SBRT Plan and Delivery Optimization for Central Lung Tumors on the Versa HD Using Elekta One Planning

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INTRODUCTION

SBRT for central lung tumors can be challenging to plan in a way that achieves high plan quality and allows for maximal treatment delivery speed. Using the Elekta One Planning treatment planning system (v6.2.3, EOP), with the GPU accelerated optimization and GPUMCD for dose calculation, three different planning approaches were investigated to compare changes in plan quality while attempting to optimize treatment delivery time.

METHODS

Three 6FFF VMAT plans were created for 5 different patients with prescriptions of 60 Gy in 8 fractions following the SUNSET protocol. Three planning approaches were investigated that specified the distribution of control points across an arc, including the use of two partial arcs with an arc increment combination of 20˚/10 ˚, two partial arcs with an arc increment combination of 30˚/15 ˚, and one partial arc with two passes with a 10˚arc increment. All plans were optimized similarly in terms of conformity, arc lengths, high fluence smoothing, limited to 150 max number of segments, normal target and avoidance margins, a 0.2 cm beamlet width, and calculated with a 2 mm dose grid.

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RESULTS

Clinically acceptable plans were generated for all optimization geometries and similar plan quality was seen for all plans. A sample slice and DVHs comparing the three different planning approaches are seen in Figure 1 and 2 below. The average estimated delivery time in seconds for each planning approach is presented in Table 1.

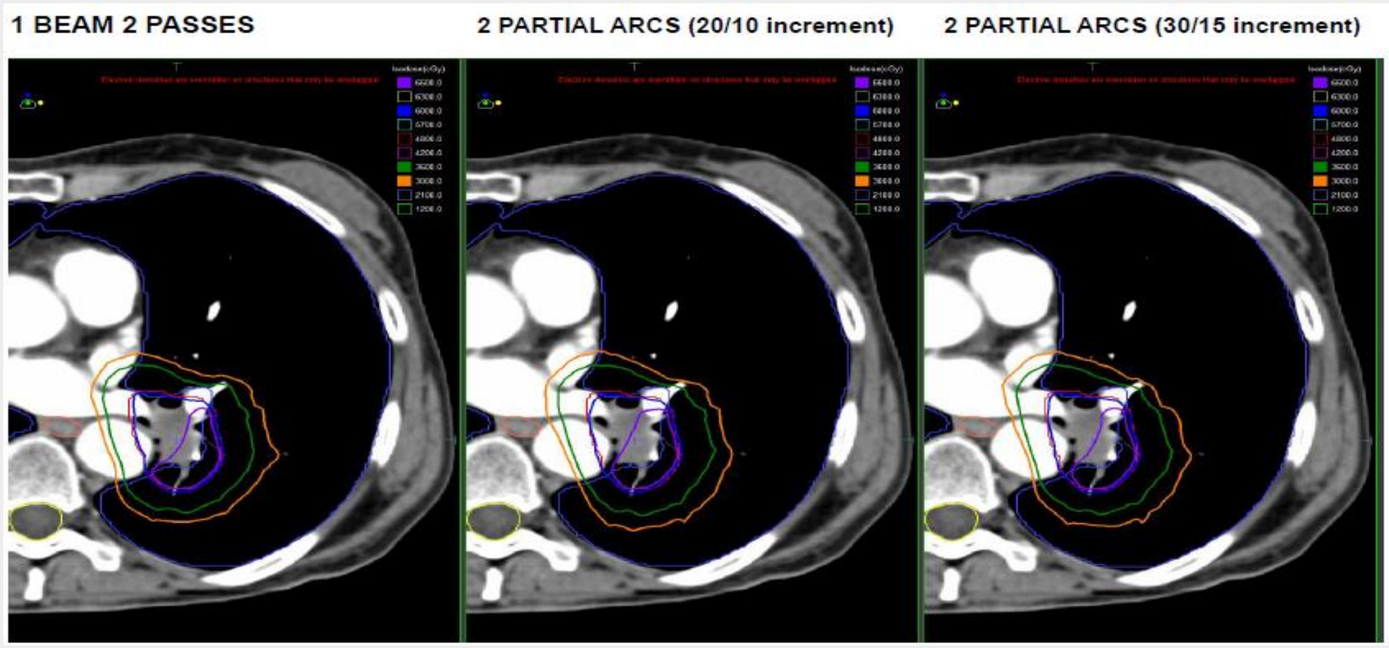

Figure 1: A sample slice showing dose distribution similarity between the different planning approaches

