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Abstract

Purpose: To examine the effects of a group exercise program on shoulder pain, disability, range of motion, and strength. Method: This was an observational study of twenty-six patients who had undergone breast cancer surgery and were receiving physiotherapy intervention. The intervention was a supervised 8-week exercise group program. The primary outcome measure was shoulder pain and disability index (SPADI). Secondary outcome measures were shoulder range of motion of flexion and abduction and strength of shoulder flexion and abduction. Results: The average age of patients referred to the group was 56-years (range of 29 to 71 years). The average time since surgery was 6-9 months (range of 2 to 16 months). The exercise group intervention resulted in small reductions in SPADI scores (pConclusion: An 8-week group exercise program can be effectively implemented in the clinic without any seen side effects. There were improvements in shoulder range of motion and strength, and a reduction in pain and disability although not clinically significant. This pilot study assists clinicians with incorporating an exercise program for patients in breast cancer rehabilitation.

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Implementation of an Exercise Program in Breast Cancer Rehabilitation to Improve Shoulder Outcomes: A Pilot Study

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ABSTRACT

Purpose: To examine the effects of a group exercise program on shoulder pain, disability, range of motion, and strength. **Method:** This was an observational study of twenty-six patients who had undergone breast cancer surgery and were receiving physiotherapy intervention. The intervention was a supervised 8-week exercise group program. The primary outcome measure was shoulder pain and disability index (SPADI). Secondary outcome measures were shoulder range of motion of flexion and abduction and strength of shoulder flexion and abduction. **Results**: The average age of patients referred to the group was 56-years (range of 29 to 71 years). The average time since surgery was 6-9 months (range of 2 to 16 months). The exercise group intervention resulted in small reductions in SPADI scores ($p<0.001$), small improvements in shoulder flexion ROM (3.3° degrees) ($p=0.001$) and shoulder abduction ROM (3.2°) ($p=0.003$), and small increases in shoulder flexion strength (0.37 lbs) ($p<0.001$) and shoulder abduction strength (0.69 lbs) ($p=0.001$). No adverse effects were reported during this study. **Conclusion**: An 8-week group exercise program can be effectively implemented in the clinic without any seen side effects. There were improvements in shoulder range of motion and strength, and a reduction in pain and disability although not clinically significant. This pilot study assists clinicians with incorporating an exercise program for patients in breast cancer rehabilitation.

INTRODUCTION

Upper limb impairments in range of motion and strength, and reduced physical fitness are common long term problems experienced after surgery and treatment for breast cancer.[1-5] These impairments can reduce the ability to perform daily functional activities and return to work and impact one's health-related quality of life.[5-8] Exercise has been shown to be effective in diminishing many of the side effects from breast cancer and its treatments.[5,9-16]

Exercise has been shown to improve the physical function of breast cancer survivors and quality of life in several high quality studies.[6,8,9,12,15,17-21] Exercise has been shown to be beneficial in symptom management for patients receiving adjuvant therapy such as chemotherapy and/or radiotherapy. [22-26] Furthermore, upper body exercise, including resistance exercise, is safe for women at risk for or with lymphedema following breast cancer.[1,12,27-30]

Based on the evidence, an exercise program for patients with breast cancer has clear health benefits and should be an integral component of rehabilitation. Therefore, we implemented an exercise program in our clinic and examined the effects on pain and disability, shoulder range of motion, and strength. It was hypothesized that there would be a decrease in pain and disability scores, an improvement in shoulder range of motion, and an increase in strength.

METHOD

Design

An observational single-centre pilot study was performed. The study was approved by the hospital Human Ethics Committee. All participants provided written informed consent.

Setting
The trial was conducted in the Physiotherapy Department of Westmead Hospital, Sydney, NSW Australia.

Participants
Participants were recruited from a sample of convenience for the study from their physiotherapist or breast care nurse. Women were eligible for the study if they had undergone surgery for diagnosed breast cancer, could attend exercise group sessions, and were able to provide consent. Women who had completed or were undergoing adjunct treatments such as chemotherapy and/or radiotherapy were included. Women were excluded if they were unable to engage in a regular exercise program due to cardiac disease, acute or chronic respiratory disease, or any other uncontrolled medical condition. Participants could withdraw from the trial at any time without prejudice, as set out in the patient information and consent form. Information on participant age, type of surgery, time since surgery, and if they were undergoing adjuvant treatment during intervention were taken.

