

# Dosimetric Advantages of Daily Adaptive vs Non-Adaptive SBRT Plans of Various Abdominal Tumors on Varian ETHOS

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PURPOSE/OBJECTIVES

To evaluate dosimetric benefits of adaptive vs non-adaptive SBRT plans for patients with various abdominal tumors utilizing Eclipse v16.12 and Varian ETHOS planning system.

MATERIALS and METHODS

Four Non-Adaptive plans (Rx=50Gy/30Gy/5fxs SIB) were created using ETHOS(6xFFF) in Eclipse and four On Table Adaptive plans were generated using ETHOS Planning System (Varian, Palo Alto, California, USA). Non-Adaptive plans were generated on a single sim scan and Adaptive plans were on daily CBCT. Three plans were optimized with volumetric modulated Arc therapy(VMAT) using two partial Arcs and one plan was static Intensity-Modulated Radiation Therapy(sIMRT) with 10 fields using CT simulated on SIEMENS. Patients were setup using compression belt just below rib/diaphragm. MD contoured the planning target volumes for PTV\_50 and PTV\_30 on AVG and FB scans using 4D CT-Sim. The doses to the organ at risks (OARs) were compared and analyzed according to NRG guidelines. We were able to analyze the PTV\_50 coverage vs OARs sparing.



