ORIGINAL RESEARCH

Improving Outcomes in Patients of Breast Cancer with Integrated Oncology Services

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Abstract

Aim and objective: The main objective was to determine the outcome of oncology-specific rehabilitation (OR) exercises in patients of breast cancer in terms of improvement in 6-minute walk test distance (6MWTD) and quality of life (QOL).

Materials and methods: An observational study was performed on patients with breast cancer who underwent OR exercises during their treatment of the disease. The 6MWTD was documented before and after exercises, different parameters were statistically analyzed, and QOL improvement was recorded with a functional assessment of chronic illness therapy (FACIT) questionnaire.

Results: Post-OR exercises, all ($n = 46$) patients had a statistically significant improvement in 6MWTD ($p = 0.0001$). Patients not receiving chemotherapy did not show any improvement post-rehabilitation ($p = 0.103$). Patients of age <55 years did better than ≥55 years in 6MWTD ($p = 0.003$). Functional assessment of chronic illness therapy questionnaire showed a statistically significant improvement in the physical, emotional, and additional well-being of the patients. No significant benefit was seen in social and functional well-being. The total FACIT score showed a statistically significant improvement in the QOL of all patients ($p = 0.01$).

Conclusion: With the above experience, OR exercises program for patients with breast cancer has a significant impact on physical endurance and QOL as per our study.

Keywords: 6-minute walk test distance, Breast cancer, Functional assessment of chronic illness therapy scores, Oncology-specific rehabilitation exercises.

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Introduction

The GLOBOCAN 2018 data show that there are 18.1 million new cases and 9.6 million cancer-related deaths.[1] International Agency for Research on Cancer (IARC) released estimates on the global burden of cancer showing the incidence of 2 million cases and 0.6 million deaths indicating 1 in 4 women with cancer is affected by breast cancer. In India, according to the Health Ministry of India, breast cancer ranks as the number one cancer among Indian females with a rate as high as 25.8 per 100,000 women and mortality of 12.7 per 100,000 women.[2] Due to lifestyle changes, improvement in the standard of living, and urbanization, breast cancer has surpassed cervical cancer to become the most common malignancy in women in India.[3] Although there is a rise in the incidence of breast cancer, the number of patients surviving after the treatment has also increased substantially.[4] Breast cancer patients are treated with a multidisciplinary approach of surgery, chemotherapy, hormone therapy, and radiotherapy as per the indications of the patient's disease condition.[5] Surgery could be mastectomy or breast conservation surgery along with axillary node dissection or sentinel node biopsy.[6] Many of these patients also receive chemotherapy and radiotherapy which further add to treatment-related toxicities.[7] Many patients commonly report symptoms such as shoulder movement dysfunction, breast or arm swelling due to lymphedema with deformity, and numbness of the skin on the upper arm. Lymphedema studies have shown that it occurs in up to 50% of women who underwent ALND and up to 20% of women who underwent SLNB.[8] Postoperative chronic pain is seen in 15–50% of women with breast cancer usually due to nerve injuries during surgery.[9] Common chemotherapy-induced toxicities include peripheral neuropathy, ovarian dysfunction and cardiovascular toxicity, fatigue, neutropenia, and alopecia.[10,11]

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Common radiotherapy-induced toxicities include dermatitis, dysphagia, cardiomyopathy in left breast cancer, and breast edema. While hormone therapy is well tolerated by most patients, it can cause hot flushes, osteoporosis, and thromboembolic events in patients.

During and post-treatment, these patients face tiredness, lack of energy, loss of libido, muscle stiffness, decreased range of motion of the affected arm, vaginal dryness, arm swelling, and pain.[12] These patients need emotional, physical, and social support to recover from the mental, physical, cognitive, and social trauma. Oncology-specific rehabilitation (OR) plays an important role in achieving these goals in several patients with breast cancer. It includes various interventions for restoring the functionality and integrity of the organs to compensate for the physical deformity and disability.[13,14] It helps in the reduction of the cancer-related symptoms, treatment side effects, restoration of neurologic or

musculoskeletal abnormality, reduction in the number of hospital admissions, and treatment cost.[15–17] We run an OR program in our institute and this is an audit of the patient outcomes of the breast cancer patients who underwent this program while receiving their postoperative radiotherapy to the breast or chest wall.

