AbstractID: 12906 Title: Effect of Edema on Survival Fraction and Biologically Effective Dose in 131Cs Prostate Permanent Seed Implants.

Purpose: To investigate the effect of edema on Survival Fraction(SF), and Biologically Effective Dose(BED) in ^{131}Cs prostate permanent seed implants.

Materials and Methods: To account the effect of edema decay on SF and BED with post implant time, the following relations were derived

$$S(D) = \frac{1}{V}\sum_{i=1}^{n}[(V_{pi} + \Delta V_i \exp(-\lambda_e t))S_i(D)] \quad (1)$$

and

$$BED = -(1/\alpha)\ln[S(D)] \quad (2)$$

Where V, V_{pi}, ΔV_i, λ_e and t are the initial tumor volume with edema, pre-edema volume of i^{th} voxel, amount of edema at day 0 in i^{th} voxel, edema decay constant and post implant time, respectively. $S_i(D)$ is the SF of cells in i^{th} voxel with dose protraction factor which consists decay constant of radioactive source and repair constant of sublethal damage. Dose volume histograms(DVH) of 31 patients with prostate cancer, who underwent ^{131}Cs implantations, were used to computeS(D) and BED using values of LQ model parameters given in the AAPM TG-137 report, and edema decay constant λ_e=0.0713d^{-1}.

Results: S(D) and BED values, obtained for reference dose without edema correction, with edema decay to CT images at 0 day and individual CT images at 14 and 28 days, are 9.45×10^{-6} and 77.13Gy, $1.52\times10^{-5}\pm3.92\times10^{-5}$ and 74.05±4.99Gy, and $1.048\times10^{-5}\pm4.96\times10^{-6}$ and 80.33±4.20Gy at day 14, and 1.57×10^{-7} and 104.46Gy, $1.31\times10^{-6}\pm5.24\times10^{-6}$ and 90.35±6.38Gy, and $1.082\times10^{-6}\pm8.023\times10^{-7}$ and 99.96±6.69Gy at day 28, respectively. There is statistically significant differences between the reference values and edema corrected values($p<0.05$). However there is no statistically significant differences between edema corrected values($p>0.05$) were found. **Conclusions:** The described equations with an account of edema decay provides accurate values of S(D) and BED at different post implant times. It can be concluded that the effect of edema must be accounted at the time of implant, and implants should not be performed based on pre-implant volume study in ^{131}Cs implants.

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