

Effects of Unilateral Mastectomy on Shoulder and Scapular Mobility and Its Relation with Functional Activity on Dominant and Non-Dominant Side

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ABSTRACT:

Introduction:

Breast cancer is the second most common type of cancer in women worldwide. Mastectomy is the complete removal of breast tissues along with the adjoining lymph nodes which can be unilateral, that is the removal of one breast, then that side will be called as dominant side and the opposite having normal breast is termed as non-dominant side. It results in restricted arm/shoulder mobility which can cause arm/shoulder pain and fibrosis. Majority of patients experience some type of pain and associated impairment around shoulder and scapular region after mastectomy.

Objectives:

Effects of unilateral mastectomy on shoulder and scapular mobility and its relation with functional activity on dominant and non-dominant side

Methodology:

An observational (cross-sectional) study was carried out on a sample of 114 post-mastectomy patients of age group above 40 years, using non-probability convenient sampling. Participants were assessed on the bases of SPADI score scale along with hoppenfeld test and lateral scapular slide test.

Results:

Out of 114 participants 93(81.6%) were undergone mastectomy on their right breast while remaining 21(18.4%) on their left breast. Hoppenfeld test was positive in 20(17.5%) participants on their dominant side of mastectomy. Scapular Asymmetry was positive in 7(6.1%) participants to the right and 4(3.5%) participants to the left. The analysis showed that there was no association between side of mastectomy and hoppenfeld test (P-value 0.761). There was significant association between side of mastectomy and scapular asymmetry (P-value <0.001). Overall mean SPADI score of dominant side was 43.66 ± 24.93 and non-dominant was 12.54 ± 12.39 . The analysis showed that the difference between SPADI score of dominant and non-dominant side were statistically significant (p-value <0.001).

Conclusion:

This study showed that while comparing the dominant and non-dominant sides in female patients who underwent unilateral mastectomy, there was a statistically significant difference in their shoulder and scapular mobility, which indicated that the patients were more prone to suffer functional disability in their shoulder and scapula on the side of mastectomy (dominant side).

Key words: Unilateral Mastectomy, Mobility, Functional activity, Effects/Relation.

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INTRODUCTION:

Breast cancer is cancer that form in the cells of breast. It is the second most common type of cancer in women worldwide. Breast cancer can occur in both men and women, but it's far more common in women than men. With the increasing awareness and early diagnosis, survival rates after breast cancer are also increasing but the major concern is about quality of life after lifesaving breast cancer surgery (1, 2) As far surgical treatment is concerned there are few surgical options most common of them is mastectomy. Mastectomy is the complete removal of breast tissues along with the adjoining lymph nodes. Mastectomy can be unilateral, that is the removal of one breast, then that side will be called as dominant side and the opposite having normal breast is termed as non-dominant side. (3). Surgeries for Breast cancer especially mastectomy results in restricted arm/shoulder mobility and thus can cause arm/shoulder pain and fibrosis. The incidence of shoulder morbidity has been found to be significantly higher in females who underwent mastectomy (17%). That's why following mastectomy, majority of patients experience some type of pain and associated impairment around shoulder and scapular region. (4). Winged scapula is usually due to damage or impaired innervation to the serratus anterior muscle. The nerve that innervates this muscle is the long thoracic nerve. Sometimes, this nerve can be injured or invaded, leading to failure of the serratus anterior muscle. Some patients may also complain of an inability to elevate the affected arm above their head. This dysfunction results in the medial border of the scapula giving a winged-like appearance. (5, 6). All these complications resulting after mastectomy effects the activity of daily living and gives the feeling of disability in cancer survivors.(7)

An observational study using 3-dimensional kinematic analysis was performed. Women who had a unilateral mastectomy on their dominant-arm side as well as a control group of age-matched women without upper-limb, shoulder, or spinal problems were measured while performing bilateral arm movements in the sagittal, scapular, and coronal planes. Women following mastectomy displayed altered patterns of scapular rotation compared with controls altogether planes of movement. In particular, the scapula on the mastectomy side rotated upward to a markedly greater extent than that on the non-mastectomy side. The findings suggest that altered motor patterns of the scapula are associated with mastectomy on the same side. (8)

A cross-sectional survey was performed in which patients with carcinoma and surgical indication for axillary dissection were included. A complete of 112 patients were surveyed with one physical evaluation before the surgery and 15, 30, 90, and 180 days after. Winged scapula incidence was 8.0 to 15 days after surgery. Two patients improved from winged scapula 90 days following the surgery and 4 more, 180 days after surgery, while three patients still had winged scapula at this stage. The prevalence after 15 days of surgery was 20.9 and 22.6 % in patients referred to sentinel node biopsy or axillary lymphadenectomy (AL), respectively ($p < 0.01$). Winged scapula incidence was 8.0 attempt to was higher in AL, and prevalence decreased during 6 months after surgery. Patients who developed winged scapula had more shoulder flexion, adduction, and abduction limitation. (9)

