AbstractID: 3490 Title: Non-Tumor Integral Dose in Conformal, External Beam Radiation Therapy

Purpose: To investigate the computed non-tumor integral dose (NTID) delivered during treatment of prostate cancer with intensity modulated radiotherapy (IMRT) compared to three-dimensional conformal radiotherapy (3DCRT). Low and high-energy photon treatments were also evaluated in this study, as was helical tomotherapy for IMRT delivery versus a conventional linac.

Method and Materials: Five patients with localized prostate cancer were selected. Five treatment plans were generated for each, including: IMRT with both 6 and 20 MV photons using a conventional linac (6MV-IMRT, 20MV-IMRT respectively), 3DCRT with both 6 and 20 MV photons (6MV-3DCRT, 20MV-3DCRT respectively), and IMRT with 6 MV photons delivered using helical tomotherapy (Tomo-IMRT). For each plan, a total of 70 Gy was prescribed to 95% of the PTV and the integral dose was calculated from dose-volume histograms for non-tumor tissue as well as surrounding critical structures.

Results: The NTID with conventional IMRT was 3.9-5.2% less than with 3DCRT, and the use of 20 MV photons resulted in 6.7-8.0% less NTID than treatments using 6 MV. Tomo-IMRT treatments were comparable to those delivered with a conventional linac. Examination of the integral dose given to surrounding critical structures showed that, compared with 6MV-3DCRT, 6MV-IMRT reduced the integral doses to the rectal wall and penile bulb by 2.8% and 6.3% respectively. Tomo-IMRT further reduced the integral doses to these structures by 12.6% and 18.0% respectively. No reductions were seen using 20 MV.

Conclusion: The differences in NTID calculated from different treatment plans are relatively small and might be negligible after accounting for leakage and neutron production at higher energies. The advantage of helical tomotherapy in the treatment of localized prostate cancer was demonstrated through the greater sparing of critical structures with no significant increase in NTID.

Conflict of Interest: This work was partially supported by TomoTherapy Inc. and PO1 Grant CA88960-01-05.