AbstractID: 6908 Title: The Use of Biological Effective Dose - Dose Volume Histograms for Comparison of Prostate Cancer Treatment Plans

Prostate cancer patients treated with radiation may receive external beam radiotherapy (EBRT), interstitial brachytherapy (IB) or a combination of these two regimens. Comparing treatment plans, as a function of dose, for each modality (or combination) is difficult due to differences in the dose rate associated with each procedure. The goal of this work is to develop a methodology for comparing dose volume histograms (DVHs) for each of the three treatment modalities using the biological equivalent dose (BED). Initially, a 3D dose distribution is calculated for the EBRT and/or IB portions of treatment. BED is calculated on a point-by-point basis to produce a BED distribution. These distributions may be used individually, or summed for combined therapies. BED-DVHs of the prostate, urethra, rectum and bladder were produced. We compared the BED-DVHs for various combinations of EBRT and IB (e.g., 100%-0%, 75%-25%, 50%-50%, 25%-75%, 0%-100%). In each case, the doses were normalized to provide the same minimum BED coverage of the prostate, with 100% IB used as the standard dose. A comparison of the BED-DVHs demonstrates that increasing the IB portion of the treatment results in more BED inhomogeniety within the prostate, and higher BEDs to the urethra. However, this results in smaller volumes of the bladder and rectum receiving the same BED compared to treatments comprised of mostly EBRT. The results of our analysis may assist physicians in determining the best treatment modality for individual patients, and will provide a method for comparing the dose-response relationship between each of these treatments.