AbstractID: 10147 Title: Dosimetric analysis of the effect of edema in 131Cs prostate permanent seed implants.

Purpose: To investigate the effect of edema on different dosimetric parameters in ^{131}Cs prostate permanent seed implants.

Materials and Methods: Transrectal ultrasound (US) and computer tomography (CT) images were used to determine pre- and post-needle implant volumes, and post-implant prostate volumes in 31 patients who had received ^{131}Cs implant. Dose volume histograms(DVH) were generated to determine the prostate volumes that received 100%, 150% and 200% of prescribed dose to calculate quality indices(QIs) and fractional D90(FD90) for each set of volumes for all patients.

Results: No statistical differences were found between post-needle and post-implant(day 0) volumes obtained by US and CT images(p=0.56). The half life of the edema was found to be 9.72days.

The change in mean values of coverage index(CI), dose non-uniformity ratio(DNR), overdose index(ODI), relative dose-homogeneity index(DHI) and FD90 can be described by

$$CI(t)=CI(0)+[1-CI(0)][1-\exp(-\lambda_{CI}t)] \quad (1)$$

$$DNR(t)=DNR(0)+[1-DNR(0)][1-\exp(-\lambda_{DNR}t)] \quad (2)$$

$$ODI(t)=ODI(0)+[1-ODI(0)][1-\exp(-\lambda_{ODI}t)] \quad (3)$$

$$DHI(t)=DHI(0)\exp(-\lambda_{DHI}t) \quad (4)$$

and $$D90(t)=(R_0/\lambda)\exp(-\lambda t)\{FD90(0)+[FD90(0)-a][1-\exp(-\lambda_{FD}t)]\} \quad (5)$$

differential equations. The values of correlation coefficients and time constants obtained from least square fit of these equations were found to be 0.9867 & 0.0316 for CI, 0.9988 & 0.0148 for DNR, 0.9958 & 0.00148 for ODI, and 0.9983 & 0.0125 for DHI, respectively.

Conclusions: CI, DHI and FD90 decreased, while DNR and ODI increased from pre–implant plans to post–implant plans at day 0 due to edema formation. CI, DNR, ODI and FD90 increased and DHI decreased with increasing post-implant time and attained optimal values in 4 weeks. During this period 85% dose is delivered due to short half life of ^{131}Cs seeds. Therefore, it is important to account for the effect of edema at the time of implant while defining seed positions. Implants performed based on pre-implant volume study only result in poor dosimetric results in ^{131}Cs implants.

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