2013 Scientific Sessions
Saturday, October 12, 2013
1:00 – 5:00 p.m.

Presenter: Sandeep Hedgire, MD

Title of Abstract: **Mapping of Prostate Cancer Using Diffusion Tensor Magnetic Resonance Tractography: A Preliminary Study**

Institution: Massachusetts General Hospital

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Modality: MR

Organ System: GU

Intro: Diffusion weighted imaging has been increasingly used for neuro-imaging over last few years. Diffusion Tensor Magnetic Resonance Tractography has been proved as valuable tool in mapping neuronal tracts. This technique has seldom been used for other visceral organs.

Purpose: To demonstrate Diffusion Tensor Magnetic Resonance Tractography for the prostate gland and to explore the feasibility of quantitative study of prostate cancer using 3D fiber tracts.

Methods Used: In our HIPPA compliant retrospective study, 14 men with biopsy proven prostate cancer were included. All patients underwent prostate MRI with endorectal coil on a 1.5 T MRI scanner. Diffusion weighted single shot echo-planar images were acquired with 6 diffusion sensitizing directions (b values 0 and 600 s/mm2). Fiber tracks were generated using Diffusion Toolkit and displayed with TrackVis ver. 0.5.1(TrackVis.org). Three identical circular regions of interest (ROI) were hand drawn over areas of pathologically proven tumor, the central gland (CG), and normal peripheral zone (PZ) of the gland. For quantitative analysis we used a tract density parameter, which is the tract number divided by the ROI volume (voxel number), as a normalized measure of the tracts passing through the given ROI. The values were statistically analyzed using a Wilcoxon signed-rank test (SOFA statistics version 1.3.2.).

Results of Abstract: Diffusion Tensor Tractography of the prostate was computed in all 14 cases and well depicted congregate fibers within the prostate. The mean value of track density in the tumor foci was 2.81 in comparison to 3.50 in the CG and 3.57 in the PZ of non-diseased portions of the gland. The analysis showed tract density difference between tumor track density and both densities in CG ($p=0.026$) and PZ ($p=0.035$) was statistically significant ($p<0.05$), whereas there was no significant difference ($p=0.875$) between track densities in PZ and CG areas. The quantitative results were in good agreement with the subjective structural observations of the fiber tracks in all three zones.

Discussion: DTI tractography of the prostate is feasible and shows distinctive tract variability in malignant foci compared to normal gland. In our study, mean value of tract density in tumor foci was lower than CG and PZ.

Scientific and/or Clinical Significance? By depicting the neurovascular tracts, tractography can offer improved lesion detection and characterization. The tract density parameter can also be used as a marker of tumor aggressiveness.

Relationship to existing work Tractography has potential to improve performance of MRI in characterization of prostate cancer by depicting diffusion paths and likely defining neurovascular tracts.