

AbstractID: 3559 Title: Dose distribution in Extracranial Radiosurgery: a comparison with Step and Shoot IMRT based on dose indexes

Purpose: To compare Extracranial Radiosurgery dose distributions to step and shoot Intensity Modulated Radiation Therapy (IMRT) aimed to the same dose prescriptions and constraints.

Method and Materials: 12 patients treated by means of the Cyberknife system for extracranial tumors (7 lung, 2 pancreas, 2 liver and 1 prostate) were selected. Volume of the PTV ranged from 19.0 cc to 584.4 cc. The prescribed doses were 16-27 Gy to the 80% isodose surface in 1-3 fractions. IMRT treatment plans were calculated to obtain the same coverage of the PTV with same constraints to organs at risk. A 5-coplanar fields, step-and-shoot technique was employed with a 6MV accelerator. IMRT plans were generated by means of the Pinnacle treatment planning system. We compared homogeneity and conformity indexes and ratios between isodose volumes. Furthermore, a recently proposed index for comparison of radiosurgery plans was calculated. The new index balances conformity and steepness of the gradient outside the PTV.

Results: Homogeneity index ranged from 1.35 to 2.00 (mean 1.54) for the Cyberknife and from 1.10 to 1.64 (mean 1.26) for IMRT. Conformity index ranged from 0.76 to 1.28 for the Cyberknife and from 0.79 to 2.55 for IMRT; the mean deviation of the conformity index from 1 was 0.14 and 0.74, respectively. The ratio between 20% and 80% isodose volumes ranged from 4.0 to 28.0 (mean 12.9) for the Cyberknife and from 9.7 to 38.3 (mean 21.7) for IMRT. Results obtained with the new index confirmed the behavior observed with the conformity index.

Conclusion: Conformity resulted in general better for the Cyberknife while homogeneity resulted in general better for IMRT. The ratio between volumes of mid-low isodose surfaces (10% - 50%) to the volume of the reference isodose surface (80%) resulted higher for IMRT than for the Cyberknife.