A cross-sectional study was conducted to determine the prevalence of shoulder pain and adhesive capsulitis in post mastectomy patients. The study recruited 150 patients. The mean age of the participants was 44.7 ± 13.7 years. 142/150 (94.7%) patients suffered from some type of pain and disability on operated site. Clinical examination revealed that 11/150 (7.3%) patients were having adhesive capsulitis. Analysis of question regarding pain with different activities showed that in 27.5% patients, pain was severe when lying on the involved side and 30.3% was having severe pain when reaching for something on a high shelf. Analysis of question regarding disability showed that 21.2% patients were having difficulty in washing back, and 23.3% patients were having difficulty in placing an object on a high shelf. The study concluded that majority of patients who underwent mastectomy are prone to shoulder pain and disability and adhesive capsulitis. Proper referral to rehabilitation settings should be practiced to prevent musculoskeletal problems in post mastectomy patients (9).

With the best of researcher knowledge there was limited literature available on the effects of unilateral mastectomy on shoulder and scapular mobility and its relation with functional activity on dominant and non-dominant side.(10). The rationale of the study is to clarify post- mastectomy effects so that early diagnosis and early detection of complication can help us to start early treatment protocol which then completely reform the outcomes of breast cancer treatment and a better, confident, and self-organized life could be provided to breast cancer survivors.

Material & methods:

A cross-sectional study was carried out to determine the effects of unilateral mastectomy on shoulder and scapular mobility and its relation with functional activity on dominant and non-dominant side. The data was collected from June 2020 to December 2020. The data was collected from 114 females diagnosed with breast cancer at Shaukat Khanum Memorial Cancer Hospital & Research Centre, Mayo Hospital Lahore and Jinnah hospital Lahore, Pakistan using non probability convenient sampling. Those patients were added to the study who were above 40 years of age. (11). and had cancer in one breast only. The ethical approval of the study was obtained from the institutional review board of Rashid Latif Medical and Dental College, Lahore. The Shoulder Pain and Disability Index (SPADI) Scale was used to assess the difference of pain and functional activity limitation after mastectomy between dominant and non-dominant side (12). Hoppenfeld test and lateral scapular slide test were also used, former for the assessing and comparing scapular winging and later for assessing possible asymmetry that could come after a unilateral mastectomy. (13, 14). Participants were explained about the objective of the research and before collecting information, a written consent was obtained from each participant. The data was analyzed by IBM SPSS STATISTICS 26. The quantitative variables were presented as mean and standard deviation while qualitative variables were evaluated as proportions (%). The quantitative variables were presented as mean, standard deviation, range and histogram. Data

was analyzed by using Chi-testing and T-testing. Categorical variables were evaluated as percentages (%), frequencies, cross tabulation, bar chart and pie chart.

RESULTS:

In this study 114 participants were asked to fill SPADI Scale questionnaire and two clinical tests, Hoppenfeld and Scapular slide test, were performed. The descriptive statistics showed that age group of participants was between the minimum limits of 40 years and maximum limits of 81 years with mean age of 52.73 ± 9.19 years. Body mass index of participants was between the minimum limits of 16.08 and maximum limits of 30.30 with mean BMI of 22.99 ± 3.04 . Out of 114 participants 93(81.6%) were undergone mastectomy on their right breast while remaining 21(18.4%) on their left breast. Hoppenfeld test was positive in 20(17.5%) participants on their dominant side of mastectomy and no positive test was recorded on non-dominant side. Scapular Asymmetry was positive in 7(6.1%) participants to the right and 4(3.5%) participants to the left. The analysis showed that there was no association between side of mastectomy and hoppenfeld test (P-value 0.761). There was significant association between side of mastectomy and scapular asymmetry (P-value <0.001). Overall mean SPADI score of dominant side was 43.66 ± 24.93 and non-dominant was 12.54 ± 12.39 . The analysis showed that the difference between SPADI score of dominant and non-dominant side were statistically significant (p-value <0.001).

DISCUSSION:

Breast cancer is the second most common type of cancer in women worldwide. Early diagnosis could be made by regular breast examination by the women herself or by yearly screening through mammography (BI-RADS) in the women who are under the certain risk factors for developing breast cancer. There are many treatment options for breast cancer but surgery is one of the most commonly used (15, 16). Restricted arm/shoulder mobility that results with more conventional mastectomy are now reduced to some extent by modified removal techniques but not entirely eliminated. Early diagnosis and timely intervention are the main concern for such post operative complications once the limitations and complications are clear through this study (17).

