

AbstractID: 8245 Title: A novel tensor decomposition algorithm for assessment of glioma white matter infiltration during radiotherapy treatment planning

Purpose: We have previously demonstrated that diffusion tensor MR imaging (DT-MRI) can be used as a tool for the assessment of glioma white matter infiltration. The technique demonstrates improved sensitivity and specificity compared to standard MR image sequences, but feature extraction from standard DT-MRI displays is a laborious process. We present a novel algorithm based on tensor decomposition techniques to facilitate the rapid identification of white matter tract infiltration. Our aim was to produce a real-time interactive version of this tool for use at the time of radiotherapy treatment planning.

Methods & Materials: Post operative DT-MRI was performed in six patients with Glioblastoma prior to radiotherapy treatment planning. A graphical user interface was written in Object Pascal which enabled the user to navigate through the DT-MRI data set in 3D. For each voxel in the data set, the diffusion tensor is characterised by plotting the magnitude of the isotropic (p) and anisotropic (q) components of water diffusion on orthogonal axes. Using these plots of p-q space it is possible to produce a tissue signature for each voxel which allows the user to rapidly distinguish between normal and potentially infiltrated white matter.

Results: When compared to standard fractional anisotropy displays, the p-q space navigation tool provides a rapid visual assessment of white matter integrity. The tool can be run alongside the planning workstation at the time of contouring.

Conclusion: The p-q space navigation tool provides a feasible technique for the assessment of white matter infiltration at the time of radiotherapy treatment planning. Further development of the tool to include co-registration with the planning CT data and export of region of interest data is under way.

Conflict of Interest: Research sponsored by Siemens Oncology Care Systems USA