Materials and Methods

A total of 46 consecutive patients with breast cancer who underwent OR and radiotherapy were analyzed as a part of this retrospective analysis. These patients were stratified on basis of age, comorbidities, laterality of malignancy, stage, type of surgery, chemotherapy, radiotherapy details in terms of dose, fractionation, and toxicities of radiation treatment. Comprehensive OR program consisted of a weekly schedule with 3 days of breast cancer-site specific exercises that involved shoulder active-assisted exercises, self-stretches, and stretching exercises to improve flexibility, breathing exercises included diaphragmatic breathing, segmental expansion, thoracic expansion exercises. Aerobic exercises were done with a frequency of 3 days a week at an intensity of 60–80% of maximum heart rate or rate of perceived exertion between 11 and 13 on Borg scale 6–20 or as tolerated by the patient on a stationary bicycle or treadmill or level ground walking for a duration of 20–30 minutes. Strength training was done 3 days a week starting with the lowest weight of 0.5–1 kg dumbbell, TheraBand, and slowly progressing to higher weight as comfortable to the patient with 12–15 repetitions of 1–2 sets. Strength training exercises concentrated mainly on large muscle groups like shoulder girdle, shoulder muscles (trapezius, rhomboideus, biceps brachii, triceps, rotator cuff, and pectoralis major and minor). Exercises to improve lymphatic drainage, lymphedema management (if required), once a week of Yoga therapy, and once a month nutrition and psychologist consult. All the above was for a duration of 4–6 weeks throughout the radiation course.

Before enrolment, a detailed history and assessment (weight, BMI, range of motion, arm girth measurement, strength assessment) were done for each patient. A 6-minute walk test distance (6MWTD) was used to evaluate the physical capacity of the patient and the distance walked in 6 minutes was recorded. Functional assessment of chronic illness therapy (FACIT)-B + 4 questionnaire was used to evaluate health-related quality of life (QOL). Functional assessment of chronic illness therapy scale comprises five components: physical (7Questions), social (7Q), emotional (6Q), functional (7Q), and additional (Cancer-Specific questions: 14Q). Each question can be rated out of 4 (0-Not at all, 1-A little bit, 2-Somewhat, 3-Quite a bit, 4-Very much). The 6MWTD and FACIT (FACT) questionnaires were documented before and after completion of the OR program.

The patient received radiotherapy 5 days a week for 3–6 weeks depending on the protocol used and underwent OR every day.

Ethics

Patients were explained about the objective of documentation of the QOL questionnaire. Women who responded were well motivated and interested in participating in the OR program. Hence, only informed verbal consent was obtained and complete confidentiality was maintained of the patient information.

Statistical Analysis

The statistical analysis was done with the Statistical Package for Social Sciences, version 21.0 (SPSS Inc., USA). Paired and unpaired *T*-test was applied for analysis of the different parameters.

Results

Demographics and Patient Characteristics

Mean age of the patients was 54 years, the youngest patient in the study was age 32 while the oldest was 74 years old (Table 1). Fifty-three percent of the patients were <55 years and the rest were above 55 years. Thirty-nine percent of patients had comorbidities such as diabetes mellitus and/or hypertension or bronchial asthma. Fifty-two percent had left breast malignancy and the rest 48% with right breast malignancy. Seventy percent of patients had early-stage disease and the remaining 30% with advanced-stage disease. All patients underwent surgery, of which 43% underwent modified radical mastectomy and breast conservation surgery in 57%. Twenty-eight percent of the patients did not receive chemotherapy based on their stage of disease and indications while 72% received chemotherapy. Fifty-three percent of patients received hypofractionated radiotherapy and the rest were treated with conventional fractionation.

