

Purpose: To develop a new inverse-planned total body irradiation (TBI) technique for treating a patient as they lay on a stationary couch, near to the floor, that improves dose homogeneity over the conventional forward-planned treatment.

Methods: The developed technique uses a collection of open-field beams distributed along an arc to deliver dose to the patient. A 170 cm long, full-body anthropomorphic water phantom was constructed for validating the technique. Treatment plans were optimized on a CT of the phantom with Pinnacle using the standard beam model. These plans explored the optimal field size and total number of beams. Additionally, these plans were compared to the conventional extended source-to-skin distance (SSD) treatment and also tested for the benefits of multi-leaf collimator (MLC) motion. From each plan the fraction of the volume within 10% of the prescription dose, $V(\pm 10)$, is extracted. The optimal treatment plan was delivered to the phantom on a Siemens Artiste. Measurements of the delivered dose were performed with a combination of a linear diode array and an ion chamber at six different positions inside the phantom. These measurements were compared directly to the dose predictions.

Results: The optimal setup for this phantom has treatment beams distributed in gantry angle at 5° steps from 305° to 55°, with a 40x40 cm field size. For the extended SSD, open field and MLC techniques, the values for $V(\pm 10)$ were 78%, 85% and 85%, respectively. The root of the mean square difference between dose predictions and measurements was 2.5%.

Conclusions: The developed technique improves homogeneity over the conventional TBI method, allows treating a patient in a comfortable lying position and enables for dose delivery in a standard-sized vault. A specific TBI beam model is being developed to further improve agreement between dose measurements and predictions.

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