AbstractID: 3516 Title: A comparison between helical Tomotherapy and LINAC-based fractionated cranial radiosurgery treatments utilizing RTOG guidelines

Purpose: An evaluation of helical Tomotherapy fractionated cranial radiosurgery treatment based on RTOG stereotactic radiosurgery indices for dose coverage (C), conformality (CI) and homogeneity (HI). A comparison between helical Tomotherapy and LINAC-based non-coplanar arc systems utilizing actual clinical cases.

Methods & Materials: Clinical cases presenting with varying target sites, tumor volumes, and risk of complication (i.e. proximity of target to OAR) are evaluated. For each case two separate treatment plans, consisting of the best achievable optimized plan from the Tomotherapy planning system, and from a LINAC-based radiosurgery planning system (Pinnacle ADAC) are compared. Coverage of the complete (100%) PTV volume is given highest priority during the treatment planning with both systems.

Results: The dose coverage obtained from both planning systems is very comparable and range from 97 to 99%. However, in terms of dose conformality and homogeneity the Tomotherapy planning system resulted in superior treatment plans for every patient evaluated in the study. The CI and HI values for the Tomotherapy plans ranged from 1.01 to 1.39 and from 1.02 to 1.12 respectively. Whereas the CI and HI values obtained from the LINAC-based plans ranged from 1.36 to 2.14, and from 1.88 to 2.98 respectively.

Conclusion: For all the cases evaluated the helical Tomotherapy system easily complied with RTOG stereotactic radiosurgery standards for dose coverage, conformality and homogeneity. Whereas target coverage defined as a percentage of the prescribed dose, is comparable between helical Tomotherapy and LINAC-based non-coplanar arcs, significantly better conformality and homogeneity are obtained with the Tomotherapy system (especially for large and irregularly-shaped tumors). The examples presented illustrate a default behavior of the TomoTherapy optimizer that is not employed in conventional radiosurgery planning, specifically the ability to deliver uniform dose to the target volume at the expense of increasing the low doses to the surrounding tissue.