

AbstractID: 11379 Title: Comparison of biological effective dose between protons and seed implant plus IMRT for prostate treatment

Purpose: To use biological effective dose (BED) as a metric to compare the dosimetric difference between mixed modality photon treatment (LDR seed implant followed by IMRT treatment) and intensity-modulated proton therapy (IMPT) for prostate cancer. **Methods and Material:** An in-house program was developed to calculate the total BED for three patients who received mixed modality photon treatment (MMPT). These patients first received brachytherapy using Pd-103 prescribed to a dose of 100 Gy to 90% of the prostate volume (112 Gy BED) followed by IMRT prescribed to a dose of 45-Gy IMRT (85.5 Gy BED) to 95% of the PTV (6-mm margin posteriorly and 1 cm elsewhere). To simulate IMPT, the inverse treatment planning system KonRad from German Cancer Research Center was used to design a two-field opposed lateral IMPT plan delivered using the spot scanning technique and was prescribed to a total dose of 81 Gy to 95% of the PTV volume (153.9 Gy BED). **Results:** In all three cases, MMPT shows minimal difference in target coverage (98% of the prostate) compared to IMPT. MMPT had higher dose heterogeneity due to the high dose gradient close to the implanted seeds, but the areas of high dose are completely confined within the target borders. The rectal and bladder biological effective DVH (BEDVH) both show that the histogram curve is higher for BEDs less than 100 Gy for MMPT compared to IMPT. The curves cross at 100 Gy and the MMPT histogram curve is lower than IMPT for all doses greater than 100 Gy. **Conclusion:** MMPT provides superior high BED (>100 Gy) normal tissue sparing compared to proton therapy for similar target coverage. In addition, considering the high-cost of a proton facility, MMPT provides a more financially viable alternative to prostate cancer treatment.