

Dosimetric Comparison of Cardiac Substructure Doses Using Deep Inspiration Breath Hold vs Free Breathing in Post-Mastectomy Left-sided Breast Cancer Patients



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BACKGROUND

DIBH (Deep Inspiration Breath Hold) reduces cardiac exposure by increasing heart chest wall separation during left-sided breast post-mastectomy radiation therapy. Prospective data on cardiac substructure sparing in South Asian PMRT patients remain limited.

OBJECTIVE

To compare cardiac substructure, ipsilateral lung, and contralateral breast doses between DIBH and FB plans in left-sided PMRT.

METHODS



25 Patients

Post-mastectomy left Breast Ca



FB + DIBH

CT Simulation



42.56 Gy / 16 Fractions

Paired IMRT Plans



Analysis: paired comparisons performed using the Wilcoxon signed-rank test

PATIENT & DISEASE CHARACTERISTICS

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N = 25

Patients



50.6

Mean Age



68%

T3–T4 Tumours



92%

Node-Positive Disease

CLINICAL IMPLICATIONS

- Cardiac sparing occurred in all DIBH plans.
- Benefit remained consistent across T- and N-stage categories.
- No difference in ipsilateral lung or contralateral breast doses.

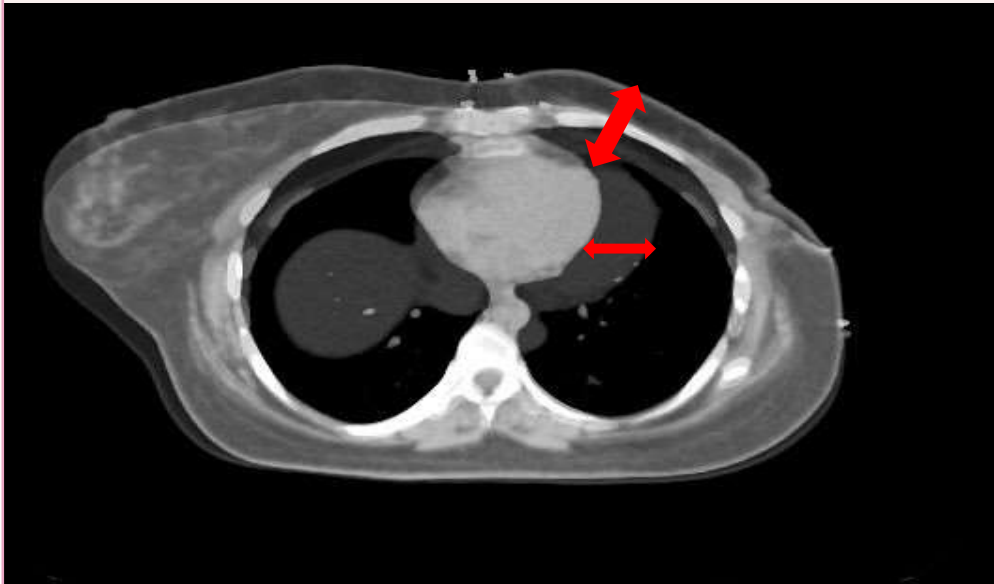


Figure 1: Arrows demonstrate the change in cardiac position between FB and DIBH.

9% RISK REDUCTION

Based on the Darby et al. model, the 1.2 Gy reduction in mean heart dose with DIBH corresponds to an estimated 9% reduction in the relative risk of major coronary events compared with free breathing.

