

AbstractID: 1354 Title: Dosimetric effects of seed placement errors in prostate seed implant brachytherapy: A Monte Carlo Model

One of the main problems with prostate implant brachytherapy is that the implanted seeds are always displaced from their planned positions. A Monte Carlo model based on published data has been developed to examine the differences in the dose distribution resulting from the inaccurate placement of seeds in prostate implants. The model considers random variations of the position of the seeds along the Z axis (along needle) and in the XY (transversal plane) as well as combined displacements. The displacements have been selected randomly in the range  $\pm 1$  mm,  $\pm 2$  mm,  $\pm 3$  mm,  $\pm 4$  mm,  $\pm 5$  mm for the Z case and  $\pm 1.0$  mm,  $\pm 2.0$  mm,  $\pm 3.0$  mm for the XY plane. The simulated patient sample size was 1000. Prostate sizes examined ranged in volume from  $27 \text{ cm}^3$  to  $125 \text{ cm}^3$  and the number of seeds implanted ranged from 27 seeds to 125 seeds. Coverage indexes (CI) were used to investigate the effect on the dose distribution caused by seed positioning errors. The results showed that for the  $27 \text{ cm}^3$  prostate, the average CI reduces from 100% for an ideal implant to 85% i.e. only 85% of the target volume was covered with the prescription isodose for seed placement errors of  $\pm 3$  mm. It was also observed that 10% of the patients have coverage indexes which were as low as 70%. The dosimetric errors associated with prostate implant brachytherapy were more significant for  $27 \text{ cm}^3$  prostate than for the  $125 \text{ cm}^3$  prostate.