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Correlation between Postural Impairment and Lymphedema in Breast Cancer Survivors

Kolekar Shital[1], Kulkarni Kajol[1], Shinde Sandeep[1]*, Shilpa Pise[2]

Abstract

The major complication of breast cancer is secondary lymphedema seen within few days to months after the surgery. Lymphedema has a debilitating effect on posture. The significance of this study is to show the effect of lymphedema on posture. These all have a huge impact on the quality of life of patients, within her family as well as working places. This study provides a platform to assess the spinal posture which may be at risk due to lymphedema in breast cancer survivors. Hence, the study is to find out correlation between spinal postural impairment and lymphedema in breast cancer survivors and to assess the correlation between demographic variables and lymphedema in breast cancer survivors. The aim of the study was to study and find out the correlation between postural impairment and lymphedema in breast cancer survivors. This was an observational study with the total of 116 breast cancer survivor women's who had undergone radiotherapy and surgery were selected from Krishna Institute of Medical Sciences, Karad. Their age ranged from 35 to 60 years old. The outcome measures which were included are postural examination chart in the anterior, posterior, lateral views by plumb line, muscle length test, muscle strength test, pain assessment using visual analog scale, and lymphedema measurement using inch tape. The obtained results showed statistically high significant increase in the forward head posture, rounded shoulders, thoracic kyphosis and scoliosis, scapular dyskinesis, and increased volume of affected arm. There were high significant correlation between spinal postural impairments and lymphedema in breast cancer survivors and also correlation between demographic variables and lymphedema in breast cancer survivors.

Keywords: Lymphedema, Forward head posture, Rounded shoulders, Thoracic kyphosis and scoliosis, Scapular dyskinesis, Breast cancer survivors

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Introduction

Breast cancer is the reason for cancer related death in women of developing countries.[1] Breast cancer is the common malignant cancer in most Asian countries and the second most common female malignancy in developing Asian countries next to uterine cervix cancer.[2] It is one of the most common cancers seen in middle age women.[3] The mortality rate due to breast cancer has been reduced due to effective screening (mammographic) and treatment. Due to the long-term treatment with radiotherapy and surgeries such as breast conserving surgery (BCS), radical mastectomy (RM), and modified RM (MRM); the morbidity rate is increased.[4]

The main causes of breast cancer in women are ionizing radiation (such as X-rays, computed tomography scan, and magnetic resonance imaging radiations), exogenous ovarian hormone (oral contraceptive pills), alcohol consumption, no child bearing (therefore no breastfeeding), and ovarian activity (breast cancer risk is higher in women with early onset of menses and late natural menopause).[5]

A study (incidence of breast carcinoma-related lymphedema) shows that out of 2 million breast cancer survivors, perhaps 15–20% are living currently with post-treatment lymphedema.[6] Every breast cancer survivor is at a risk of developing secondary lymphedema.[7]

Lymphedema occurring in the ipsilateral arm causes loss of functional ability.[8] Lymphedema is a progressive pathologic condition of the lymphatic system. There is interstitial accumulation of protein-rich fluid and subsequent inflammation, adipose tissue hypertrophy, and fibrosis. The swelling can cause dislodgement as well as decreased mobility and function.[9]

Lymphedema is the major important long-term complication of breast cancer treatment. Lymphedema in patients with breast cancer is caused due to interruption of axillary lymphatic channel. It is mainly caused due to radiation and surgery.[10] In spite of adequate drainage of the chest wall and axilla which occurs for about 5–10 days, lymph collection takes place causing lymphedema. It causes accumulation of fluid in the subcutaneous tissue in the arm which decreases the distensibility of tissue and increases the weight of arm causing the postural abnormalities such as rotator cuff disease, myofascial dysfunction, adhesive capsulitis, and axillary web syndrome.[11]

These affect the quality of life of patient and reduce the functional activity. There may be tilting due to increase in the weight of the affected side, that is, change in the shoulder girdle alignment. These may also result in cosmetic issues. These will impact a women's ability to take care for her family and return to work.[12,13]

[1]Department of Musculoskeletal Sciences, Faculty of Physiotherapy, Krishna Institute of Medical Sciences Deemed to Be University, Karad, Maharashtra, India.

[2]Department of Pharmaceutics, Dadasaheb Balpande College of Pharmacy, Nagpur, Maharashtra, India.

