AbstractID: 6543 Title: Peak Temperature and Thermal Dose on MR Imaged Thermal Lesion Boundary in the in vivo Rabbit Brain

Magnetic resonance (MR) thermometry based on the proton resonance frequency shift provides the means to predict thermal lesions in real-time if temperature measures of the lesion boundary are known. The purpose of this study was to evaluate a threshold temperature and thermal dose, $T_{43,}$ indicative of damage of the rabbit brain *in vivo* after interstitial laser ablation. In seven rabbits, a laser fiber was inserted 8-mm into the brain and 3-mm lateral to the longitudinal fissure. Two rice noodles were inserted as fiducial markers in the same scan plane. Gradient Echo MR phase images were acquired with a TE of 38.9 ms at 10 seconds intervals before, during and after heating. A reference phantom was used to correct the phase drift during the imaging. At four hours time-point after heating, T2 weighted FSE images were acquired. The lesion boundary was manually traced on the T2 FSE images and registered to the temperature maps. Average peak temperature and thermal dose on the lesion boundary were measured using a direct MR measurement and an analysis based on a binary discrimination model. The direct measurement results were an average peak temperature on the boundary of 48.3 ± 2°C and a T_{43} of 191 minutes. The results from the binary analysis were a threshold temperature of 47.7 ± 0.9°C and a T_{43} of 4.8 minutes. The results of this study indicate that a peak temperature of 48 °C is a consistent measure of thermal damage in normal rabbit brain while thermal dose is inconsistent.