AbstractID: 8232 Title: Beam Characteristics for Planning Carbon Ion Therapy of Ocular Melanoma

Purpose: We recently started orthogonal two-port carbon ion therapy for ocular melanoma with the intent to reduce incidence of radiation complications that occur with mono-port therapy. In order to calculate dose distributions for this therapy, biophysical beam characteristics was investigated and defined as input into the treatment planning software. **Method and Materials:** Uniform fields of the vertical and the horizontal carbon-ion beams from a synchrotron were shaped with the passive beam shaping systems. Apertures and range compensators (RC) were designed for individual patients. We used a commercially available treatment planning system for proton therapy, which was customized to our carbon-ion beams. The physical depth dose profiles were measured with an ionization chamber and LET depth profiles were calculated. Variation of the survival curves with LET for HMV-I cell were obtained experimentally. The range modulating ridge filters were designed to produce the spread-out Bragg peaks with region of uniform HMV-I cell killing for delivery of 70 Gray-Equivalent in five fractions. The beam penumbra was defined based on measurements with radiographic films and calculations. The lateral penumbra was estimated to be 1/3.6 of the proton beam. Dose distributions were calculated with broad beam and pencil beam algorisms using these defined beam data. **Results:** The dose distributions calculated in water for typical irradiation arrangements showed the lateral penumbra width (80-20%) to be less than 0.15 cm along full penetration depth. During two years, more than twenty patients have been treated with two fractions of vertical beams and three fractions of horizontal beams. With the use of RC, the dose distributions showed high conformity to tumors with low dose to organs at risk such as I-C body and disk. **Conclusion:** The biophysical beam characteristic for clinical dose calculation was described. The employed bio-clinical model could be evaluated by clinical outcome.