Corresponding Author: Shinde Sandeep, Department of Musculoskeletal Sciences, Faculty of Physiotherapy, Krishna Institute of Medical Sciences Deemed to Be University, Karad, Maharashtra, India. E-mail: drsandeepshinde24@gmail.com

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This study showed that the correlation between lymphedema and spinal postural impairment which may be caused due to change in the alignment of the shoulder girdle will put stress on the spinal posture.[14,15] This may mostly affect cervical and thoracic region and this will produce compensatory effect on the lumbar region. The one side of the muscles of the trunk will undergo shortening and other side will undergo weakening. There is overall impairment of spinal posture caused due to lymphedema in breast cancer survivors.[16]

There are lots of physical symptoms seen as well as psychological symptoms. It is frustrating and debilitating disease for a patient with just recovered from breast cancer.[17] This study will help to prevent the further spinal deformities which may be caused due to lymphedema.

The information from this study is designed to meet the gaps and will provide a scientific basis for the development of new or refinement of existing, assessment, intervention, and prevention techniques which should lead to improved clinical outcomes in this population. To improve these dysfunction and quality of life, early assessment and rehabilitation are essential. Physiotherapy will help to correct posture, improve mobility, decrease pain, avoidance of secondary complications due to lymphedema, and reduce the lymphedema.[18] There are studies showing that early post-surgical physiotherapy reduces the risk of lymphedema.[19] If rehabilitation is not taken, may lead to lymphedema and future postural alterations. Recent advances about the treatment of breast cancer and lymphedema in breast cancer survivors have described progression in survival and focus is shifted to rehabilitation and improvement in quality of life.[20] Correlation study will help in assessment of patient's spinal postural impairment and its relation with lymphedema.

Materials and Method

This observational study was carried out in Krishna Hospital deemed to be university, Karad.

Procedure

Ethical (Protocol number-0132/2019-2020) approval was taken from Institutional Ethical Committee; permission from respective authorities was taken. After the protocol and ethical clearance, the procedure was started.

The study was done in 6 months duration and was conducted in Karad. Total 116 female breast cancer survivors were grouped into three groups (according to the surgery, i.e., BCS, RM, and MRM) based on inclusion and exclusion criteria. Informed consents were taken from the subjects, patients were assessed for following:

- The demographic data and information related to the surgery were taken.
- Lymphedema measured using inch tape.
- The postural assessment was taken with the plumb line using the postural examination chart.
- The pain assessment was taken using visual analog scale (VAS) scale on activity and at rest.
- The muscle length test was done for trunk flexion, trunk extension, and cervical flexion.
- The muscle strength was assessed using manual muscle test for spinal flexors and extensors.

The procedure and the importance of the study were explained before the assessment. The result of the study was done based on the detailed assessment.

Subject Criteria

Total 116 breast cancer survivors fulfilling the following inclusion criteria were randomly selected for this study. Age group was ranged from 35 to 60 years old, women who had done with surgery and undergone radiotherapy and suffering from lymphedema were selected for this study. All participated women were from various occupations. The most of the women with postural impairments, pain, lymphedema, and decreased range of motion. Male breast cancer survivors and females with known case of traumatic musculoskeletal injuries, neurological deficits, and patients operated for breast cancer but not suffering from lymphedema were not included in this study. Written informed consent was taken from the participants those willing to participate. The participants were allocated by simple random sampling method. The detailed outcome assessment was done using demographic data, lymphedema measurement, postural assessment, VAS, and muscle strength and length test.

Outcome Measures

A full history was taken from each breast cancer survivor women before starting this study according to the items of the data sheet. The demographic data and information related to the surgery were taken. After that, the assessment was taken with the plumb line by the postural examination chart in the anterior, lateral, and posterior views. At that time, the subjects were asked to stand in normal anatomical position.

The lymphedema volume was measured using inch tape of both affected and no affected hand and was calculated using truncated cone volume formula.

The pain assessment was taken using VAS scale on activity and at rest.

The range of motion of cervical spine (flexion, extension, lateral flexion, and rotation) and thoracolumbar (flexion, extension, lateral flexion, and rotation) was measured using goniometer and inch tape and was written on chart.

The muscle length test was done for trunk flexion, trunk extension, and cervical flexion. The muscle strength test was done to know the weakness of muscles after breast cancer surgery like flexors and extensors of spine.

Statistical Analysis

The outcome measures were assessed at the baseline. The collected data in this study were statistically analyzed using descriptive statistics as mean and percentage. The postural examination was analyzed on the basis of percentage, which was calculated in the anterior, lateral, and posterior views in Table. Pain assessment was analyzed on the basis of percentage and mean, using VAS scale which was described in Table. For lymphedema, girth was measured using inch tape and analyzed on the basis of percentage of subjects suffering from spinal deformities. Muscle strength and length were analyzed on the basis of percentage.

