Purpose: To determine the feasibility of diffusion-weighted imaging (DWI) and apparent diffusion coefficient of water (ADC) mapping in monitoring MR-guided Focused Ultrasound Surgery (MR-gFUS) for the treatment of uterine tumors.

Methods and Materials: Sixteen consecutive patients were enrolled and treated using MR-gFUS. Two patients did not undergo DWI imaging at the time of treatment. Fourteen patients with DWI were enrolled and 12 of 14 completed the MR exam with DWI at 6 months. Ultrasound treatment was performed using a modified MR-gFUS system coupled with a GE1.5T MR scanner. Pre-, post-, and 6-month follow-up MR scans were obtained using T1 FSPGR phase sensitive, T1-wieghted contrast, and DWI. Total MR-gFUS treatment time was 1-4 hrs. Trace ADC maps were constructed for quantitative analysis. ROIs were drawn on post-contrast images and localized to DWI hyperintensity and quantitative statistics were obtained from pre-, post-, 6-month, treated, and non-treated uterine tissue. Statistical analysis was performed using an independent t-test and significance was set at $p<0.01$.

Results: There were no signal intensity changes within the fibroid on the pre-treatment contrast T1, DWI, and ADC maps. However, considerable signal intensity changes were noted on DWI localized within the treated MR-gFUS areas. Mean baseline fibroid ADC values($1440 \pm 418 mm^{-6}/sec^2$) was significantly($p<0.002$) different from post treatment ADC values($1077 \pm 309.8 mm^{-6}/sec^2$) with an ADC ratio=0.69(range=0.50-0.97). There was a significant difference ($p<0.005$) between 6mn fibroid ADC value($1905 \pm 378 mm^{-6}/sec^2$) and the baseline ADC, with an ADC ratio=1.40(range=1.11-1.71).

Conclusion: We have demonstrated that DWI and ADC mapping is feasible for identification of ablated tissue after MR-gFUS treatment of uterine fibroids.