

AbstractID: 3577 Title: Dosimetric comparison of Helical TomoTherapy treatment and step-and-shoot intensity-modulated radiotherapy treatment on stereotactic radiosurgery

Purpose:

To evaluate the feasibility of Helical TomoTherapy for stereotactic radiosurgery, and to compare the dose conformity, dose uniformity, and dose gradient between plans of Helical TomoTherapy and step-and-shoot intensity-modulated radiotherapy (IMRT) generated by the NOMOS CORVUS system.

Method and Materials:

Thirteen patients with intracranial tumors treated with stereotactic radiosurgery by step-and-shoot IMRT were analyzed. Tumor sizes varied from 1.45 cc to 40.78 cc. Two step-and-shoot IMRT treatment plans, one (IMRT I) with gantry angle restriction due to the existence of beam stopper at our institute and the other (IMRT II) with those constraints removed, were generated using the CORVUS system. Helical TomoTherapy treatment plans were generated for each case with identical anatomic contouring and prescription. The three plans were compared using dose conformity index, homogeneity index and dose gradient score index.

Results:

IMRT II plans without field angle constraints resulted in better dose conformity and steeper dose drop-off outside the targets compared to IMRT I with beam stopper restriction. Statistical analysis showed that TomoTherapy plans were better compared to the two step-and-shoot IMRT plans by dosimetric study. The average dose conformity index for TomoTherapy is 1.33 (range: 1.14 – 1.60). For IMRT I plans, it is 1.39 (range: 1.17 – 1.89). The dose gradient score index, with 100 being optimal, is 37.3 (range: 16.5 – 52.7) for TomoTherapy plans, and 18.9 (range: –31.1 – 36.2) for IMRT II. Dose homogeneity index does not show statistical difference for the three treatment plans. The average treatment time for TomoTherapy plans is 47 minutes.

Conclusion:

TomoTherapy treatment planning showed significantly better results compared to the step-and-shoot IMRT treatment planning in dose conformity and dose gradient for intracranial stereotactic radiosurgery. The treatment time using TomoTherapy was comparable to that using step-and-shoot IMRT.

Conflict of Interest (only if applicable):

Research partially supported by TomoTherapy Incorporated.