"Comparison of two inverse planing algorithms HIPO and IPSA in terms of their suitability for breast brachytherapy planning"

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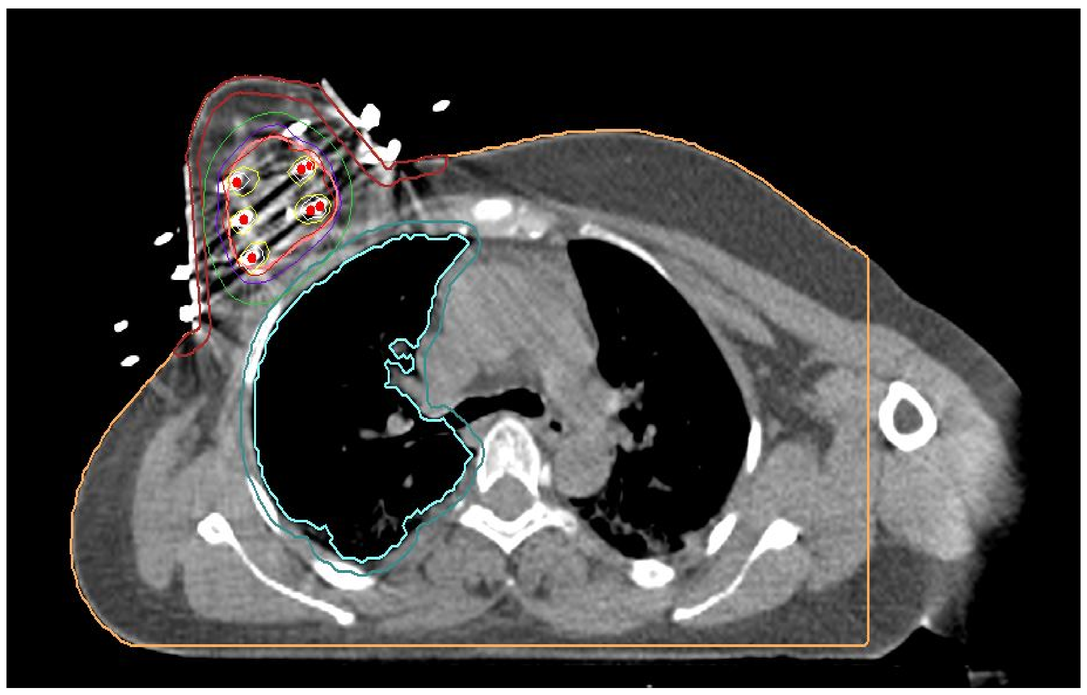
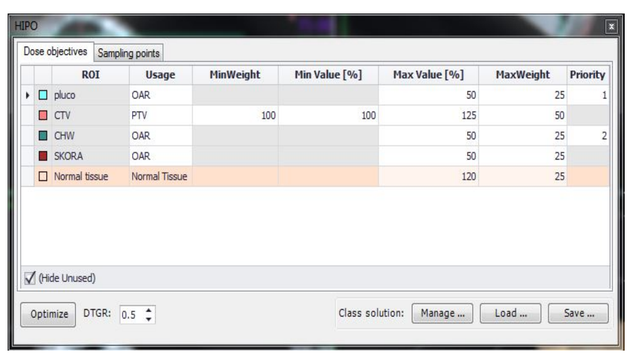
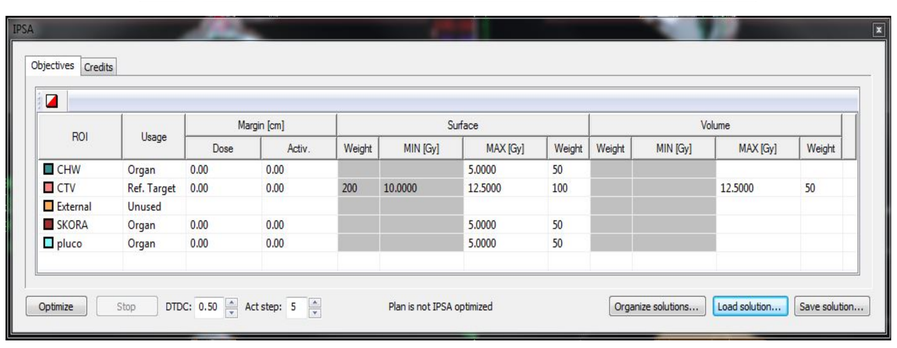
The aim of the study was to compare two algorithms of inverse brachytherapy planning Hybrid Inverse Planning Optimization (HIPO) and Inverse Planning Simmulated Annealing (IPSA) in terms of their suitability fot breast brachytherapy planning. The values of dose distribution parameters were evaluated for target volumes and critical organs.



The analysis included 40 treatment plans prepered for 20 breast cancer patient treated with brachytherapy boost using rigid interstitial applicators. For each patient CTV and organs at risk were countoured. Next, two treatment plans were performed using HIPO and IPSA algorithms with individual constrains selected to be fully comparable.
The source step was set at 5mm and dwell time gradient restriction (DTGR) was set at 0.5 level. Obtained treatment plans were not supoosed to fulfill clinical criteria, but only to show differences between the analyzed algorithms. The collected data were analyzed statistically using the Wilcoxon test for non-parametric variables.

For CTV the following average values were obtained: V100 71,26% and 82,35%, V150% 13,85% and 19,11% and V200 6,31% and 8,39% for IPSA and HIPO algorithms respectively. Similarly, COIN and DNR values were higher using the the HIPO and were 0,65 and 0,93 and 0,2 and 0,22. In case of organs at risk the following values were obtained - for chestwall D1cc 49,60% and 53,80% and D0,1cc 55,62% and 0,56%, for skin D1cc 41,91% and 54,72% and D0,2cc 55,66% and 62,10% respectively for IPSA and HIPO algorithms. The mean dose in the lung was also higher for the HIPO algorithm and reached 15,19% and 21,48% respectively. All differences were statistically significantat p <0.001.





Presented results indicate the predominance of the IPSA algorithm, especially in the area of lowering doses for organs at risk. However the coverage parameter COIN clearly indicates the adventage of HIPO algorithm. This is diectly due to much more uniform dwell times generated by HIPO algorithm. The presented comparison may be used as a valuable hint for choosing the initial optimization method during the process of planning brachytherapy boosts for breast cancer patients.