All patients (n = 46) showed a statistically significant improvement in 6MWTD post-OR when compared with pre-OR (Table 2). Individual parameters such as age <55 vs ≥55 years, presence or absence of comorbidities, laterality of malignancy, type of surgery (MRM or BCS), patients with early or advanced-stage disease, those receiving chemotherapy, and hypofractionated or conventionally fractionated radiotherapy showed a statistically significant improvement in 6MWTD post-OR when compared with pre-OR values. No significant improvement was seen in patients who did not receive any chemotherapy ($p = 0.103$). Comparative analysis of parameters showed a statistically significant improvement in 6MWTD in patients of <55 years age when compared with those ≥55 years, p = 0.003 (Table 3). All other parameters of the presence of comorbidities *vs* no comorbidities, left vs right breast malignancy, BCS vs MRM, patients treated with chemotherapy vs those not receiving chemotherapy, early-stage vs advanced stage disease, local vs locoregional radiotherapy, hypofractionation vs conventional fractionation, presence or absence of lymphedema, mean heart dose <4 vs >4 Gy and mean lung dose <9 vs >9 Gy did not show any statistical significance in terms of improvement in 6MWTD when compared with each other (Table 3).

Table 1: Demographics

Characteristics	*n = 46*	*Percentage*
Age <55 years	24	53
Age >55 years	22	47
No comorbidities	28	61
With comorbidities	18	39
Right breast	22	48
Left breast	24	52
Early-stage disease	32	70
Advanced stage disease	14	30
Surgery modified radical mastectomy	20	43
Breast conservation surgery	26	57
No chemotherapy	13	28
Chemotherapy	33	72
Hypofractionated radiotherapy	24	53
Conventional fractionation radiotherapy	22	47

Statistical analysis of various parameters with paired and unpaired "*t*" tests was applied to evaluate pre- and post-onco-rehab outcomes of the 6-minute walk test distance and FACIT QOL questionnaire

Table 2: 6-Minute walk test distance (6MWTD) measurements

Parameters	*Total number of patients (N)*	*6MWTD (meters)*		*Statistical significance*
		Pre-OR mean	*Post-OR mean*	
All patients	46	392.7	439.6	$p = 0.000$
Age <55 years	24	410.2	469.0	$p = 0.000$
Age >55 years	22	373.7	407.5	$p = 0.005$
No comorbidities	28	402.7	451.4	$p = 0.000$
With comorbidities	18	381.2	426.1	$p = 0.001$
Right breast	22	387.1	443.9	$p = 0.000$
Left breast	24	397.9	435.67	$p = 0.000$
Early-stage disease	32	400.1	440.9	$p = 0.000$
Advanced stage disease	14	376	436.7	$p = 0.000$
Surgery modified radical mastectomy	20	389.2	442.9	$p = 0.000$
Breast conservation surgery	26	395.5	437.1	$p = 0.000$
No chemotherapy	13	407.2	430.5	$p = 0.103$
Chemotherapy	33	387.0	443.2	$p = 0.000$
Hypofractionated radiotherapy	24	395.9	436.8	$p = 0.000$
Conventional fractionation radiotherapy	22	389.3	442.6	$p = 0.000$

Table 3: Comparisons of 6-minute walk test distance (6MWTD) among different parameters

Parameters	*No. of patients*	*6MWTD (meters)*		*Statistical significance*	
		Pre-OR	*Post-OR*	*Pre-OR*	*Post-OR*
Age					
(<55 years)	24	410.2	469.1		$p = 0.003$
(>55 years)	22	373.7	407.4		
With comorbidities	18	377.2	421.2	$p = 0.293$	$p = 0.150$
Without comorbidities	28	402	451.4		
Left breast	24	397.9	435.6	$p = 0.657$	$p = 0.706$
Right breast	22	387.1	443.9		
Breast conservation surgery	26	395.4	437.1	$p = 0.794$	$p = 0.792$
Modified radical mastectomy	20	389.2	442.9		
Early-stage disease	30	402.6	437.7	$p = 0.302$	$p = 0.814$
Advanced stage disease	16	376.0	443.1		
Local radiotherapy	18	414.4	448.6	$p = 0.139$	$p = 0.505$
Locoregional radiotherapy	28	378.8	433.7		
No chemotherapy	13	407.2	430.4	$p = 0.443$	$p = 0.599$
Chemotherapy	33	387.0	443.2		
Hypofractionation	24	395.9	436.8	$p = 0.780$	$p = 0.791$
Conventional fractionation	22	389.2	442.6		
No lymphedema	37	393.7	437.7	$p = 0.859$	$p = 0.735$
Lymphedema	9	388.4	447.1		
Mean heart dose					
<4 Gy	33	393.3	440.9	$p = 0.922$	$p = 0.843$
>4 Gy	13	391.2	436.3		
Mean ipsilateral lung doses					
<9 Gy	21	409.9	454.1	$p = 0.182$	$p = 0.212$
>9 Gy	25	378.3	427.4		

