



# Retrospective Study on the Dosimetric Differences of Critical Organs in Left-Sided Breast Cancer Radiotherapy: Comparing Reverse Semi-Decubitus and Supine Position

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## Introduction:

Postoperative radiotherapy for breast cancer reduces local recurrence and improves survival rates. However, radiation exposure to the heart is linked to cardiovascular risks. Modern breast cancer radiotherapy techniques focus on minimizing heart dose to enhance future life quality. Our facility employs a breast board and a unique “reverse semi-decubitus position” to increase the distance between the heart and the treatment target, aiming to lower heart radiation dose. The study compares critical organ dosimetry in left-sided breast cancer radiotherapy using reverse semi-decubitus and supine positions.

## Material & method:

This study, approved by the Kuang Tien General Hospital (KTGH) IRB, used a retrospective design to compare dosimetric differences between a novel reverse semi-decubitus position and the traditional supine position in total 60 left-sided breast cancer patients post-breast conserving surgery (BCS). Treatment plans for both positions were recreated using a computerized planning system to analyze dose distributions to critical organs like the heart, lungs, esophagus, and contralateral breast. Data were analyzed using an independent sample t-test in SPSS 20.0.

## Result:

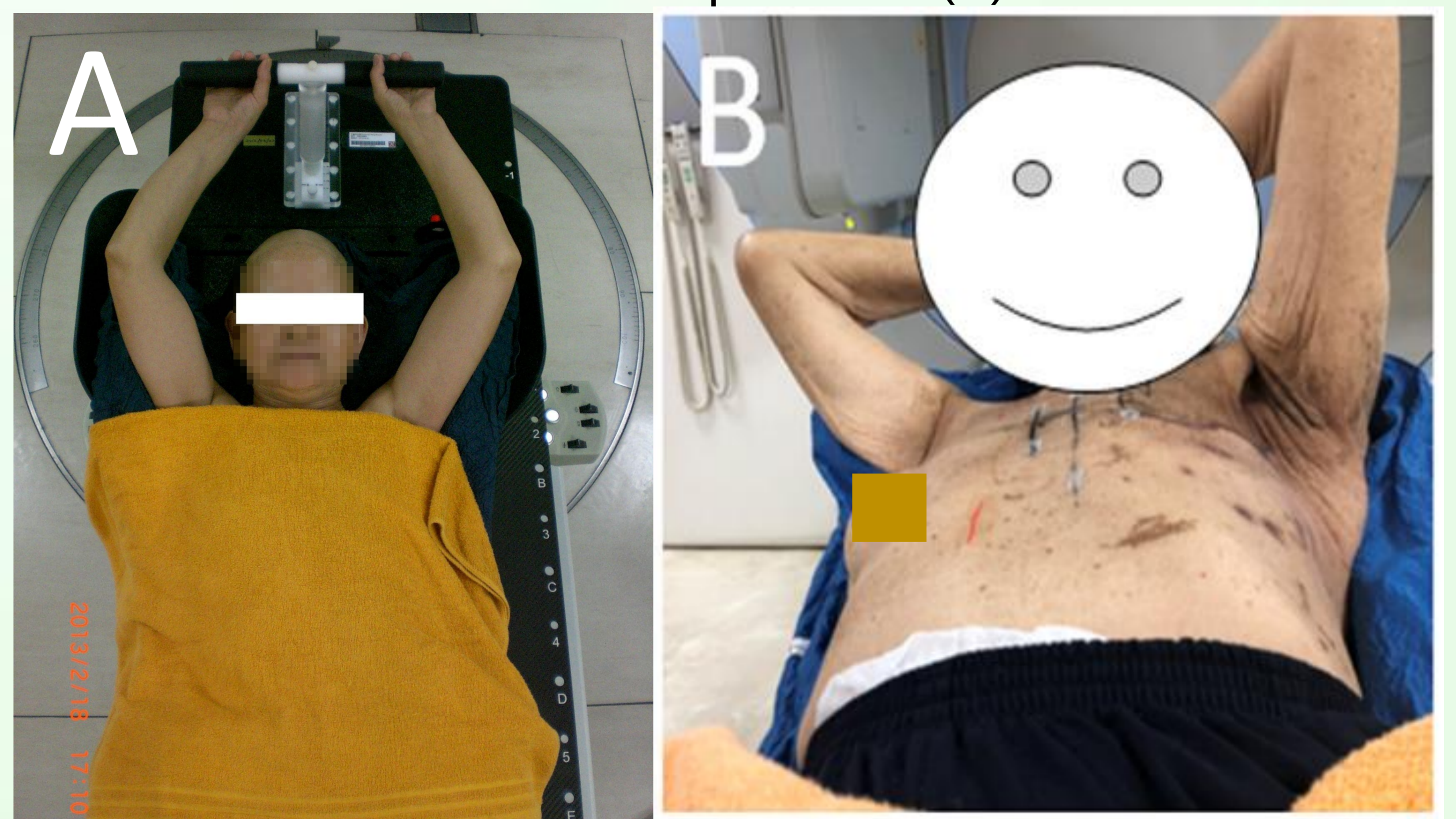
The study results revealed that there were significant differences in the dosimetric parameters for the heart, including Mean dose, V30 (volume receiving 30 Gy or more), V25, V20, V15, V10, and V5. Similarly, significant differences were observed in the left anterior descending (LAD) artery's Mean dose, V35, V30, V25, V20, and V40 when comparing the reverse semi-decubitus position with the conventional supine

