

AbstractID: 4385 Title: Comparison Of Inverse Planning Simulated Annealing And Graphical Optimization For Prostate High Dose-Rate Brachytherapy

Purpose:

HDR dose optimization may be performed using a combination of Geometric Optimization (GO) and manual adjustment e.g. Graphical Optimization (GrO), but is time-consuming. Optimization using anatomy based inverse planning e.g. Inverse Planning with Simulated Annealing (IPSA) can generate a solution in minutes. This study compares optimization using IPSA and GrO for treatment of prostate cancer.

Materials and Methods:

A retrospective comparison was performed of 63 consecutive patient plans generated and treated using GrO then re-planned using IPSA. The clinical target volume and critical organs were contoured using PLATO v14.2.6 (Nucletron). A dose of 10Gy per insertion was prescribed to the 100% isodose. Dose optimization was performed using a combination of GO and GrO. For GrO, the isodose was dragged to the desired position, and the system automatically recalculated the appropriate dwell times. For each plan, the following dosimetric comparisons were made between that generated by IPSA and that generated and treated using GrO: prostate V100, V150, V200, urethra V120, Rectal V80, bladder V80, Homogeneity Index (HI) and Conformity Index (COIN).

Results:

The V100 was slightly lower with IPSA (GrO=97.5%, IPSA=96.7% p=0.001) but with a greater reduction in V150 (GrO=35.6%, IPSA=30.2% p=0.000) and V200 (GrO=12.7%, IPSA=10.7% p=0.000). Similarly, V120 for urethra (GrO=16.1%, IPSA=6.7% p=0.000), V80 for rectum (GrO=2.1%, IPSA=1.3% p=0.000) and V80 for bladder (GrO=2.3%, IPSA=1.3% p=0.000) were significantly lower with IPSA. HI increased (GrO=0.63, IPSA=0.69 p=0.000) while COIN was lower (GrO=0.71, IPSA=0.68 p=0.000).

Conclusions:

IPSA enables the rapid generation of dose-optimized plans. The resultant plans provide comparable target coverage but with greater dose homogeneity, a lower high dose volume and lower dose to critical organs. Planning time was reduced using IPSA. This is a significant advantage over other methods of dose optimization in a clinical environment.