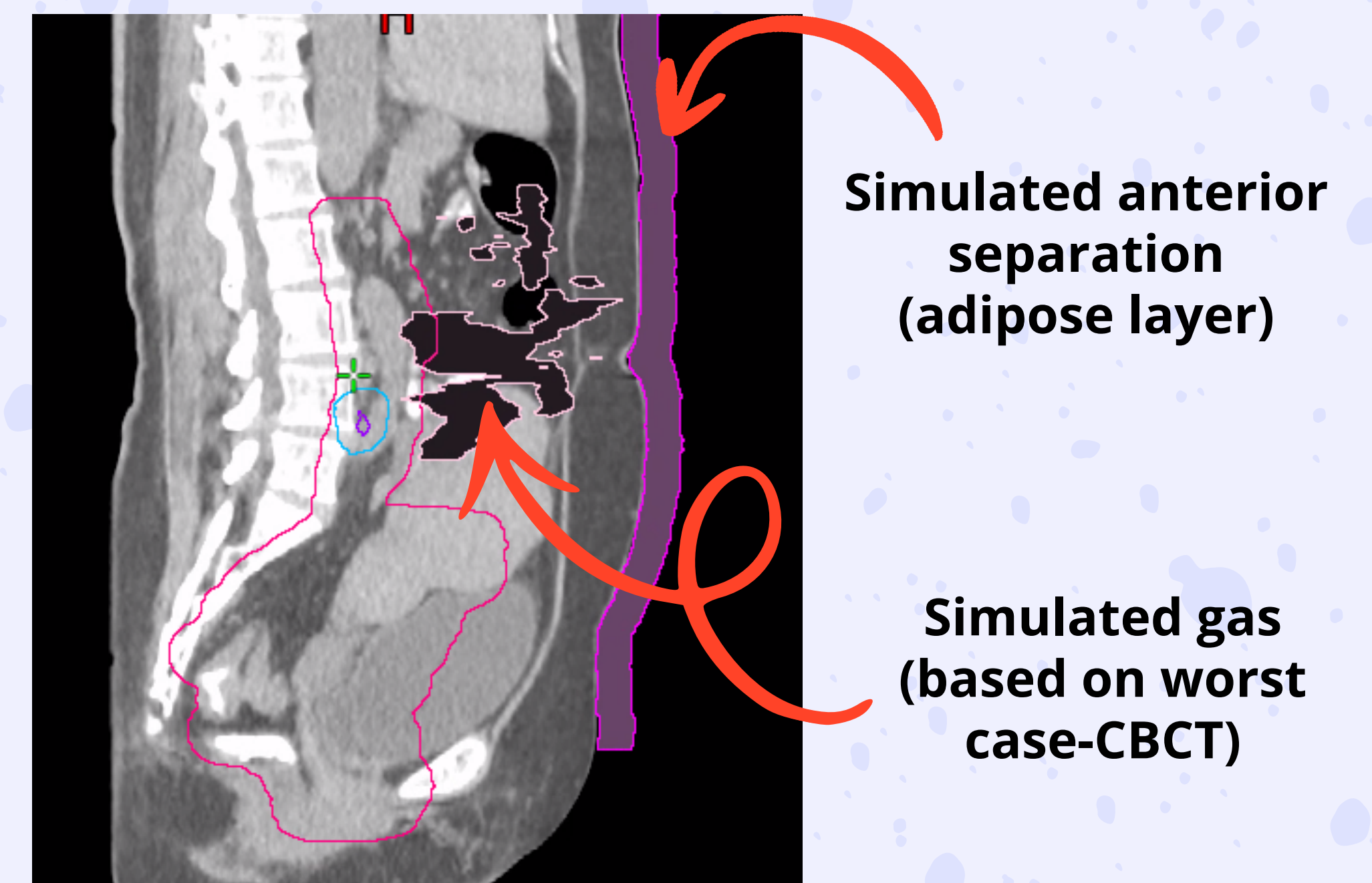


DOSIMETRIC ROBUSTNESS OF CERVICAL CANCER VOLUMETRIC MODULATED ARC THERAPY (VMAT) PLANS TO BODY SEPARATION AND BOWEL GAS

Loo Yu Rou, Ong Saw Huey
Sunway Medical Centre, Selangor, Malaysia

Introduction

Daily anatomical variations such as bladder filling, bowel gas or rectal gas can influence dose distribution in cervical cancer radiotherapy. Bowel gas may alter photon beam interactions due to density differences between air and surrounding tissues.



Objective

This study evaluated the dosimetric impact of simulated anterior body separations and bowel gas on VMAT plans for cervical cancer.

Methodology

A retrospective analysis was performed on 6 cervical cancer patients treated at Sunway Medical Centre in 2025 with prescription of 45Gy/25#.

Anterior body separation (0.5-3cm) was simulated by adding adipose tissue layers to original planning CT images

Gas cavities based on worst-case CBCT observations were introduced in each separation scenarios.

Same VMAT plan was recalculated for all the simulated scenarios

Dosimetric parameters, including D95%, D98%, V107%, and V110% of the planning target volume (PTV) and Dmax and D2cc of organs at risk (OARs), were recorded and analyzed.

Results & Discussion

With increasing simulated body separation from 0.5cm to 3cm, D95% and D98% of PTV45Gy decreased by 3.45% and 3.56%, respectively, with noticeable reductions observed from 1.5cm onward. High-dose regions represented by V107% and V110% reduced by 7.4% and 3.06%, respectively. Bowel gas produced only small dosimetric differences, with variations of less than 0.7Gy in target coverage metrics. Previous studies reported that air cavities may reduce dose within the cavity while slightly increasing dose beyond it due to changes in electron equilibrium. For bladder, rectum, and bowel, both D2cc and Dmax showed minimal variations across all simulated scenarios, with dose differences generally within ± 0.5 Gy.

Conclusion

Increasing anterior body separation resulted in measurable reductions in target coverage, particularly beyond 1.5cm, although the overall dosimetric impact remained limited. Bowel gas produced minimal additional dosimetric effects on PTV and OARs, suggesting cervical cancer VMAT plans remain relatively robust to bowel gas and moderate anatomical variations.

Reference

Chang, X., Yuan, Y., Wang, G., Hu, L., Zhou, M., Liu, H., Pan, L., & Wang, J. (2022). The effects of intestinal air cavity on dose distribution of volume modulated arc therapy for cervical cancer. *Annals of Palliative Medicine*, 11(4), 1326335-1321335. <https://doi.org/10.21037/apm-22-66>