

AbstractID: 9258 Title: Inverse optimization for cervix cancer brachytherapy including automatic loading, DVH optimization and modification restriction adapted from manual planning

Purpose: This study tests the difference in dosimetric values and performance between a new Hybrid Inverse Planning Optimization (HIPO) tool for cervix cancer brachytherapy and conventional manual optimization.

Method and Materials: The clinically used treatment plans of ten tandem/ring (T/R) and ten cases with additional needles (T/R+N) planned with PLATO (v14.3, Nucletron) were included. Standard loading patterns were manually optimized to reach an optimal coverage with 7 Gy per fraction to the High Risk-CTV and dose constraints for organs at risk. A second plan was retrospectively created with OncentraGYN (v0.9.14, Nucletron). Anatomy based automatic dwell position loading was used to produce loading patterns similar to standard Fletcher loadings, but adapted to the topography of bladder, rectum, and sigmoid. The optimization algorithm included individual dwell time gradient restrictions and modification restriction for the T/R and needle optimization to preserve the spatial high dose and dwell time distribution as accepted for manual plans.

Results: HIPO could achieve a better target coverage (V100) for all T/R and 7 T/R+N patients. The D2cc per fraction for bladder, rectum and sigmoid was on average lower by 0.2 Gy, 0.4 Gy, 0.2 Gy respectively for T/R patients and 0.6 Gy, 0.3 Gy, 0.3 Gy for T/R+N patients (e.g.: a decrease from 4.5 to 4 Gy per fraction means a total dose reduction of 5 Gy EQD2 for a 4 fraction schedule). In 7/10 cases the dwell time in the additional needles was lower as with manual planning. The optimization procedure including handling, evaluation and calculation time (<3s per run) was lower compared to manual treatment planning.

Conclusion: HIPO is a feasible and quick method for treatment planning in cervix cancer brachytherapy. Essential is anatomy based loading, anatomy based optimization and a dedicated concept to control spatial dwell time distribution.

Conflict of Interest: Research sponsored by Nucletron