AbstractID: 9369 Title: Inverse Planning Simulated Annealing [IPSA] Optimization versus Manual Optimization in the treatment of prostate cancer using Ir-192 High Dose Rate Brachytherapy

Purpose: Traditionally the dose distribution in the high-dose-rate (HDR) brachytherapy of the prostate is optimized using algorithms based on forward planning approaches, such as dose-point optimization, geometric optimization and graphic optimization. Recently, a new inverse optimization technique based on inverse planning simulated annealing [IPSA] has been introduced.

Material & Methods: We have retrospectively planned and analyzed 10 HDR prostate patients with IPSA and have compared the results with manual optimization [MO] based on forward planning approach [dose-point optimization followed by graphical optimization]. All the plans satisfied the evaluation criteria of RTOG-0321 protocol with a dose-prescription of 1900 cGy in 2 fractions. Various indices like V_{100}, V_{150}, V_{200}, D_{90}, conformity index, dose homogeneity index [DHI] for the prostate, V_{75} for rectum and bladder and V_{125} for urethra were compared.

Results: The prostate volume ranged from 40.4 to 84.8 cm^3 with mean and median volumes of 60.1 and 55.2 cm^3, respectively. The number of implanted catheters varied from 17 to 27 with a mean of 21.2. The mean V_{100} in MO and IPSA plans was 92.9% & 93.2%, respectively, while the corresponding values for D_{90} were 1003 & 993.8 cGy. The conformity index, defined as the ratio of the prescribed dose volume to the prostate volume, was identical in both the cases and had a value of 1.11, though the standard deviation in MO was 0.2 against 0.1 of IPSA. The mean DHI was slightly better with IPSA at around 0.8 vs 0.7 in case of manual optimization. The V_{75} for rectum & bladder and V_{125} of urethra were similarly improved.

Conclusion: Our results have demonstrated an advantage of IPSA over conventional forward optimization approaches. In certain cases further improvement in the isodose distribution coverage can be obtained if IPSA is followed by graphical optimization.