AbstractID: 10317 Title: Is IMRT better than 3D conformal therapy for prostate cancer? A radiobiological comparison

Purpose: This study compares and evaluates radiation therapy plans for prostate cases using both 3D conformal treatment (3DCRT) plans and IMRT plans, to ascertain if there are dosimetric advantages to IMRT, given the current constraints. We perform a more comprehensive treatment plan evaluation using the biologically effective uniform dose ($\bar{\bar{D}}$) together with the complication-free tumor control probability (P_+). **Materials and Methods**: Plans were generated for ten prostate cases using the Pinnacle[3], HiArt Tomotherapy, and Corvus TPSs, using two sets of IMRT constraints: from RTOG 0415, and from published data with stricter constraints. The biological equivalent of the corresponding difference in their mean doses was estimated by the Biologically Effective Uniform Dose ($\bar{\bar{D}}$). **Results**: At the optimum dose levels of the 3D-CRT dose distributions using 6 and 18 MV energy photons, the complication-free tumor control probability, P_+ is 59.3% for a $\bar{\bar{D}}_{PTV}$ of 89.0Gy and 67.7% for a $\bar{\bar{D}}_{PTV}$ of 89.6Gy, respectively. The respective total control probabilities, P_B are 87.8% and 89.0%, whereas the corresponding total complication probabilities, P_I are 28.5% and 21.3%. At the optimum dose levels of the RTOG dose distributions using 6 and 18 MV energy photons the complication-free tumor control probability, P_+ is 61.9% for a $\bar{\bar{D}}_{PTV}$ of 87.9Gy and 59.1% for a $\bar{\bar{D}}_{PTV}$ of 87.0Gy, respectively. The respective total control probabilities, P_B are 85.6% and 83.3%, whereas the corresponding total complication probabilities, P_I are 23.6% and 24.2%. **Conclusions**: The 3DCRT plans were able to meet the RTOG criteria, suggesting the added time and expense of IMRT planning was not justified for these cases. To evaluate clinical cases, traditional dose based evaluation tools should be complemented by radiobiological measures. In such situations, the use of $P_+ - \bar{\bar{D}}$ diagrams to compare similar treatment plans may show that although they look dosimetrically similar, in radiobiological terms they may be quite different.