Results

Demographic Data

Table 1 represents the demographic data that include age, dominance, obesity, lifestyle, surgical history, occupational status, and population, respectively. About 63 (54.31%) obese population

was suffering more than non-obese. About 78 (67.24%) sedentary, 74 (63.79%) non-workers, and 75 (64.65%) rural population were suffering more than exercising, workers, and urban population.

Postural Examination of Anterior View

Table 2 shows that position of head was abnormal in 75 (64.65%) subjects and shoulder alignment was abnormal in 82 (70.68%) subjects. This shows that there was a significant alteration in anterior view.

Postural Examination of Lateral View

Table 3 shows that excessive kyphosis was seen in 69 (59.48%) subjects and scoliosis was present in 76 (65.51%) subjects. This shows that there was a significant alteration in lateral view.

Postural Examination of Posterior View

Table 4 shows that scapular dyskinesis was observed in 79 (68.10%) subjects and scoliosis was observed in 40 (34.48%) subjects. This shows that there was a significant alteration in posterior view.

Lymphedema Measurement

Table 5 shows that 43 subjects were having mild lymphedema, 18 subjects were suffering from spinal deformities. 47 subjects were having moderate lymphedema, 35 subjects were suffering from spinal deformities, and 26 subjects were having severe lymphedema; all subjects were suffering from spinal deformities.

Muscle Length Test

Table 6 shows that muscle length of trunk extension was limited in 73.27% peoples showed pectoralis muscle tightness. The muscle length of cervical flexion was limited in 25% peoples showed trapezius, posterior, and anterior muscle tightness.

Muscle Strength Test

Table 7 shows that maximum individuals were having weakness of extensors and flexors of spine. About 29.31% subjects were having Grade 2 spinal extensor muscle weakness and 22.4% subjects were having Grade 2 spinal flexor muscle weakness. About 41.37% subjects were having Grade 3 spinal extensor muscle weakness and 35.34% subjects were having spinal flexor muscle weakness.

Pain Assessment

Table 8 shows that minimum pain was 0.3 and maximum pain was 3.2 at rest and minimum pain was 3.8 and maximum pain was 8.5 on activity.

Discussion

This study "Correlation between Postural Impairment and Lymphedema in Breast Cancer Survivors" was conducted to assess the correlation between postural impairment and lymphedema in breast cancer survivors.

There are studies showing that breast cancer survivors suffer from postural and musculoskeletal impairment such as increased thoracic kyphosis, many upper limb dysfunctions,[24] physical discomfort, cosmetic deformity, psychological distress, and episode of erysipelas.[25,26]

Table 1: Demographic data

	Present	*Percentage*
Age		
50–60	52	44.82
35–49	64	55.17
Dominance		
Right	98	84.48
Left	18	15.51
	Frequency	*Percentage*
Obesity		
Obese	63	54.31
Non-obese	53	45.68
Total	116	
Lifestyle		
Exercising	38	32.75
Sedentary	78	67.24
Type of surgery	*Present*	*Percentage*
Surgical history		
BCS	38	32.75
RM	39	33.62
MRM	39	33.62
Total	116	
Occupational status		
Workers	42	36.20
Non-workers	74	63.79
Population		
Urban population	41	35.34
Rural population	75	64.65
Total	116	

Table 2: Postural examination of anterior view

Anterior view	*Normal*	*Abnormal*
Head position	41 (35.34%)	75 (64.65%)
Shoulder alignment	34 (29.31%)	82 (70.68%)

Table 3: Postural examination of lateral view

Lateral view	*Absent*	*Present*
Excessive Kyphosis	47 (40.51%)	69 (59.48%)
Scoliosis	76 (65.51%)	40 (34.48%)

Table 4: Postural examination of posterior view

Posterior view	*Present*	*Absent*
Scapular dyskinesis	79 (68.10%)	37 (31.86%)
Scoliosis	40 (34.48%)	76 (65.51%)

Table 5: Lymphedema measurement

Category	*Percentage of Subjects*	*Percentage of Subjects Suffering from Spinal Deformities*
Mild lymphedema	37.06% (43)	41.86% (18)
Moderate lymphedema	40.51% (47)	74.46% (35)
Severe lymphedema	22.41%% (26)	100% (26)

Mild lymphedema: <20% increase in extremity volume
Moderate lymphedema: 20–40% increase in extremity volume
Severe lymphedema - >40% increase in extremity volume

Table 6: Muscle length test

Muscle length test	*No. of individuals*		*Result*
	Normal	*Limited*	
Trunk extension	26.72%	73.27%	Pectoralis tightness
Cervical flexion	75%	25%	Trapezius, posterior and anterior neck muscle tightness