position in radiotherapy techniques. These findings highlight the potential benefits of the reverse semi-decubitus position in reducing radiation exposure to the heart and LAD artery during breast cancer radiotherapy.

## Conclusion:

The reverse semi-decubitus position technique has been demonstrated to be effective in significantly lowering the radiation doses received by the heart and the left anterior descending (LAD) artery. This positioning strategy offers a valuable approach to minimize potential radiation-induced cardiac complications in patients undergoing radiotherapy for breast cancer.

**Figure 1.** Traditional supine position (A), reverse semi-decubitus position (B)



**Table 1.** Dosimetric parameters of PTV and OARs

Parameters	reverse semi-decubitus (N=30)		Supine (N=30)		P-value	
	Mean ± SD	95% CI	Mean ± SD	95% CI		
PTV	Volume (ml)	513.05 ± 173.21	451.07 – 575.03	534.30 ± 165.99	474.91 – 593.70	0.629
	Maximum dose (Gy)	55.37 ± 0.94	55.03 – 55.70	55.65 ± 10.82	55.00 – 56.34	0.446
Heart	Volume (ml)	549.06 ± 105.31	511.38 – 586.74	523.81 ± 110.66	484.21 – 563.41	0.369
	Maximum dose (Gy)	39.98 ± 9.30	36.65 – 43.31	40.93 ± 9.27	37.62 – 44.26	0.691
	Mean dose (Gy)	3.69 ± 1.30	3.23 – 4.16	5.22 ± 1.46	4.70 – 5.74	<0.001
	V40	0.13 ± 0.35	0.01 – 0.26	0.33 ± 0.61	0.12 – 0.55	0.122
	V35	0.37 ± 0.61	0.15 – 0.59	0.77 ± 1.10	0.37 – 1.16	0.088
	V30	0.70 ± 0.84	0.40 – 1.00	1.43 ± 1.50	0.90 – 1.97	0.023
	V25	1.20 ± 1.30	0.74 – 1.66	2.37 ± 1.90	1.69 – 3.05	0.007
	V20	2.03 ± 1.79	1.39 – 2.67	3.93 ± 2.78	2.94 – 4.93	0.003
	V15	3.27 ± 2.56	2.35 – 4.18	6.70 ± 4.56	5.08 – 8.33	0.001
	V10	5.97 ± 3.77	4.62 – 7.32	12.07 ± 7.32	9.45 – 14.69	<0.001
V5	17.73 ± 11.33	13.68 – 21.79	30.00 ± 12.25	25.62 – 34.38	<0.001	
LAD	Volume (ml)	5.21 ± 1.05	4.84 – 5.59	4.95 ± 0.85	4.64 – 5.25	0.284
	Maximum dose (Gy)	31.01 ± 9.19	27.72 – 34.30	32.36 ± 10.58	28.57 – 36.14	0.601
	Mean dose (Gy)	8.98 ± 3.11	7.87 – 10.09	12.88 ± 4.36	11.32 – 14.44	<0.001
	V40	0.13 ± 0.51	-0.05 – 0.31	1.10 ± 2.89	0.06 – 2.14	0.077
	V35	0.77 ± 2.19	-0.02 – 1.55	3.60 ± 6.07	1.43 – 5.77	0.019
	V30	2.43 ± 4.14	0.95 – 3.92	7.07 ± 9.50	3.67 – 10.47	0.017
	V25	6.17 ± 6.20	3.95 – 8.38	12.23 ± 12.25	7.85 – 16.62	0.019
	V20	12.37 ± 9.07	9.12 – 15.61	19.67 ± 13.94	14.68 – 24.65	0.019
	V15	19.97 ± 12.97	15.32 – 24.61	32.27 ± 19.82	25.18 – 39.36	0.006
	V10	30.73 ± 17.23	24.57 – 36.90	48.30 ± 25.12	39.31 – 57.29	0.003
V5	56.03 ± 22.86	47.85 – 64.21	78.73 ± 25.15	69.73 – 87.73	0.001	

**Keywords:** Left-sided breast cancer, breast board, semi-decubitus position