

AbstractID: 14165 Title: Do stricter IMRT planning constraints produce better radiobiological results?

Purpose: Widely used for prostate cancer treatment, IMRT provides more conformal dose to target and better sparing of the critical normal structures than 3DCRT. It has been shown that the stricter constraints in IMRT planning provide better dosimetric results. The purpose of this study is to assess if the stricter constraints also produce better biological consequence by using the biological effective uniform dose (BEUD) and complication-free tumor control probability (P_+). **Method and Materials:** The IMRT plans were created for 9 and 7 prostate cancer patients respectively with 6 MV and 18 MV photon beams, using two IMRT planning dose/volume constraints of OARs: from RTOG 0415 (RTOG) and from published data with stricter constraints (FCCC), separately. For each patient, the contours of prostate (GTV=PTV), bladder, rectum, left and right femoral heads, and penile bulb were delineated on planning CT by the same physician. The biological difference of corresponding plans was measured and compared by the BEUD ($\bar{\bar{D}}$) and P_+ .

Results: At the optimum dose levels of the RTOG dose constraint using 6 and 18 MV photons, the P_+ is 61.1% for a $\bar{\bar{D}}_{PTV}$ of 90.4 Gy and 62.6% for a $\bar{\bar{D}}_{PTV}$ of 90.3 Gy, respectively, and the corresponding total tumor control probabilities P_B are 89.2% and 88.9%, whereas the total complication probabilities P_t are 28.1% and 26.3%, respectively. At the optimum dose levels of the stricter FCCC dose constraint using 6 and 18 MV photons, the P_+ is 84.6% for a $\bar{\bar{D}}_{PTV}$ of 95.4 Gy and 77% for a $\bar{\bar{D}}_{PTV}$ of 92.8 Gy. The corresponding total tumor control probabilities P_B are 95.1% and 92.8%, whereas the total complication probabilities P_t are 10.5% and 15.8%, respectively. **Conclusion:** The more stringent IMRT planning constraints leads to better radiobiological outcome for prostate cancer treatment at the same beam energy.

Conflict of Interest: None.