AbstractID: 13904 Title: Dosimetric characteristics of the small diameter BrainLab cones for stereotactic Radiosurgery

Purpose: To study the dosimetric characteristics of the small diameter ($\leq$10.0mm) BrainLab cones used for stereotactic radiosurgery (SRS) treatments in conjunction with a Varian Trilogy accelerator.

Method and Materials: Required accuracy and precision in dose delivery during SRS can be achieved only when the geometric and dosimetric characteristics of the small radiation fields is completely understood. Although a number of investigators have published the dosimetric characteristics of SRS cones, to our knowledge, there is no generally accepted value for the relative output factor (ROF) for the 5.0mm diameter cone. Therefore we have investigated the dosimetric properties of the small ($\leq$10.0mm) diameter BrainLab SRS cones used in conjunction with the iPlan TPS and a Trilogy linear accelerator with a SRS beam mode. Percentage depth dose (PDD), off-axis ratios (OAR) and ROF were measured using a SRS diode and verified with Monte Carlo (MC) simulations. The dependence of PDD, OAR and ROF on the alignment of the beam CAX with the detector motion line was also investigated using MC simulations.

Results: An agreement of 1% and 1mm was observed between measurements and MC for PDD and OAR. The calculated ROF for the 5.0mm diameter cone was 0.695$\pm$0.008 in good agreement with the measured value of 0.711. For 7.5 and 10.0mm diameter cones the agreement was within 0.5%. Simulations of the misalignment of the beam axis and detector motion axis for angles between 0.5°-1.0° show a deviation >2% in PPD beyond certain depth.

Conclusions: Monte Carlo calculated ROF values for 5.0 mm diameter cone agrees with our measurement to within 2.3%. Care should be exercised when measuring PDD and OAR for small cones. We recommend the use of MC to confirm the measurement under these conditions.