale was significantly reduced within 24 hours and further reduced at later follow-ups.

Conclusions: Comprehensive QA procedures have been developed for the safe and successful operation of the MRgFUS system as a multi-modality platform for breast surgery, bone palliation, and prostate boost in combination with radiotherapy clinically and for drug delivery enhancement investigations for gene therapy and chemotherapy using animal models.