AbstractID: 7669 Title: To determine the geometric and dosimetric accuracy of MRI based IMRT treatment plan for patients with prostate, brain, and head and neck cancers.

Purpose: To determine the geometric and dosimetric accuracy of MRI-based IMRT treatment plan for patients with prostate, brain, and head and neck cancers.

Methods and Material: CT simulation images were obtained for prostate, brain and head and neck cancer patients in treatment position with required immobilization. T1 and T2 weighted MRI images were also obtained for these patients. Contours for organs-at-risk (OARs) and planning target volumes (PTVs) from CT images were copied to the MR images. Contours created for OAR and PTV in MR images were verified by a radiation oncologist. The intensity map from CT-based plans and the contoured MR images were used to create MR-based treatment plans with both homogenous and inhomogeneous tissue density (average HU from CT was assigned to MR structure). Treatment plans (Varian Eclipse TPS) were created by assigning water equivalent homogenous tissue density to CT-based plan compared to CT-based plan with inhomogeneity correction. We evaluated the geometric accuracy of MR-based plans by determining the percent difference of structure volumes between CT and MR-based contours. Furthermore, we evaluated the dosimetric accuracy of MR based treatment plans by comparing DVH, isodose lines, absolute dose and MUs.

Results: The mean absolute dose difference between approved CT plan and one with homogenous tissue density in CT was < 1% for the anatomical sites. Volume differences between MR based and CT based contours were as great 25% ± 5 and dose differences varied 20% ± 1 5 depending on the initial structure volume. Less than 2% MU variation was observed between CT and MR-based treatment plans using contours from CT and with uniform or non-uniform electron density.

Conclusion: Homogenous tissue density could be used for MR-based treatment planning for prostate and head cases. Further, better dose coverage equivalent to CT-based plan could be achieved by optimizing structures contoured on MR images.