

AbstractID: 9073 Title: Impact of Seed Localization on Post-Implant Dosimetry in Prostate Brachytherapy

Purpose:

To study the impact of seed localization, as performed by different observers using linked I-125 seeds, on post-implant dosimetry in prostate brachytherapy and to compare TRUS-based with CT-based approach for the dosimetric outcomes.

Method and Materials:

Permanent prostate implant is conducted using linked I-125 seeds. Both post-implant TRUS and CT images were acquired and the prostate glands were delineated on each of those images by a single oncologist, who performed the seeding procedures for all 19 patients under study. Six observers then independently localized the seeds on both TRUS and CT images, based on which the principle dosimetric parameters V_{100} , V_{150} and D_{90} were directly calculated for each patient. A single-factor analysis of variance (ANOVA) is first applied to determine inter-observer variability in seed localization. A non-parametric comparison of the approach using the two imaging modalities, TRUS and CT, is then carried out by the Wilcoxon paired-sample test.

Results:

Analysis from the ANOVA for TRUS (V_{100} : $P=0.655$; V_{150} : $P=0.994$; D_{90} : $P=0.734$) and CT (V_{100} : $P=0.901$; V_{150} : $P=0.999$; D_{90} : $P=0.99$) shows that the null hypothesis for equal means, cannot be rejected for all six observers based on a significance level $\alpha=0.05$. TRUS-based and CT-based approaches are then cross-compared by the Wilcoxon paired-sample test, which suggests that the null hypothesis is not rejectable for V_{100} and D_{90} , but is for V_{150} .

Conclusion:

Both TRUS and CT imaging modalities provide indistinguishable post-implant dosimetry results as far as V_{100} and D_{90} are concerned. TRUS-based seed localization has comparable observer independence as CT-based seed localization for linked-seed implant procedures. In view of other advantages that TRUS imaging modality has over CT in the evaluation of post-implant dosimetry, TRUS can therefore be an alternative gold standard to CT and would be a preferred choice together with linked-seed for intra-operative procedures in prostate brachytherapy.