

Effects of breast cancer surgery on thoracic kyphotic angle ; preliminary results



Ho-Geon Namgung, MD, Se-Joon Kim, MD, Jong In Lee, MD, Ph.D

Department of Rehabilitation Medicine, Seoul St. Mary's hospital, College of Medicine, The Catholic University of Korea

Background and Objective

Breast cancer is one of the most common cancer in women, and surgical treatments are commonly performed. Although controversial, some studies have shown that unilateral mastectomy may worsen spinal alignment, particularly scoliosis. Furthermore, an increase in thoracic kyphotic angle is associated with decreased physical performance and balance in elderly populations.

Therefore, this study aimed to investigate whether breast cancer surgery affects the thoracic kyphotic angle. In addition, while the scoliosis is usually measured in a standing position, there is correlation with measurements taken in a supine position, and it is known to be measured about 5-10 degrees higher in the standing position. However, there is a lack of research on the kyphotic angle.

Therefore, we also explore the correlation of the thoracic kyphotic angle in supine and standing positions.

Methods

The retrospective study

- Included Patients who were diagnosed with breast cancer and performed surgery from September 1, 2017, to August 31, 2019, taken preoperative chest CT and postoperative whole spine x-ray, and at least two chest CTs were performed until August 31, 2022.
- Excluded Patients who had spine metastasis

The thoracic kyphotic angle was measured as the Cobb angle based on the T4 upper border and T12 lower border on the lateral view of CT or X-ray.

The angle was measured four times

- The chest CT conducted before the surgery
- The whole spine X-ray taken at the earliest time after the surgery.
- The Chest CT taken at the earliest time after the surgery.
- Last chest CT taken within the follow-up period (at least 2 years interval from the time of the initial measurement)

Results

A total of 50 patients were included in the analysis.

The baseline characteristics of patients are shown in **Table 1**. The intervals at which the kyphotic angles were measured, and the measured angles are shown in **Table 2**.

The difference between the kyphotic angle measured at the last and at the initial chest CT was 1.2 ± 1.7 degrees, but the difference was minimal and considered within the measurement error range.

However, only one patient showed a significant difference in angular change of 6.495 degrees.

There was a significant correlation between the kyphotic angle measured using a chest CT (supine position) performed at the earliest time after surgery and the kyphotic angle measured using whole spine X-ray (standing position). (pearson correlation coefficient = 0.758, P-value < 0.001) (**Figure 1**)

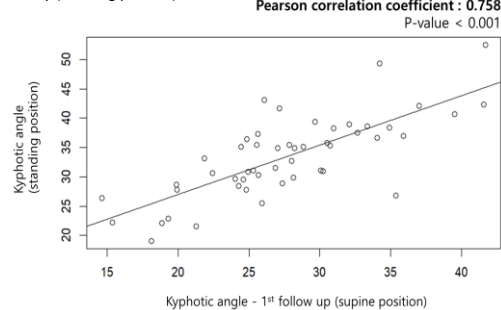
Table 1. Demographic and clinical features of patients

Features	Total (N=50)
Age (years)	53.7 ± 9.4
BMI (kg/m ²)	23.6 ± 4.6
Surgery type	
Breast conserving surgery ; n(%)	31 (62.0%)
Mastectomy without immediate reconstruction ; n(%)	3 (6.0%)
Mastectomy with immediate reconstruction ; n(%)	16 (32.0%)
Sentinel lymph node biopsy ; n(%)	37 (74.0%)
Axillary lymph node dissection ; n(%)	13 (26.0%)
Neoadjuvant chemotherapy ; n(%)	8 (16.0%)
Adjuvant chemotherapy ; n(%)	30 (60.0%)
Adjuvant radiotherapy ; n(%)	36 (72.0%)
Adjuvant endocrine treatment	
Aromatase inhibitor ; n(%)	19 (38.0%)
Tamoxifen ; n(%)	25 (50.0%)
Osteoporosis ; n(%)	11 (22.0%)

Table 2. Thoracic kyphotic angle in breast cancer patients

Characteristics	Findings
Interval between initial measurement and 1st follow up (months)	7.5 ± 5.9
Interval between initial measurement and last follow up (months)	43.4 ± 6.4
kyphotic angle(°) (supine position ; chest CT) mean ± standard deviation	
initial (preoperative)	27.1 ± 6.3
1st follow up (postoperative)	27.5 ± 6.1
last follow up (postoperative)	28.3 ± 6.0
Angular change (between initial measurement and last follow up)	1.2 ± 1.7
kyphotic angle(°) (standing position ; whole spine X-ray) mean ± standard deviation	33.6 ± 6.8

Figure 1. Correlation between the kyphotic angle measured using a chest CT (supine position) and the kyphotic angle measured using whole spine X-ray (standing position)



Conclusion

Currently, this study found that breast cancer surgery did not affect thoracic kyphotic angle.

However, further research is needed with a larger sample size.

Furthermore, there was a significant correlation between the kyphotic angles measured in supine and standing positions, indicating that CT could be clinically used to measure kyphotic angles instead of standing X-rays.