

AbstractID: 5349 Title: Whole-Body Dose for Helical Tomotherapy

Purpose: Tomotherapy is a form of intensity modulated radiation therapy (IMRT) that utilizes rotating fan beams modulated by a binary-multileaf collimator. The radiation is delivered either serially or helically as the patient is moved in a craniocaudal sequence for tumor coverage. While Tomotherapy can deliver highly conformal dose distributions, it yields the lowest delivery efficiency (tumor dose per MU) of current IMRT-delivery options. This relatively low efficiency has the potential for delivering high total-body doses due to head leakage, so a quantitative evaluation of the whole-body dose is warranted.

Methods and Materials: We conducted this evaluation for a dedicated helical Tomotherapy delivery device (Hi-Art System®, Tomotherapy Inc) and compared the results against the previously published serial Tomotherapy system (Corvus, NOMOS Corporation) and traditional IMRT whole-body data. A typical head-and-neck treatment plan (2Gy per fraction, 6622MU) was prepared and delivered to a large water-equivalent phantom. An ADCL-calibrated large-volume ionization chamber (A17 Exradin) was used to measure the low doses. The dose was measured at both 1.5cm (d_{max}) and at the center of the phantom.

Results: From 10cm to 48cm from the inferior target edge (the most proximal serial tomotherapy point was at 10 cm), the helical tomotherapy dose was less than 0.5% of the target dose, and was between 20% and 30% of the serial tomotherapy leakage dose. This study showed that the whole-body dose for the 70Gy is approximately 140mSv. This dose is less than the 560mSv for a 70Gy treatment as published by Followill, et al. (Int.J.Radiat.Oncol.Biol.Phys. 38, 667).

Conclusions: This study indicates that the commercial helical Tomotherapy system provides less whole-body dose than serial Tomotherapy or conventional IMRT. This is probably due to the internal linear accelerator shielding design and the use of 6 MV photons.

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