$p \leq 0.05$ was considered statistically significant

Functional assessment of chronic illness therapy (version 4.0) or functional assessment in cancer therapy questionnaire for QOL assessment pre- and post-onco-rehabilitation in breast cancer patients $N = 34$ of 46 patients took part in QOL assessment questionnaire (Table 4). Quality of life questionnaire showed a statistically significant benefit of improvement in FACIT scores in emotional ($p = 0.05$), physical ($p = 0.02$), and additional components ($p = 0.03$) of FACIT scores post-onco-rehabilitation. Added scores of

Table 4: Functional assessment of chronic illness therapy (FACIT) scores measurements

Components	FACIT score		Statistical significance
	Pre-OR	Post-OR	
FACIT-functional	20	21.3	$p = 0.109$
FACIT-social	24.5	23.9	$p = 0.345$
FACIT-emotional	19.6	21.0	$p = 0.050$
FACIT-physical	20.1	22.1	$p = 0.026$
FACIT-additional	30.8	33.6	$p = 0.036$
FACIT-total	115.5	122.1	$p = 0.016$
Trial outcome index	71.38	77.12	$p = 0.005$

all components showed a statistically significant total FACIT score ($p = 0.016$). No improvement was seen in the social and functional parameters of the QOL questionnaire. The trial outcome index also showed a statistically significant improvement post-OR ($p = 0.005$).

Discussion

This study was conducted to explore the impact of OR in patients of breast cancer on musculoskeletal endurance by 6MWTD and overall improvement in their QOL with assessment by FACIT questionnaire. All the patients showed a significant improvement in their 6MWTD as well as their QOL. Breast cancer and its treatment may cause fatigue, decreased strength, and deterioration of QOL in patients.[18] Mustian et al. showed improvement in strength as well as the QOL and reduction in cancer treatment-related fatigue after a home-based exercise program.[19] Similarly, a randomized study by Samuel et al. showed a significant improvement in 6MWTD and QOL in head and neck cancer patients after a structured exercise program.[20]

In our study, younger patients showed significantly more benefits of OR programs, similar to findings by Derks et al. of improvement of physical functioning in younger patients of breast cancer.[21] Patients who did not receive any chemotherapy showed no significant improvement in 6MWTD pre- and post-rehabilitation, possibly due to lack of chemotherapy-induced detriment in the strength and endurance. Patients who received chemotherapy did not show a significant difference in 6MWTD compared with patients who had not undergone chemotherapy, after the OR. This could possibly imply the benefit of OR in patients who have undergone chemotherapy in restoring their strength and endurance to match those of patients who have not undergone chemotherapy. Chemotherapy-related fatigue and muscle weakness due to oxidative stress worsens QOL[22] and decreases muscle strength and endurance capacity in patients with breast cancer.[23,24]

Radiotherapy for breast cancer is known to cause symptoms such as fatigue, acute dermatitis, tightening of the skin, and lymphedema in the long run. In the current study, all patients did significantly better post-rehabilitation irrespective of radiation dose, fractionation, mean heart, and lung doses. There was an overall significant improvement in 6MWTD irrespective of presence or absence of comorbidities, stage of the disease, laterality of the disease, type of surgery, presence or absence of chemotherapy, presence or absence of lymphedema, radiotherapy site.

Functional assessment of chronic illness therapy QOL questionnaire scores in 34 patients showed significant improvement in emotional, physical, and additional components while no improvement was seen in social and functional aspects. Total scores of all the components showed betterment of the QOL in all the patients of breast cancer after OR. Meta-analyzes of 56 randomized trials with 4,826 participants showed similar findings of better health-related QOL in patients of cancer undergoing active exercise intervention.[25] In the current study, patients had significant improvement in emotional wellbeing post-onco-rehab indicating a positive impact of rehabilitation exercises and psychological assistance provided. The limitations in our study were the small number of patients and the lack of a control arm.

Conclusion

With the above experience, OR exercises program for patients with breast cancer has a significant impact on physical endurance and QOL as per our study.

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