AbstractID: 7451 Title: Dosimetric verification of a novel TBI technique using segmented radiation fields

Purpose: To evaluate the dosimetric performance of a novel CT planning based total body irradiation (TBI) technique, which utilizes a conventional linear accelerator in a standard bunker and employs segmented beams for dose uniformity.

Methods and Materials: An extended distance TBI technique at ~180 cm SSD has been developed for a conventional linear accelerator using a custom couch aligned along the plane of gantry rotation. Up to 3 abutting fields are used to cover the patient, with divergence matching achieved through a combination of gantry angles and couch shifts. Treatment planning was performed using a full body CT scan and standard beam models within the Pinnacle 7.6C TPS. The dosimetric verification consisted of: (i) pre-treatment patient specific dose measurements in phantoms and (ii) in-vivo dosimetry using MOSFET and films. Similar to the process of IMRT verification measurements, treatment plans were transferred to a $40\times40\times20$ cm^3 phantom and compared to ionization chamber dose measurements in the same geometry. In-vivo dosimetry measurements were performed using paired MOSFET detectors (at entrance and exit) at the level of the umbilicus and at the level of the mediastinum. Junction doses were assessed by in-vivo exit dosimetry using films on the couch.

Results: Dose measurements in phantom for 11 clinical TBI patients were found to agree with Pinnacle to within (0.96±0.71)%, with a maximum deviation of 2.08%. The average agreement between the in-vivo dose measurements and calculated values were found to be within (0.44±4.33)%, with a maximum deviation of 10.7%. No significant dose differences were observed along the junctions.

Conclusion: This work validates the accuracy of dose delivery for this novel TBI technique, developed with Pinnacle 7.6C. The segmented fields and the matching of divergent field edges provide adequate dose uniformity throughout the treatment volume.