Intervention
Participants attended a weekly supervised exercise session for 8 weeks. The group size varied between 5 and 8 participants per session. All participants exercised within this group once per week for 8 weeks. The group was conducted between July 2012 and October 2013. The session was 60 minutes in duration and consisted of a warm up of 10-minutes with light aerobic activity, which may have included outdoor walking, treadmill, stationary bike, or stepper as selected by the supervising physiotherapist according to participant ability or need. Stretches involving large muscle groups such as triceps, quadriceps, hamstrings, calf, were performed actively. The exercise component consisted of 30 minutes of strengthening exercises for the major muscle groups. The supervising physiotherapist tailored the exercise program to meet the individual needs of each participant based on their physical assessment and consideration of adjuvant treatment. The exercises performed were biceps curls, triceps curls, upper limb rowing, squats, step ups, modified abdominal curl ups, bridging, and core stability on an exercise ball. The exercises enabled progression to accommodate increases in strength gained over the course of the program. Free weights were used with 0.5 increments in weight. Participants were instructed to perform 2 sets of 8 to 12 repetitions of each exercise. Resistance was increased by 0.5kg when they could complete 3 sets of 15 repetitions. Participants were instructed to exercise at a moderate intensity, which is the equivalent to a rate of perceived exertion on the Borg Scale of no more than 13 out of a possible 20, described as "somewhat hard."[31] Cool down was 10 minutes comprised of light aerobic activity, stretches, and breathing exercises. All patients who had a compression garment were encouraged to wear it during exercise in line with other exercise trials.[32] Adverse effects were monitored. At the conclusion of the trial, women were encouraged to continue with the program.

Outcome Measures
Measures were taken at baseline and after intervention at 8 weeks by the same physiotherapist. The shoulder pain and disability index (SPADI) was utilized; a higher score indicates more pain and disability.[33] Shoulder range of motion (ROM) of the affected arm for flexion and abduction was measured in sitting with the same two arm goniometer. The final result was recorded in degrees as the best of three attempts where a higher score indicates increased range of motion. Maximal isometric shoulder strength measures were taken with a hand-held dynamometer. Shoulder flexion and abduction were measured in sitting with the arm by side with elbow flexed at 90 degrees. The dynamometer was positioned two cm proximal to the elbow crease for measures. The final result was recorded in pounds (lbs) as the best of three attempts where a higher score indicates more strength.

Statistical Analyses
Descriptive statistics for age, type of surgery, and time since surgery were made. Data was examined and parametric analyses conducted. The mean within patient change was determined for outcome measures using paired samples t-tests. Mean and standard deviation are reported. Analyses were conducted with SPSS (version 19, IBM, USA 2010).

RESULTS
The study recruited 32 participants. Twenty-six participants completed the 8 week group program. The demographics of the participants are described in Table 1. The six participants that dropped out of the study were unable to attend for the following reasons: return to work (3), unable to organize childcare (1), further surgery (1) and moved away (1). The average number of sessions attended for drop outs was 4. The average age of patients referred to the group was 55-years (range of 24 to 71 years). The average time since surgery was 8.2 months (range of 2 to 16 months). All participants attended 8 sessions of the exercise program over an average of 8.3 weeks (range 8 to 12 weeks).

Table 1. Demographics

Participant	Age	Surgery	Time Since Surgery (Months)	Adjunct Treatment During Intervention
1	54	Mx	6	Chemotherapy
2	61	Mx & ALND	8	Chemotherapy
3	65	WLE	6	-
4	68	WLE	4	-
5	44	WLE & ALND	13	-
6	55	Mx	7	Radiotherapy
7	56	Mx & ALND	8	-
8	24	Mx & ALND	6	Chemotherapy
9	31	WLE	12	-
10	66	WLE & ALND	5	-
11	43	Mx	6	-
12	55	Mx	7	-
13	48	Mx & ALND	5	Radiotherapy
14	59	WLE	3	-
15	66	Mx	8	-
16	51	Mx & ALND	11	-
17	59	Mx	4	-
18	71	WLE	2	-
19	70	Mx & ALND	16	-
20	68	WLE	14	-
21	62	WLE	12	-
22	56	Mx & ALND	12	-
23	32	Mx	6	-
24	39	Mx	11	-
25	69	WLE & ALND	6	-
26	60	WLE	16	-

