

## INTRODUCTION

Varian Ethos is a commercially available CBCT-guided online adaptive radiotherapy machine. Ethos utilizes an artificial intelligence (AI) aided plan re-optimization. This work is the first to evaluate the adapted plan quality and fidelity for stereotactic plans for upper abdominal malignancies.

## METHODS

- Five abdominal cancer patients
- Initial plans on CT simulation (50Gy in 5 fraction)
- High quality CBCT images were acquired on the Ethos linac and were used to guide daily adaptation to simulate the adapted workflow (23 fractions simulated).
- Adapted plan quality evaluated (MU, Dmax, PTV coverage, conformity index (CI), and OAR sparing)
- An online calculation based quality assurance was done with Mobius3D.
- Adaptive plans were also delivered to a phantom (Octavius4D) for 3D dose verification. Gamma values (2%/2mm)

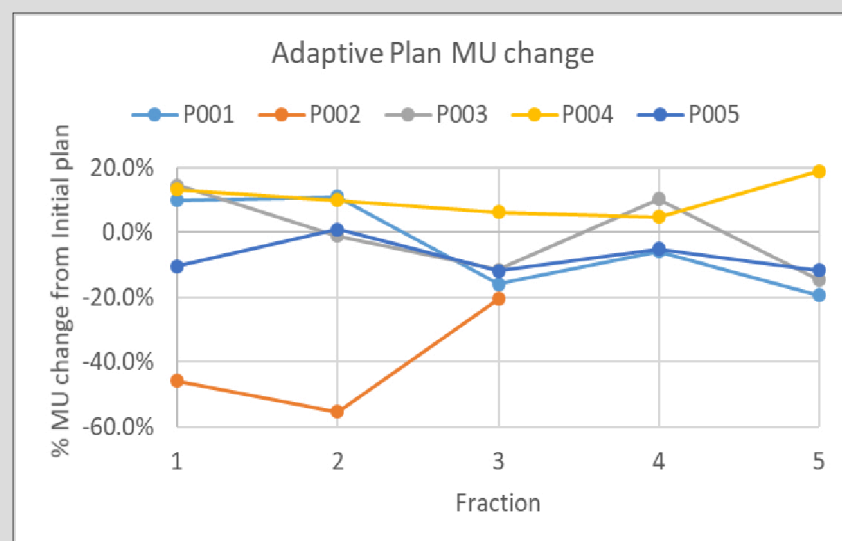


Figure 1: Percent MU difference of adapted plan compared to the initial plan. Max increase was 19.1%, while greatest decrease was 55.4%.

