

AbstractID: 6924 Title: Risk of Secondary Fatal Malignancies from Hi-Art Tomotherapy IMRT

Purpose: This work compares out-of-field secondary doses and associated risk of a fatal secondary malignancy from a Hi-Art Tomotherapy machine and a conventional gantry based accelerator for an adult IMRT prostate and a pediatric cranio-spinal treatment.

Method and Materials: A conventional 3D and tomotherapy IMRT cranio-spinal treatment plan were developed to deliver the same prescription to a pediatric anthropomorphic Rando phantom using a Philips Pinnacle and Hi-Art Tomotherapy planning system, respectively. Similarly, an adult IMRT prostate treatment plan, using the Pinnacle and tomotherapy planning systems was developed to deliver the same prescription with the same constraints to an adult Rando phantom. The target and organs at risk (OAR) were contoured. TLD were located within each of the OARs selected. Each phantom was irradiated three times per plan. The out-of-field organ TLD doses for the gantry based delivery and tomotherapy treatments were compared. For each organ site, an average dose was determined and organ weighted linear non-threshold dose response model risk factors were used to estimate the risk of a secondary fatal malignancy for each treatment.

Results: Doses calculated from the adult TLD data were lower for all organs when treated with the Tomotherapy plan and the overall risk was lower. The pediatric TLD dose findings were mixed between the 3D and tomotherapy treatment, however because of the higher integral dose with the Tomotherapy, the overall risk is higher for the Tomotherapy treatment.

Conclusion: The risk of a secondary fatal cancer was lower for the Hi-Art Tomotherapy adult prostate treatment than the gantry based IMRT treatment due to due to the lower integral out-of-field secondary radiation doses. The risk for the pediatric case appears higher for the Hi-Art Tomotherapy treatment than the 3D conformal cranio-spinal treatment.

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Conflict of Interest (only if applicable):