AbstractID: 1365 Title: Realistic dose calculations for prostate implant

A Monte Carlo study is performed to quantify the dosimetric effects of interseed attenuation, seed anisotropy and seed orientation for ^{103}Pd and ^{125}I prostate implants. Idealized and real implants are considered. Full Monte Carlo simulation (FMCS) of implants (all seeds are physically simulated) is compared with 1D and 2D dose kernel superposition (1DKS, 2DKS). The 1D and 2D kernels are consistent with the point source and line source models (TG-43), respectively. The dose to the prostate, rectum and urethra are calculated. The volumes of these structures are discretized using transrectal ultrasound images. Dose differences (1DKS and 2DKS vs. FMCS) are investigated for co-linear and randomly oriented seeds. Primary and scattered dose are calculated separately. The average absolute dose difference between FMCS and 1DKS is 6.14% for the clinical preplan (^{103}Pd) and 3.7% for the clinical postplan (^{125}I). For both seeds, average dose differences between the 2DKS and FMCS are less significant: 2.5% to 3.2% for clinical plans. Differences between 1DKS and FMCS are due to the absence of seed anisotropy and interseed attenuation in the 1DKS approach. 2DKS accounts for seed anisotropy but not for the interseed effect, leading to systematic overestimated dose in comparison with FMCS. For both idealized and clinical implants the scattered dose represents less than 1/3 of the total dose. Prostate DVHs with co-linear and randomly-oriented seeds show no significant differences for the clinical plans. Prostate DVHs from 1DKS and 2DKS are almost indistinguishable and right-shifted (by less than 5% of D_{90}) in comparison with FMCS.