Fig 1: Patient Setup with compression belt



Fig 2: Patient Setup with compression belt



Fig 3: CT Simulation

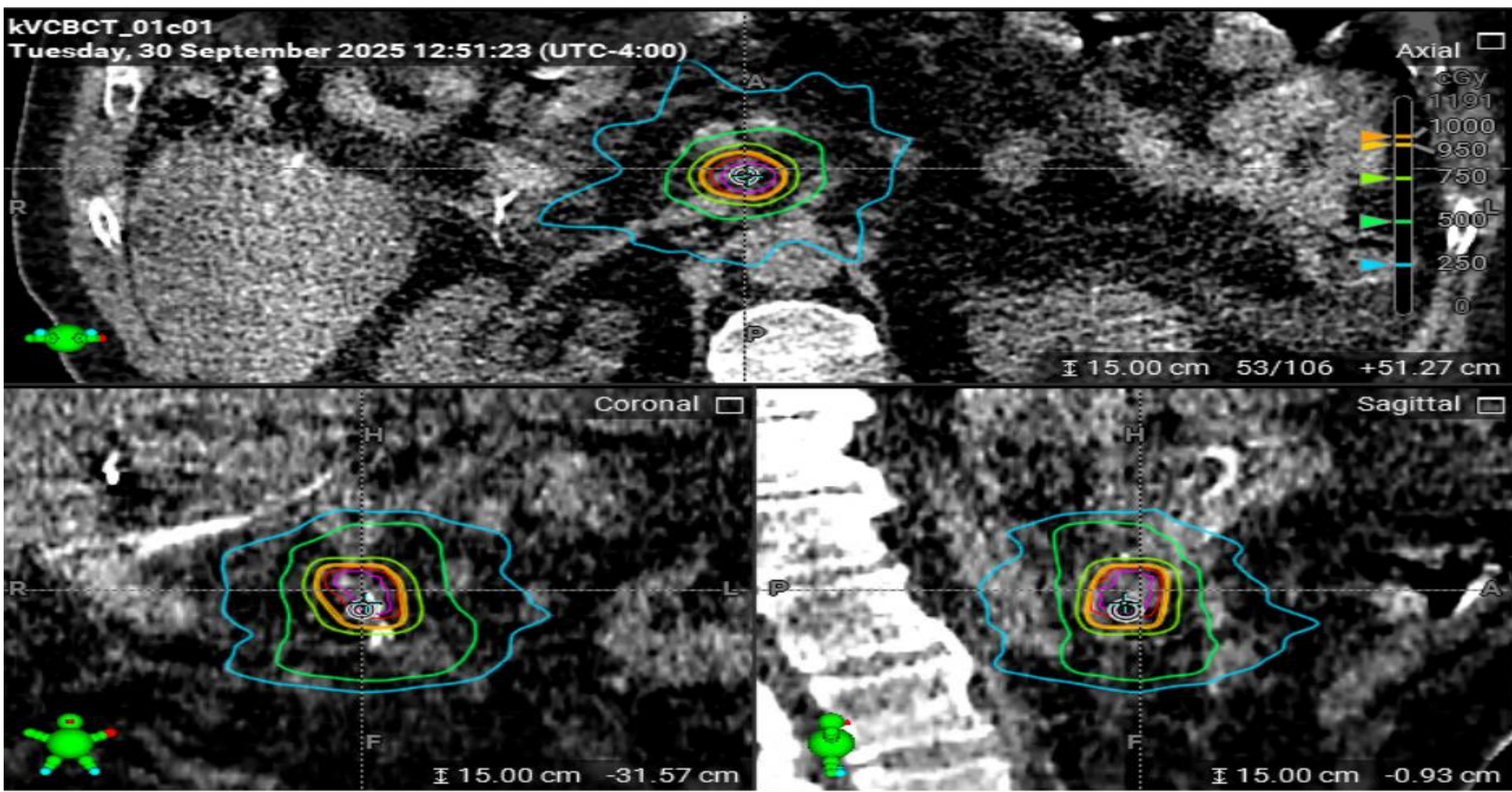


Fig 4: On-Table Adaptive

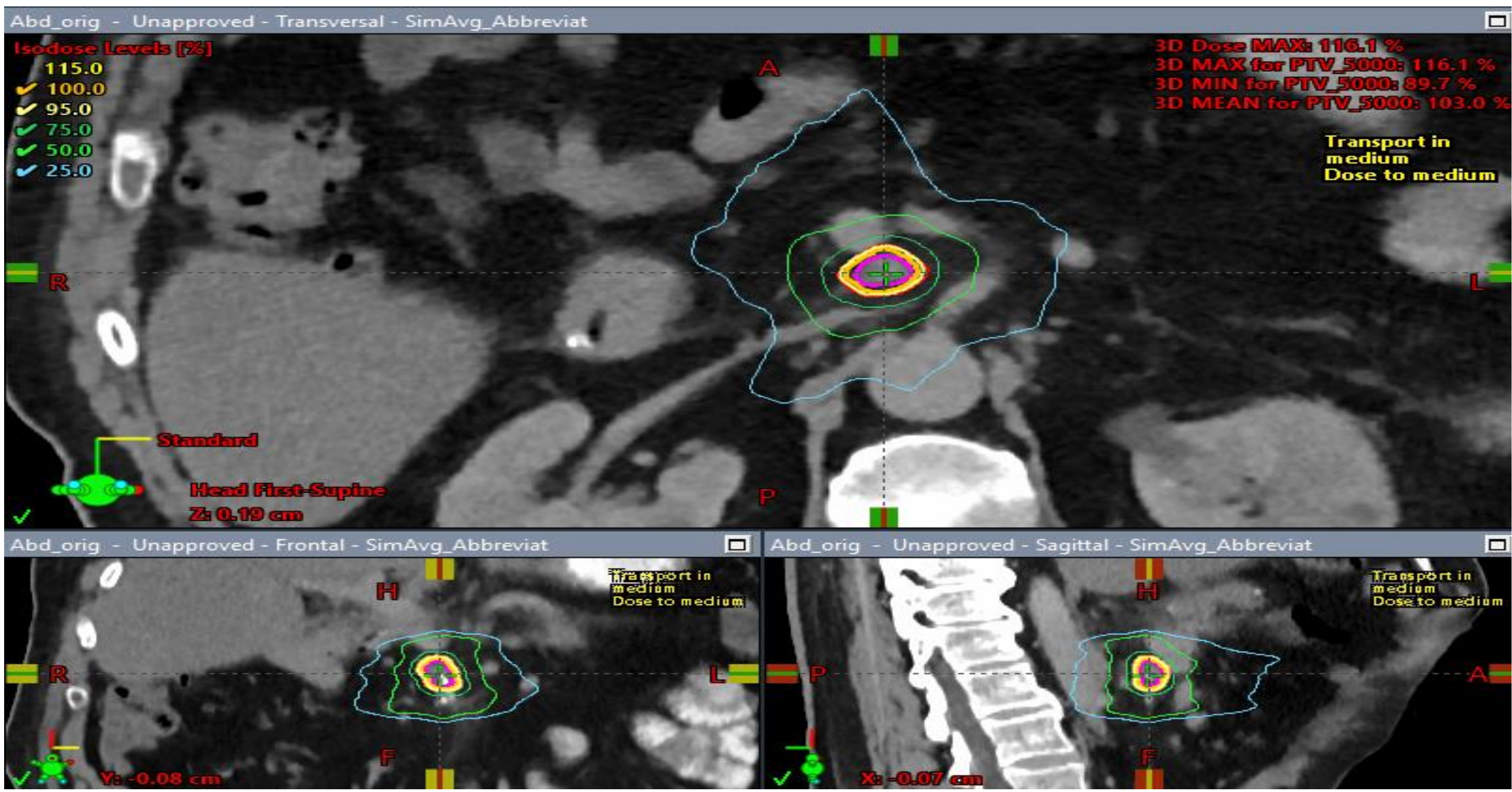


Fig 5: Non-Adaptive

| Patients | Non_ART PTV_50 D100>=95% | ART PTV_50 AVG D100>=95% |
|----------|--------------------------|--------------------------|
| P1       | 88%                      | 91%                      |
| P2       | 84%                      | 40%                      |
| P3       | 74%                      | 58%                      |
| P4       | 92%                      | 90%                      |

Fig 6: Table PTV coverage for Non-Adaptive and Adaptive

| Patients | Non ART Bowel_PRV CT MPD < 3050cGy | ART Bowel_PRV MPD< 3050cGy |
|----------|------------------------------------|----------------------------|
| P1       | 3056.8                             | 2624                       |
| P2       | 4332.1                             | 3972                       |
| P3       | 4510                               | 3307                       |
| P4       | 3118                               | 3906                       |

Fig 7: Table Bowel MPD for Non-Adaptive and Adaptive

RESULTS

All the plans were optimized only once for each machine with similar optimization constraints to evaluate all NRG objectives. All treatment plans did not meet PTV\_50 coverage (D100%≥95%±2%) due to meeting OARs constraints which were overlapped with PTV\_50.