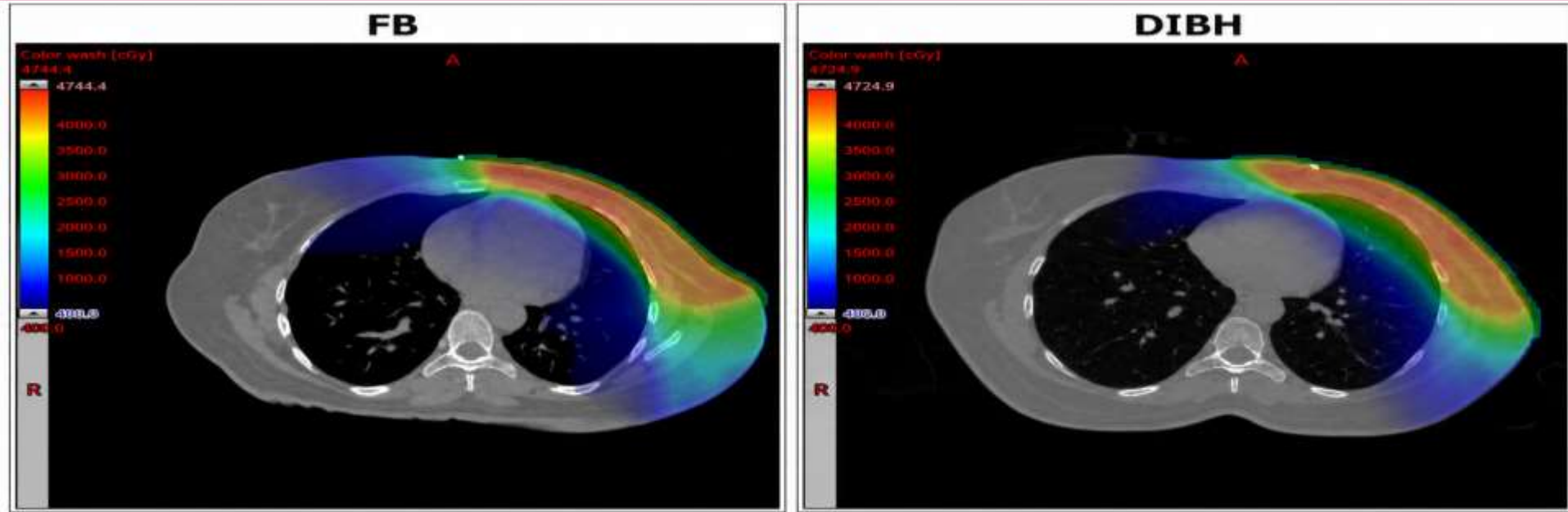


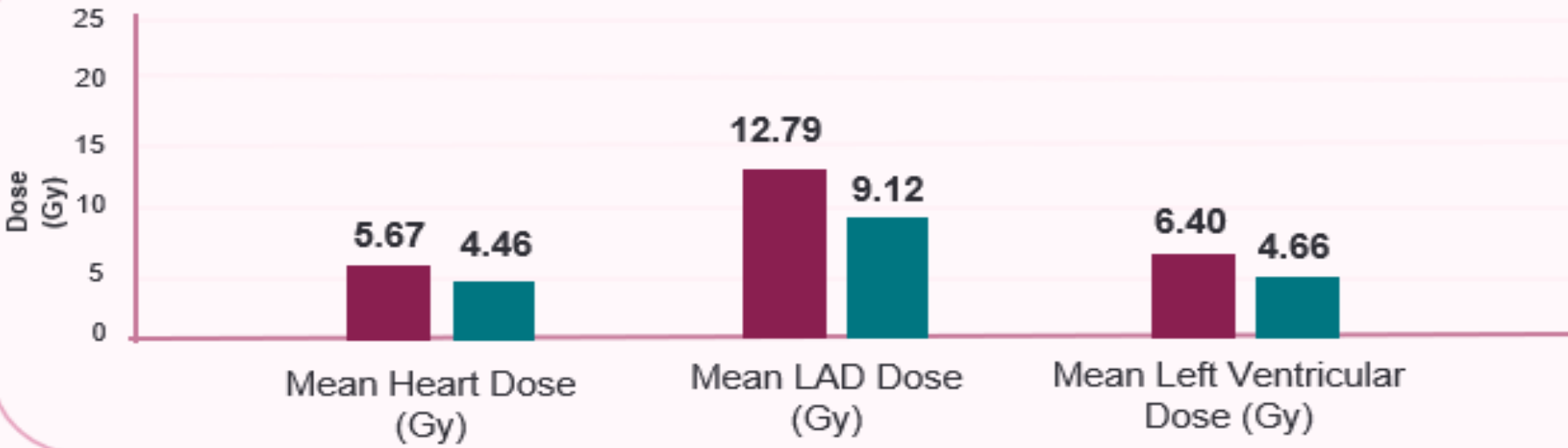
Figure 2: FB vs DIBH isodose / colorwash comparison showing cardiac displacement and reduced cardiac exposure with breath hold.

DOSIMETRIC COMPARISON

Mean Dose Comparison: FB vs DIBH

■ FB (Free Breathing)

■ DIBH (Deep Inspiration Breath Hold)



OAR Dose	FB (Mean ± SD) [Gy]	DIBH (Mean ± SD) [Gy]	Difference (Δ) [Gy]	% Reduction	p-value
Mean Heart Dose	5.67 ± 2.11	4.46 ± 1.62	1.20	21%	<0.001
Mean LAD Dose	12.79 ± 2.70	9.12 ± 1.81	3.14	29%	<0.001
Mean Left Ventricular Dose	6.40 ± 2.23	4.66 ± 1.75	1.75	27%	<0.001

*Paired comparisons performed using Wilcoxon signed-rank test.

CONCLUSION

DIBH provides consistent cardiac and cardiac substructure sparing during left-sided PMRT, including regional nodal irradiation, supporting its routine use in eligible South Asian patients.

TAKE HOME MESSAGE

With DIBH, the same target coverage can be achieved while meaningfully reducing cardiac exposure—turning a simple breathing maneuver into a practical strategy for safer left-sided PMRT.

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