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Topic (read-only)

Physics: Dose prediction/calculation, optimisation and applications for photon and electron planning

Keywords (read-only)

auto-planning, prostate cancer

Abstract title (read-only)

Automated VMAT planning for prostate radiotherapy on Halcyon system

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Purpose/Objective (read-only)

Automated VMAT planning for prostate radiotherapy on Halcyon system

Material/Methods (read-only)

Automation in radiotherapy treatment planning is a highly active research field. Promising results have been achieved using a two-step auto-planning (AP) pipeline that includes knowledge-based dose prediction followed by dose mimicking [1,2]. The purpose of AP is to efficiently produce high-quality treatments, minimize inter-observer variability, and reduce planning time. This study introduces and tests a commercially available, fully automated, end-to-end VMAT treatment planning pipeline for prostate radiotherapy [3] for multiple prostate cancer prescriptions on the Halcyon system, an increasingly used clinical platform.

Results (read-only)

Machine learning models were trained using data from multiple institutions in Europe. External validation was conducted on 30 patients across six different regimens, ranging from normo-fractionated to ultra-hypofractionated schedules.
For each patient, the AP pipeline generated a VMAT Halcyon plan with a standardized two-arc beam arrangement, which was imported into Eclipse TPS for final dose calculation. The resulting RTdoses were quantitatively compared with manual plans (MP) using established clinical criteria and prescription-specific guidelines [4–6]. A senior radiation oncologist reviewed the plans, adjusted normalization if needed, and assessed clinical acceptability. A subset of plans underwent patient-specific QA.

Prescription	PTV criteria	OAR criteria	PTV criteria	OAR criteria
80 Gy SV in 40 Fx	8/8	8/8	8/8	8/8
80 Gy LN in 40 Fx	8/8	8/8	8/8	8/8
76 Gy in 38 Fx	4/4	4/4	4/4	4/4
74 Gy in 37 Fx	2/2	2/2	2/2	2/2
60 Gy in 20 Fx	3/4	4/4	4/4	4/4
36.25 Gy in 5 fx	4/4	4/4	4/4	4/4
Overall 30 cases	29/30	30/30	30/30	30/30

Table 1. Comparison of manual vs autoplanning in terms of number of cases that met the protocol criteria for each prescription

Conclusion (read-only)

This study demonstrates the feasibility of a fully automated planning pipeline that generates high-quality, machine-deliverable VMAT plans for prostate cancer on the Halcyon system. AP produced plans comparable to clinically approved manual plans, with significant time savings. This approach could enable a streamlined workflow in which CT, approved contours, prescription, and Linac selection are submitted to the pipeline, producing a ready-to-treat plan with minimal human intervention.

References (read-only)

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Conflict of Interest Disclosure (read-only)

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