CONCLUSION

This study evaluated adaptive versus non-adaptive SBRT planning for abdominal tumors and found significant dosimetric challenges with both approaches. Neither the Adaptive ETHOS plans nor the Non-Adaptive plans met the PTV coverage goals (D100% ≥ 95% ± 2%) due to PTV/OAR overlap requiring prioritization of organ-at-risk sparing. On Table Adaptive plans showed better bowel sparing vs Non-Adaptive. Future work should investigate optimization techniques and individualized constraint trade-offs to better determine the clinical situations where adaptive radiotherapy can most significantly improve the therapeutic ratio.

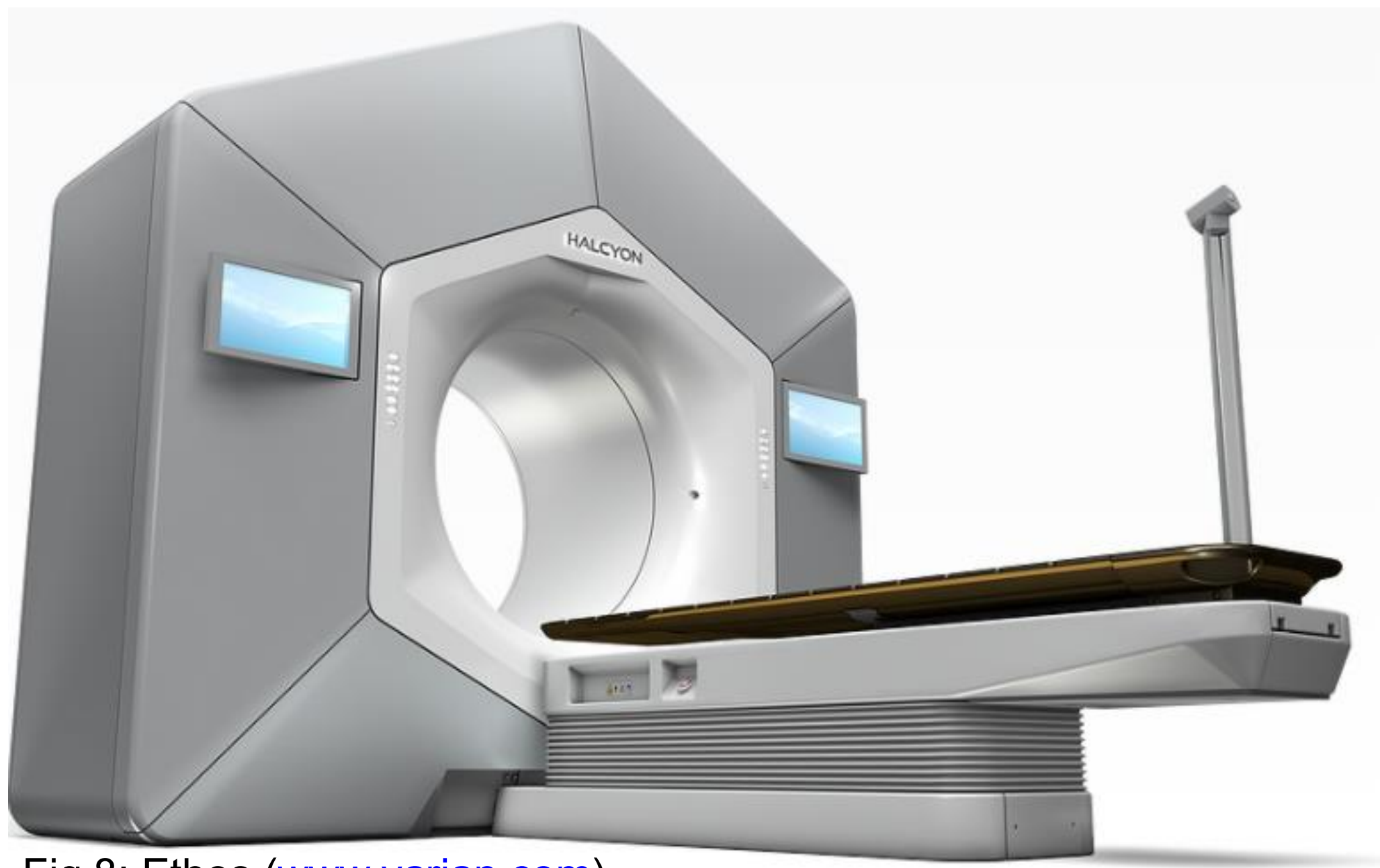


Fig 8: Ethos ([www.varian.com](http://www.varian.com))

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