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abstract

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Automated VMAT Treatment Planning Using Monaco Scripting Option: Clinical Validation for Node-Positive Prostate Cancer

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Introduction: Prostate cancer represents 42% of the VMAT workload in our radiotherapy department. VMAT is the standard technique for treating prostate cancer. However, manual planning for this technique is time-consuming and requires substantial human resources. In addition, the quality of the resulting plans relies heavily on the medical physicist's expertise. To address this clinical challenge, we developed an automated planning script that interfaces with the monaco TPS. This study aims to validate the script clinically by comparing the dosimetric plans it generates with plans created manually.

Methodology: We randomly selected 30 patients treated for node-positive prostate cancer between 2023 and 2025. We used our script to generate treatment plans for all patients and then compared them with approved manual plans. The script is trained using dosimetric results from previous approved manual plans, which allows the parameters of the cost functions of the model used to be adjusted

and provides a better starting point for the optimizer. The script then iteratively optimizes these parameters based on the obtained results.

We compared the coverage of target volumes and OAR constraints. We also analyzed planning time and plan complexity. Paired t-tests were used to compare dosimetric indexes.

Results: No statistically significant differences were observed between the plans. In a heavy workload scenario, a comparison was performed on a single patient. A significant difference was observed for the rectum, with V40Gy and V30Gy reduced by 16.4% and 31.3%, respectively, in the automated plan compared to the manual plan. The number of segments and monitor units were comparable between the two methods. Overall treatment planning time was reduced by 46% with automated planning, decreasing from 70 minutes to 38 minutes.

Conclusion: The results of this study demonstrate that our script generates treatment plans of equivalent or even superior dosimetric quality to manual planning, while limiting the impact of workload.

These findings support the integration of the script into our clinical practice.

Conflict of interests: The authors declare no conflict of interests.

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