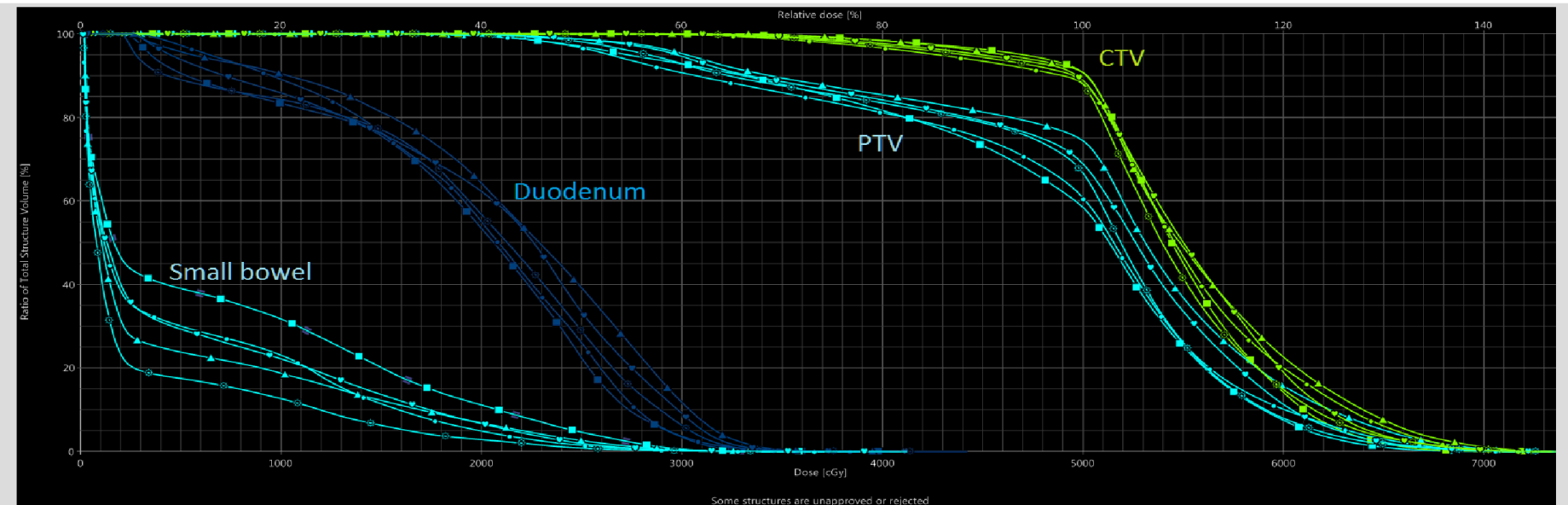


Figure 2: DVHs for all 5 simulated adapted plans for P003. AI-aided plan optimization provided consistent plan quality while accounting for differences in structure volume and positioning.

## RESULTS

- Maximum MU increase was 19.1%, while the greatest decrease was 55.4%.
- Adapted Dmax changes ranged from -7.3% to +5% (mean Dmax = 138% for all plans).
- V100% for the PTV ranged from 97% to 59%.
- Largest adapted plan increase in coverage compared to initial plan was 19%, while the largest decrease in coverage was 13%.
- CI ranged from 1.12 to 0.59, while adapted CI changes ranged from -21.3% to +17%.
- For 3/5 patients, adapted plan coverage was at or better than the initial plan for each fraction (13 fractions).
- For the other 2 patients 6/10 fractions had reduced coverage to meet OAR constraints.
- Hard OAR constraints were met for every fraction.
- The Mobius3D and Octavius4D measurements (n = 17) yielded an average Gamma passing rate of  $97.2\% \pm 0.9\%$  and  $95.3\% \pm 1.9\%$ , respectively.

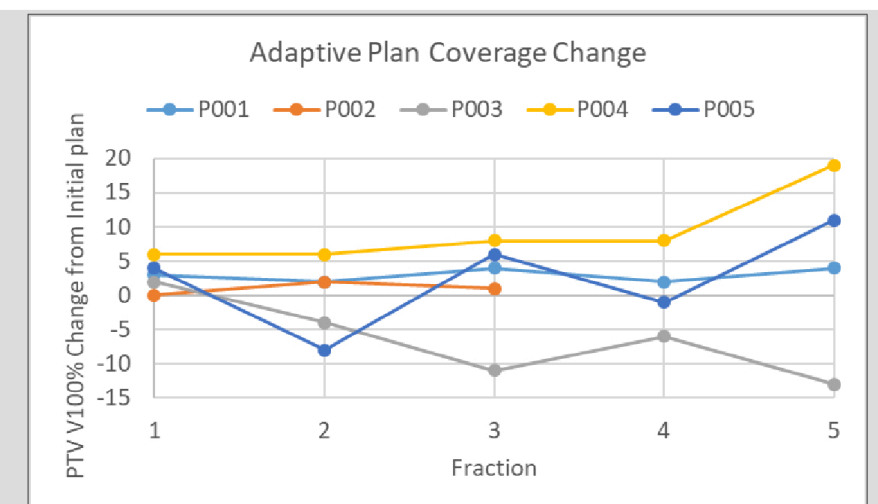


Figure 3: Change in PTV V100% from initial to adapted plan. Plan coverage decreased at most by 13%, while greatest increase in coverage was 19%.

**CONCLUSIONS:** Online plan adaption with Ethos platform is feasible and the adaptive plan quality and fidelity was verified.

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