# Bilateral Chest-Wall and Locoregional Node Irradiation Using a Dual Isocenter DIBH VMAT Technique for Heart and Lung Sparing

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## PURPOSE/OBJECTIVE(S)

- Deep inspiration breath-hold (DIBH) for a **bilateral comprehensive irradiation of the chest-wall and locoregional nodes** presents a challenging case.
- We have developed a robust **dual-isocenter DIBH VMAT technique** with visual guidance for maximum sparing of the heart and lungs

## MATERIAL & METHODS

- A comprehensive chest-wall plan to irradiate the **bilateral chest-wall and locoregional nodes** was created using a hypofractionated approach to 4256 cGy in 16 fractions in accordance to the Alliance A221505 trial
- A total of **eight partial arcs** in two groups of four were optimized simultaneously using automatic feathering to avoid hot/cold spots in the overlap region.

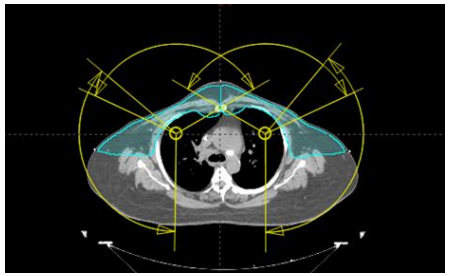

**Figure 1**: The preferred arc arrangement used for each isocenter. Both plans were treated using 4 partial co-planar arcs

- A **1 cm virtual skin flash bolus (HU=-500) was used for optimization** to take into account setup uncertainties and ensure appropriate coverage at the skin

## RESULTS

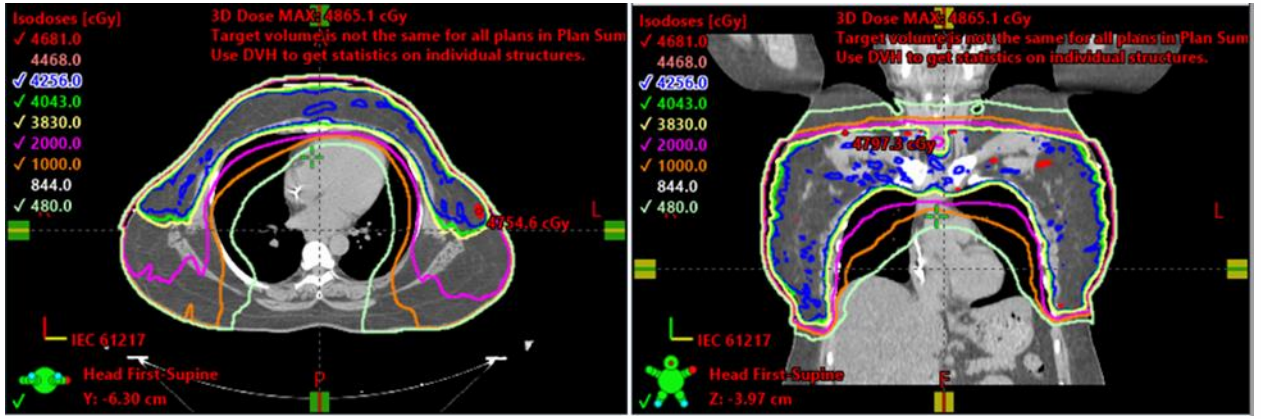


**Figure 2:** Treatment isodoses in the axial and coronal planes ranging from 4681 cGy (110% of prescription) to 480 cGy (10% of prescription). It can be seen that the dose is carved out of the lungs and heart to achieve substantial sparing.

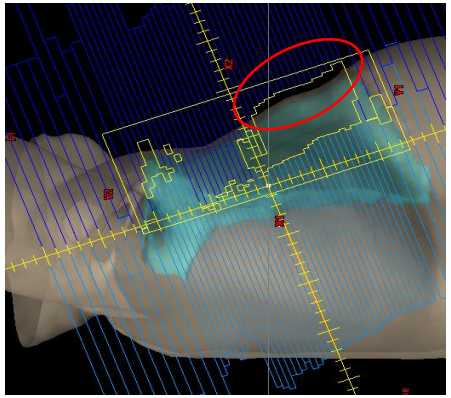

**Figure 3: A)** The individual field dose gradients created from the auto-feathering option turned on during optimization to increase plan robustness and B) Uncertainty analysis assuming a 5mm translational shift in isocenter, where the blue, yellow and red traces are the target, lungs and heart respectively.

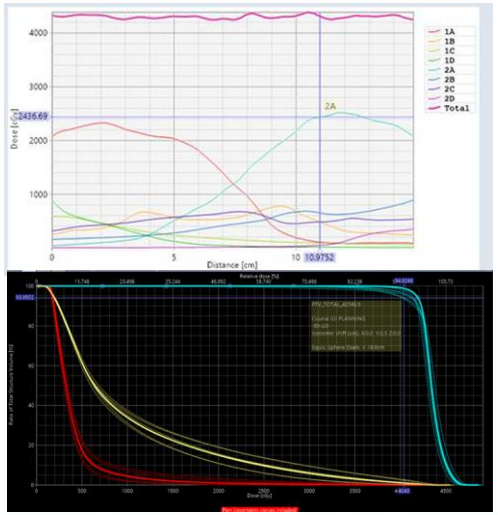


**Figure 4:** Beam's eye view example of an arc segment demonstrating the result of flash optimization. Note in the red oval how the MLCs do not close to the patient's skin surface

- Total PTV coverage achieved was **V95%=98.8%**, while mean heart dose was kept at **408 cGy**, total lung **V18Gy=17.7%** and **V4.8Gy were 63.0%.**
- All **Alliance A221505 hypofractionated dose constraints were met** at the preferred or acceptable level while highly exceeding all coverage constraints.
- Robustness analysis showed a **worst case scenario of PTV coverage of V95%=94.0%.**
- Minimal breath-hold coaching was needed from the therapy team with the use of patient visual feedback. Each arc was completed in nearly a **single breath-hold** and treatment was completed in **30 minutes**.

## SUMMARY/CONCLUSION

- A **dual isocenter DIBH VMAT technique** was developed using visual-guidance for comprehensive chest-wall and locoregional node irradiation.
- The technique was able to **meet relevant OAR constraints** and an efficient and robust treatment delivery.

## REFERENCES/ACKNOWLEDGEME

Tamburella C et al. Jour of Rad Oncol Bio Phys. 2016, 96(2)E45-E46
Varian Eclipse 15.6 Technical Reference Guide