

## AbstractID: 14313 Title: Effect of radiation on hippocampal white matter: a prospective DTI study

**Purpose:** To investigate delayed and late effects of cranial irradiation on hippocampal white matter that are not evident on conventional MRI using diffusion tensor imaging (DTI). We also examined the feasibility of DTI indices for early prediction of changes in cognitive function.

**Materials and Methods:** Sixteen patients treated with standard partial brain radiation therapy (RT) participated in a prospective MRI protocol. DTI was acquired before RT, 3 and 6 weeks during RT, and 1, 6 and 18 months after finishing RT. The Hopkins Verbal Learning Test (HVL) was also given at these time points. Change in DTI indices such as longitudinal, perpendicular and mean diffusivities in the cingulum bundles and hippocampal gray matter, contoured on T1-weighted MRI, were evaluated.

**Results:** Progressive decreases in longitudinal diffusivity and increases in perpendicular diffusivity of left cingulum were observed with an onset at week 3 during RT and persisting up to 18 months after the completion of RT compared to pre-RT. These changes, possibly due to reactive astrogliosis and demyelination, were significant at 1, 6 and 18 m post-RT (paired t-test,  $p \leq 0.02$ ). A similar trend was observed in right cingulum. There was no significant change observed in left or right hippocampal gray matter by any DTI indices over the period of 18 m follow-up (Figures 1 & 2, supplement). Late (occurring >12 months post-RT) decline in HVL total recall score was seen in 3 patients. The percent decline in longitudinal diffusivity of left cingulum at 3 and 6 weeks during RT predicted the late decline in total recall score (receiver operating characteristic analysis,  $p < 0.001$ ; Figure 3, supplement).

**Conclusion:** Early DTI indices changes in normal appearing cingulum white matter may be useful to identify patients at risk for late radiation injury, and monitor neuroprotection intervention.