Mx = mastectomy
ALND = axillary lymph node dissections
WLE = wide local excision

Table 2 displays the mean SPADI, shoulder ROM, and shoulder strength scores before and after intervention for the 26 participants who completed the 8 week intervention. The mean within patient change for the SPADI was -8.1 (95% CI -4.8 to -11.5, p <0.001). Analysis to compare the pain and disability subsections of the SPADI revealed the change was relatively equal across both sections. The mean within patient change for flexion range was 3.3° (95% CI 1.5 to 5.1, p = 0.001). The mean within patient change for abduction range was 3.2° (95% CI 1.2 to 5.2, p = 0.003). The mean within patient change for shoulder flexion strength was 0.37 lbs (95% CI 0.18 to 0.55, p<0.001). The mean within patient change for shoulder abduction strength was 0.69 lbs (95% CI 0.31 to 1.08, p = 0.001).

Table 2. Outcome Measures Before and After Intervention

	Mean Before Intervention	Mean After Intervention	Mean Within Patient Change
SPADI	31.8	23.7	8.1 (p<0.001)
Shoulder ROM			
Flexion	138.4°	141.7°	3.3 (p<0.001)
Abduction	135.6°	138.8°	3.2 (p<0.003)
Shoulder strength			
Flexion	11.4(lbs)	11.8(lbs)	0.37(lbs) (p<0.001)
Abduction	11.1(lbs)	11.8(lbs)	0.69(lbs) (p<0.001)

No adverse effects or complications were reported during the intervention or at follow up.

DISCUSSION

The results of the present study led us to conclude that an 8-week exercise program has positive effects on pain and disability, shoulder range of motion, and strength in breast cancer patients who completed the intervention. The SPADI has been used previously in breast cancer patients and has shown a significant relationship between reduced shoulder muscle function and increased SPADI scores in post-operative breast cancer patients.[4,34] Our results showed significant improvement of scores, but that change was small. It has been reported that minimal detectable change with 90% confidence is 13 points and change less than this may be attributable to measurement error.[33] Our sample had low to moderate pain and disability scores to begin with, so a change in the score is not likely to be as high as it may be with a population who had moderate to high scores at the start of the study. Shamley et al found higher pain scores in patients who had undergone mastectomy compared with wide local excision.[4] Our sample consisted of 58% of participants having mastectomy versus 42% having wide local excision, so perhaps that is why the pain and disability score in our study were not as high. Both pain and disability sections of the SPADI showed relatively equal change across time in our study.

Our results add to the body of evidence that exercise programs can be utilized after breast cancer surgery.[24,27,35] The increases in muscle strength seen in our study are small when compared with the increases reported by other studies and may represent measurement error.[24] Courneya et al asked participants to exercise three times a week, which was not a feature of our study.[24] Considering our program included similar upper limb resisted exercises to their study, it seems likely that exercising more during the week may lead to larger increases in strength. Introduction to the exercise program did not cause any reported adverse effects, including no report of lymphedema symptoms or exacerbation in line with previous studies.[12,24,27,36]

This present study has some limitations. In the absence of a control group, it is not known whether the small improvements seen may have occurred due to healing over time. As there was no randomization, the effect size may be overestimated.[9] Bias may have occurred as the physiotherapist performing the outcome measures was the same physiotherapist who supervised the intervention. However, the primary outcome was a self-administered questionnaire reducing assessor bias. The sample was one of convenience; hence, the generalizability of findings to other breast cancer populations is limited. Furthermore the setting was a single site physiotherapy outpatient department of a large tertiary public hospital, so the applicability of these findings to other settings is unknown. Participant expectancy may also have increased effects; however, participants were blinded to the experimental hypotheses. The constraints of the present pilot study, performed without additional funding or staffing in a busy clinical hospital setting, precluded us from exploring the effects of an exercise group intervention on other health domains, such as quality of life and physical fitness measures.

CONCLUSION

This study provides some empirical evidence that a group exercise program for breast cancer patients can be effectively implemented in the clinic with small improvements in reported pain and disability without any side effects. Future studies may provide more information to support the role and effectiveness of group exercise programs in the clinical setting in the management and rehabilitation of breast cancer patients.

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