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# Structured Respiratory Training Improves Clinical Eligibility for Deep Inspiration Breath Hold in Left-Sided Breast Cancer Radiotherapy

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Purpose: Deep Inspiration Breath Hold (DIBH) is an established technique to reduce cardiac dose in left-sided breast radiotherapy. Successful implementation requires adequate thoracic expansion, stable plateaus, and sufficient apnea-time. This study evaluates the effect of structured respiratory training on breath-hold performance and DIBH eligibility, and whether breath-hold capacity mediates the relationship between training and DIBH approval.

Methods: A total of 166 patients with left-sided breast cancer were assessed for adjuvant radiotherapy using optical surface-guided system. Participants were allocated to a Control group (n= 91) or a Training group (n= 75). Patients in the Training group underwent supervised 30-minute respiratory training sessions at the Champalimaud Foundation Exercise Oncology Hub. Breath-hold duration was compared between groups using the Mann–Whitney U test. Associations between respiratory training and DIBH approval were examined using chi-square tests. Multivariable logistic regression analysis was performed to identify independent predictors of DIBH eligibility.

Results: Patients who underwent respiratory training sustained significantly longer breath-holds than the control group (median 40.56 s vs 30.20 s; $U = 2030.5$; $p < 0.00001$). The proportion of patients approved for DIBH was higher in the Training group compared with controls (74.7% vs 48.3%; $p = 0.001$). In logistic regression analysis, breath-hold duration was strongly associated with DIBH approval ($\beta = 0.184$; OR = 1.20, 95% CI 1.13–1.27; $p < 0.001$). After adjustment for breath-hold duration, participation in respiratory training was no longer associated with DIBH eligibility ($p = 0.793$), indicating that the effect of training on DIBH approval is mediated by improvements in breath-hold capacity.

Conclusion: Respiratory training increases the proportion of patients able to perform DIBH during breast radiotherapy by improving breath-hold capacity. Breath-hold duration is the main determinant of DIBH approval. Introducing supervised respiratory training supports patient selection and facilitate cardiac-sparing radiotherapy in routine clinical practice.

## Keywords

Keywords: inspiratory capacity, left-sided breast irradiation, treatment feasibility, Breathing Training.

## Conflict of Interest & Ethical Approval

yes

## Abstract submitters declaration

yes

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