AbstractID: 7571 Title: Feasibility of using High-Field MRI, Functional Imaging, And Diffusion Tensor Images for treatment planning of SRS and IMRT

Purpose: Loss of hearing, vision, and other cranial nerve functions can occur as complications of radiotherapy for brain and H&N tumors. Thus, we tested the feasibility of using high-field magnetic resonance images, function magnetic resonance images (fMRI) and diffusion tensor images (DTI) in treatment planning to spare the cranial nerves and visual and auditory pathways.

Method and Materials: Three-dimensional T1-weighted images (T1WI) and DTI from GE 3-Tesla MR scanner were acquired on two volunteers. At the same position, The fMRI paradigm was performed by a block design in which music was binaurally presented through headphones. Structures including the nerves and fiber tracts (FT) and the tonotopic maps were defined in the DTI, fMRI, and T1WI using IPlan and BrainScan planning system (BrainLab). A small acoustic neuroma (SAN) and a large meningioma (LM) were created as targets in treatment plans. Subtracted DVHs were used for comparison of plans using dynamic arc radiotherapy (DART), conformal beam radiotherapy (CBRT), or intensity-modulated beam radiotherapy (IMRT) with prescription dose (PD) at 96%, 90% or 80% isodose.

Results: For the SAN, cranial nerves V, VII, VIII, IX and X near the tumor have been clearly defined in 3.0-Tesla T1WI. DVHs indicate that IMRT was superior with the PD 96%, and DART was superior with PD 80%. For the LM, optic nerves and tracts, chiasm, and hearing response regions were all considered as OAR. IMRT plan provided a better target coverage while sparing critical structures. However, doses to chiasm and left optic nerve and tract reached above the tolerance level. Plans for preserving only one side optic pathway can reduce the hot spots by 40%.

Conclusion:

This study shows potential benefits of using new imaging techniques to reduce the hearing and vision losses for SRS and IMRT of brain and H&N tumors.