Table 7: Muscle strength test

Muscle strength test	*No. of individuals with grades*											*Result*
	1	*2–*	*2*	*2+*	*3–*	*3*	*3+*	*4–*	*4*	*4+*	*5*	
Spine extension	0%	29.31%	0%	0%	41.37%	0%	0%	0%	0%	21.55%	7.77%	Weakness of spine extensors
Spine flexion	0%	22.4%	0%	0%	35.34%	0%	0%	0%	0%	32.93%	4.33%	Weakness of spine flexors

Table 8: Pain assessment

Pain (VAS)	*At rest*	*On activity*
Minimum pain	0.3	3.8
Maximum pain	3.2	8.5
Mean	0.9	6.6

Recent studies show that physiotherapy treats lymphedema by reducing swelling and discomfort, increasing joint mobility.[8] This study focuses on postural impairment which is caused due to lymphedema and if left untreated can cause further functional impairments.

Conducted study drives attention toward adverse effect on the spine[23] and overall posture caused due to secondary lymphedema.[24-26] There are early degenerative changes seen in the thoracic and cervical region which is caused due to changes in the shoulder alignment and may further lead to deformities. Changes in the cervical region give rise to forward head posture as well as laterally flexed head toward the affected side. The overall mobility and strength of the cervical region are decreased. The mobility of the shoulder is decreased and other problems such as rotator cuff disease, myofascial dysfunction, adhesive capsulitis, and axillary web syndrome are observed. The swelling of the arm and increase in the weight of the extremity causes discomfort, considerably impairing arm function.[27] The excessive stresses on the shoulder complex caused due to the increased weight of the ipsilateral arm, alters the alignment of thoracic region causing deformities such as kyphosis and scoliosis. Kyphosis is mainly caused due to increase in the weight of the arm and limited use of the affected arm due to fear. Scoliosis is the other debilitating deformity caused due to long-term effect of tilting toward the affected side and the weight of the affected extremity. It is not commonly seen in mild and moderate lymphedema but is commonly observed in severe lymphedema. The joint mobility of the overall spine is reduced causing difficulty in activity of daily living. The motion of upper extremity is hindered. The overall posture of the person is affected.[12]

Physiotherapy can prevent lymphedema, only if the breast cancer treatment is accompanied with rehabilitation.[28] There are various studies showing effect of physiotherapy to prevent lymphedema as well as treat lymphedema secondary to breast cancer[19,29] and this conducted study focuses on postural impairment which should be considered during the treatment of lymphedema. The role of physiotherapy for women with breast cancer surgery is to reduce swelling, pain along with correcting the posture,[30] improving the spinal range of motion,[31] improving and maintaining physical performance and promoting fitness, health, and wellness.[32] Physiotherapy should also involve strengthening the weak muscles and stretching of tight muscles after breast cancer surgery.[33,34] Multidisciplinary approach should be taken to treat lymphedema and other complications related to that and multicomponent exercise program should be used to counter the overall impairment.[35]

Therefore, overall posture should be assessed for better treatment and prognosis in patients suffering from lymphedema in breast cancer survivors.

Conclusion

There is statistically high significant increase in the forward head posture, rounded shoulders, thoracic kyphosis and scoliosis, scapular dyskinesis, and increased volume of affected arm in breast cancer survivors. Furthermore, muscle strength test was conducted showed that there is a significant amount of weakness in extensors and flexors of spine. Therefore, on the basis of results, there was statistically high significant correlation between postural impairments and lymphedema in breast cancer survivors.

Evaluation of age showed that percentage of age ranging from 35 to 49 have more breast cancer survivors with lymphedema than 50 to 60. Obese population are suffering more than non-obese. Sedentary, non-workers, and rural population are suffering more than exercising, workers, and urban population. Hence, there is a significant correlation between demographic variables and lymphedema in breast cancer survivors.

Clinical Significance

Breast cancer survivor women suffering from lymphedema have the highest chances of postural impairment such as in the forward head posture, rounded shoulders, thoracic kyphosis and scoliosis, and scapular dyskinesis. Hence, more attention toward preventive steps is needed.

Authors Contribution

KolekarShital conducted literature review for this manuscript and developed introduction section of the manuscript. Kulkarnikajol conducted the discussion of the study, findings, collected data, and analyzed the data. Dr. ShindeSandeep provided a description of the background information, collected data and analyzed the data, and participated in preparation of the manuscript. All the authors read and approved the final manuscript.

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