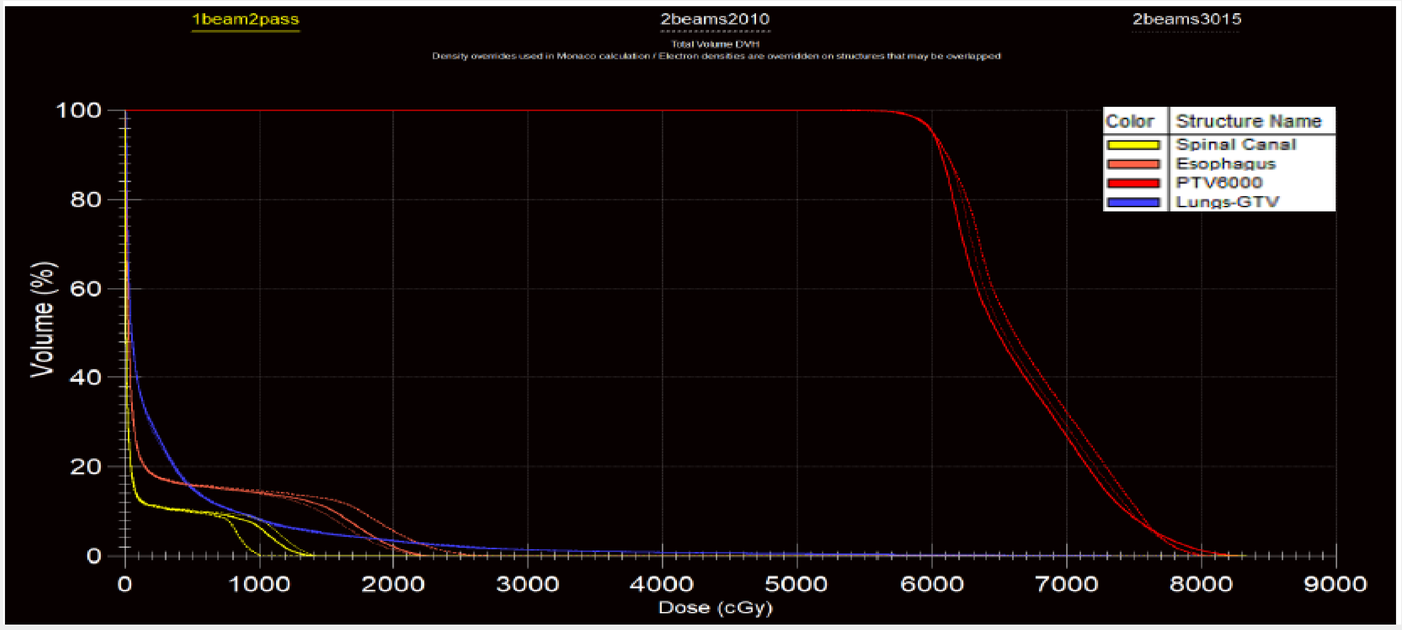

Figure 2: Representative DVHs for the different planning approaches for the PTV and a subset of OARs

Beam Geometry	Average Estimated Delivery Time (s)
One Partial Arc with 2 Passes (10˚ arc increment)	195.9 ± 54.8
Two Partial arcs (20˚/10 ˚ arc increment)	231.2 ± 58.1
Two Partial arcs (30˚/15 ˚ arc increment)	244.8 ± 59.2

Table 1: Average estimated delivery time of the three planning techniques across the five patients investigated

DISCUSSION

All investigated planning approaches on a VersaHD allowed EOP to generate clinically acceptable plans for all 5 patients. In all cases, the one partial arc geometry with two passes resulted in the fastest delivery speed with consistent plan quality and OAR doses across all approaches. While other approaches and techniques could be investigated, a limited study was done to determine the most optimal method to use in our clinic.

CONCLUSIONS

The one partial arc with two passes was found to have the fastest delivery among the planning techniques investigated while maintaining consistent plan quality metrics. As a result, this planning approach seems advisable to use clinically since it best balances plan quality with treatment efficiency.

REFERENCES

1. EOP/GPUMCD Documentation
2. Choi JH, Ryu H, Oh DH, Yoo L, Chun M. Dosimetric advantages of dual arc increments for head and neck volumetric-modulated arc therapy in the Monaco treatment planning system. J Appl Clin Med Phys. 2025; 26:e14571. https://doi.org/10.1002/acm2.14571