

AbstractID: 3644 Title: A Study of the Effects of Seed Migration on Prostate Post-seed Dose Plan Evaluation

Purpose:

Brachytherapy using permanent seed implants has been an effective treatment for prostate cancer. It is a known fact that the seeds will migrate after implant, thus making the evaluation of long-term (e.g. a few weeks) dose distribution difficult. We have performed a sensitivity analysis to determine the impact of seed migration on post-seed dose plan evaluation parameters.

Method and Materials:

The CMS Interplant system and loose Pd-103 seeds are used for the implant. The prostate is implanted with direct ultrasound visualization. CT scan and radiographs are taken 3 hours after the implant. Dosimetric studies are done using Nucletron's Theraplan Plus treatment planning system based on CT images.

The migrations of the seeds are randomly modeled according to Gaussian distribution. The mean migration is taken to be 0.5 cm and the sigma to be 0.25 cm. These numbers are close to latest clinical observations published. To test the sensitivity, an extreme case with mean migration of 1.0 cm and sigma of 0.5 cm is also modeled and compared.

Patients are divided into 3 groups according to the prostate size. For each patient, the seed locations are modeled 10 times for a given mean migration, and the resulting 10 DVHs from the 10 trials are compared. Data are summarized according to prostate size and mean migration.

Results:

Preliminary results shows that D_{100} and D_{90} for prostate change about 3.5% and 2.5% respectively, V_{100} for prostate changes by about 25%, V_{100} and V_{150} for urethra change by about 20% and 50% respectively, and V_{50} for rectum changes by about 15%.

Conclusion:

Dose distribution changes as seed migrate, especially for the volume coverage. This effect should be taken into account when evaluating post-seed plans. Quantitative knowledge of this effect may also factor into the seed distribution in the pre-plan.