

AbstractID: 5557 Title: Effect of non-uniform source strength on I-125 prostate implant dosimetry

Purpose: The current quality control policies in brachytherapy recommends assaying at least 10% of the seeds and source strengths uniformity should not be greater than 3% in those assayed seeds. In real clinical cases, the un-assayed seeds from the same batch may have larger source strength non-uniformity. In this study, we investigated the effect of non-uniform source strength on ^{125}I prostate implant dosimetry.

Method and Materials: Ultrasound images were obtained from volumetric measurement; those images were digitized into TheraPlan Plus planning system (Nucletron) for calculation with uniform source strength. A clinical pre-plan was approved and used as reference plan. AAPM TG43 dosimetric system was used for dose calculation throughout the study. While keeping seed positions fixed, the iodine-125 seeds were assigned different source strength sampled from four normal probability distributions with 5%, 10%, 20% and 30% standard deviation centered on mean source strength respectively. The pre-plan was then recalculated with sampled seed strength and the V200, V150 and V100 were compared with those of the original pre-plan with uniform seed strength.

Results: The maximum change from 5 patients for V100 is -0.4%, -0.8%, -1.4% and -3.3% for normal probability distribution with 5%, 10%, 20% and 30% standard deviation respectively when compared with uniform source strength plans. For V150 the maximum change is -2.6%, 4.0%, -5.1% and 20.1%. And for V200, the maximum change is -3.5%, -5.9%, -8.9% and 31.8% respectively.

Conclusion: V100 changed less than 3.5% with 30% source strength non-uniformity; implying V100 was not sensitive to source strength distribution. V200, V150 and V100 changed less than 4.0% with 5% source strength non-uniformity. With a source strength non-uniformity of 5%, its effect on ^{125}I prostate implant dosimetry was not significant. Evaluation of DVHs for urethra, rectum wall and location of hotspot were still underway.