

AbstractID: 6599 Title: Treatment planning advantages of proton scattered beam and intensity modulated proton therapy over IMRT for pancreas tumors

Purpose: To examine potential treatment planning advantages of proton scattered beam and intensity modulated proton therapy over IMRT for pancreas tumors.

Methods and Materials: Five patients with pancreatic tumors were selected. Treatment plans for the conedown phase of the treatment were developed using three different modalities: IMRT, proton scattered beam, and intensity modulated proton therapy (IMPT). The motion of the pancreas was compensated for by using margins equal to those used in IMRT planning. A dose of 1440 cGy in 8 fractions was prescribed to the target. The IMRT plan consisted of 5 coplanar fields and was developed using the Eclipse treatment planning system. The single field proton scattered beam plan was computed using the Eclipse system with an IBA proton nozzle, an aperture block, and a compensator. The IMPT plan was calculated through the use of an in-house method utilizing GEANT4, a validated Monte Carlo method. The IMPT procedure uses a step and shoot “spot scanning” method with Gaussian beams with an initial width of 8 mm FWHM. Plan optimization for the scanning treatment was performed using the Cimmino algorithm, a feasibility method that utilizes upper and lower dose constraints. Dose distributions, dose volume histograms, and dose statistics were calculated and compared for the three modalities.

Results: All plans provided similar coverage of the target. The proton scattered beam plan exhibited better dose homogeneity than the IMRT plan, while the IMPT plan produced noticeable hot spots. These hot spots are a result of the spacing of the Bragg peaks and are avoidable. Both the proton scattered beam and the IMPT plan provided significant sparing of all organs at risk compared to the IMRT plan.

Conclusions: Proton therapy in the forms of both scattered beam and IMPT offers organ sparing advantages over IMRT in the treatment of pancreatic tumors.