McAnaw et al performed a review in 2002. Women faced with carcinoma may develop musculoskeletal impairments following mastectomy and breast reconstruction, the aim of this review is to spotlight physiotherapy considerations with these surgeries. Close communication between physician and physiotherapist is emphasized. Physical therapists facilitate patient education, skillfully evaluate and treat musculoskeletal dysfunctions, and provide individualized patient exercise prescriptions (18) In current study post mastectomy patients were assessed to look for the possible impairment around the shoulder joint. SPADI scale was used that has showed us how breast removal procedure can affect the mobility and activity around the shoulder joint (18). Scapular winging and asymmetry are strong indicators of possible functional limitation in patients undergone mastectomy. Hoppenfeld and Scapular slide test were used for measuring these respectively This study has showed us that there is an overall trend of activity limitation and impairment on the side of

mastectomy comparing to the sound opposite side. Kannan et al through his meta-analysis in year 2021 showed that a number of physical therapy interventions are reported beneficial in alleviating pain and reducing the activity limitation in post mastectomy patients. (19).

Ghordadekar et al through his work in 2020 has shown the common complications in post mastectomy patients and their effective treatment with physical therapy. Adhesive capsulitis is considered a long-term complication that takes time to develop after surgery but this is one of the most restricting kind of impairment for these patients (20). Mehta et al in 2018 did research to show the effect of physical therapy on these common complications. This study has showed that post-operative complication in breast cancer survivors can be reduced by a significant number through a careful assessment and physical therapy intervention (21).

Current study has used self-administered questionnaire and two clinical tests with significant sensitivity and specificity, but it would be highly valuable if we use 3D kinematic analysis to study the baseline mechanical differences between two sides of the patient. This can give us a closer insight to the activity limitations and its potential underlying causes in a post mastectomy patient

CONCLUSION:

This study showed that there was a statistically significant difference in the females of unilateral mastectomy of their shoulder and scapular mobility between dominant and non-dominant side. Scapula was abducted away from the normal only on the dominant side along with the marked significant limitation of mobility in the shoulder of dominant side. Because of this surgical intervention, postoperatively, participants were unable to perform their daily functional tasks. As this results in functional disability of post-mastectomy patients majorly on their dominant side, therapist could pay close attention to diagnose and give early intervention to prevent such complications.

Participants consent and ethical consideration:

Participants were knowledgeable about the aims & objectives of the study was observed by all individuals and consent form in the written form was obtained.

Consent for research publication

Individuals were familiar about the aims of the research and informed written statement and consent was taken.

Competing interests

There is no competing interest as declared by the author. The results of the research are obtained clearly, fairly, and without assembly, distortion, or misleading data maneuvering.

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Table no.1: participants' comparison of side of mastectomy regarding Hoppenfeld test dominant side

| Fisher's Exact Test | | | | |
|---------------------|-------|-----------------------------|----------|----------|
| Hoppenfeld Test | | | Positive | Negative |
| Side of Mastectomy | Right | Count | 16 | 77 |
| | | % within Side of Mastectomy | 17.2% | 82.8% |
| | Left | Count | 4 | 17 |
| | | % within Side of Mastectomy | 19.0% | 81.0% |
| Total | | Count | 20 | 94 |
| | | % within Side of Mastectomy | 17.5% | 82.5% |

Comparison of side of mastectomy regarding hoppenfeld test dominant side showed that there was no association between side of mastectomy and hoppenfeld test. (p-value 0.761)

Table.2: comparison of side of mastectomy regarding scapular asymmetry

| Scapular Asymmetry | | | Absent | Right side asymmetry | Left side asymmetry | |
|--------------------|--------|-----------------------------|--------|----------------------|---------------------|--------|
| Side of Mastectomy | Right | Count | 86 | 7 | 0 | 93 |
| | | % within Side of Mastectomy | 92.5% | 7.5% | 0.0% | 100.0% |
| | Left | Count | 17 | 0 | 4 | 21 |
| | | % within Side of Mastectomy | 81.0% | 0.0% | 19.0% | 100.0% |
| Total | | Count | 103 | 7 | 4 | 114 |
| | | % within Side of Mastectomy | 90.4% | 6.1% | 3.5% | 100.0% |
| Likelihood Ratio | 16.643 | | | | | |

Comparison of side of mastectomy regarding scapular asymmetry showed that there was significant association between side of mastectomy and scapular asymmetry.

(P-value <0.001)

Table.3: comparison of SPADI Score regarding side of mastectomy using T-Test

| | N | Dominant side score | Non-Dominant side score | p-value |
|---------|-----|---------------------|-------------------------|---------|
| Overall | 114 | 43.66±24.93 | 12.54±12.39 | <0.001* |
| Right | 93 | 43.02±25.26 | 11.73±11.05 | <0.001* |
| Left | 21 | 46.52±23.81 | 16.12±17.00 | <0.001* |

Overall mean SPADI score of dominant side was 43.66 ± 24.93 and non-dominant was 12.54 ± 12.39 . The difference between SPADI score of dominant and non-dominant side were statistically significant. (p-value <0.001)

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