Abstract Overview

Automated VMAT Planning for Prostate Radiotherapy on Halcyon System

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Purpose

- To test a commercially available, fully automated, end-to-end VMAT treatment planning pipeline for prostate radiotherapy on the Halcyon system, across multiple indications (6 dose prescriptions).

Mat&Methods

- 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 (Configuration: 2 arc balistic for all the VMAT AP plans).
- Quantitaive evaluation was done comparing AP doses vs the manual plans.
- Qualitative review was done by one senior Rad Onc.
- A subset of plans underwent planQA measurements.

Results

- AP plans were created within 10–20 minutes, including TPS export and dose calculation.
- Using only two arcs, the AP pipeline consistently produced high-quality results, whereas clinical practice often employs additional arcs to meet objectives.
- 29/ 30 AP plans were deemed clinically acceptable; one was rejected due to a hotspot.
- Excellent deliverability with gamma pass rates >99% (3%/3 mm) and >95% (2%/2 mm).

Conclusion

- 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,with minimal human intervention.

- Delivers ready-to-treat VMAT plans, significantly reducing planning time and enabling a streamlined, low-touch workflow.
  10-20 minutes for the plan generation & 10 minutes for plan review by physician□ total ~20–30 minutes.
- Ensures consistent, high-quality plans across multiple prescriptions.
  With 29/30 cases clinically acceptable and comparable to manual planning.
- Produces machine-deliverable treatments with high reliability.
  Demonstrating excellent QA results (>99% gamma pass) using a standardized two-arc approach.

	Number of plans that met the mandatory quantitative critera			
	Manual Planning		AutoPlanning	
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.

Internal