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The Perioperative Educational Program for Improving Upper Arm Dysfunction in Patients with Breast Cancer: A Controlled Trial

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Most patients who undergo breast cancer surgery suffer from impairment of upper extremity function. In this study, we investigated the effectiveness of a perioperative educational program for improving upper arm dysfunction in patients with breast cancer. This longitudinal controlled study was conducted between January 2010 and July 2012. Participants comprised 149 patients with primary breast cancer before operation, allocated to intervention and control groups. Intervention comprised a 3-month educational program on monitoring arm function and exercises for preventing shoulder dysfunction and lymphedema. The control group received routine care from on-site staffs. Of the 149 patients analyzed, 69 underwent axillary lymph node dissection (ALND), and 80 underwent sentinel lymph node biopsy (SLNB). The intervention group included 39 patients with ALND and 51 patients with SLNB, while the control group included 30 patients with ALND and 29 patients with SLNB. Arm girth, shoulder range of motion (ROM), and grip strength were measured before surgery and at 1 week, 1 month and 3 months postoperatively. Self-reported questionnaires, the Subjective Perception of Post-Operative Functional Impairment of the Arm (SPOFIA) and the Disabilities of the Arm, Shoulder and Hand (DASH), were administered at the same time points. Among the variables examined, only SPOFIA and grip strength were significantly improved in the intervention group with ALND. In contrast, the perioperative educational program caused no significant improvement for the patients who underwent the surgery with SLNB. Thus, the present program improves the postoperative upper arm function and discomfort in breast cancer patients who undergo surgery with ALND.

Keywords: breast cancer; controlled trial; education; surgery; upper arm dysfunction
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Introduction

Recently, the standardization of multimodal therapy and sentinel lymph node biopsy (SLNB) has resulted in more conservative treatment of breast cancer, compared to the surgical treatment with axillary lymph node dissection (ALND). However, invasive surgery is unavoidable in cases of more malignant cancer involving axillary lymph node metastases. Impaired upper extremity function following surgery for breast cancer is a particular complication of ALND. Post-surgical morbidity has also been reported in SLNB treatment groups, although its frequency is lower than in patients undergoing ALND (Ashikaga et al. 2010). Assessment and support of upper extremity function following breast cancer surgery are therefore applicable not just after ALND, but also after SLNB. The Upper Extremity Rehabilitation Guideline recommends 6-8 weeks of shoulder joint range exercise after breast cancer surgery and 1 year of postoperative follow-up (Harris et al. 2012). However, numbness, pain, swelling, and limitation of arm movement occurred in 8-35% of 330 breast cancer patients for 2-5 years postoperatively (Warmuth et al. 1998), and chronic symptoms have been reported (Hack et al. 1999; Voogd et al. 2003; Macdonald et al. 2005). In a cross-sectional survey that we conducted, 85.3% of 150 breast cancer patients experienced at least one of swelling, pain, decreased shoulder range of motion (ROM), numbness, reduced muscle strength in the arm, or a feeling of pulling in the skin of the arm up to 1 year postoperatively, with a greater loss to quality of life (QOL) in those patients experiencing such symptoms (Sato and Kuroda 2008). Some patients have reported problems with writing, and actions such as opening or closing jars in daily activities, and work can be affected due to weakened grip strength after surgery.

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As hospital stays become increasingly shorter, there is a need for systematic forms of support such as ongoing rehabilitation and individual counseling in support of breast cancer patients after they leave the hospital.

As one example of an intervention study for preventing or improving impaired upper extremity function after breast cancer surgery, Wyatt and Friedman (1996) developed and demonstrated the efficacy of a support program based on a holistic framework for QOL, encompassing strategies for preventing impaired upper extremity function and lymphedema, physical care, mental health, and family involvement. This program showed effectiveness in self-care, emotional well-being, physical well-being, and social/family well-being. However, the effectiveness of the program may differ in Japan, as hospital stays are longer and the home-care system is relatively underdeveloped. In addition, most rehabilitation for postoperative impairment of upper extremity function has been developed to recover shoulder ROM and minimize lymphedema (Box et al. 2002; Harris et al. 2012). No studies have yet reported the tracking of changes in upper extremity function over time to assess the effects of a program that was not limited to lymphedema or shoulder ROM and that was suitable for impaired upper extremity function in Japanese breast cancer patients.

The objective of this study was to investigate the effectiveness of short-term intervention for up to 3 months postoperatively using a program intended to prevent or improve impaired upper extremity function after breast cancer surgery, as assessed on the basis of changes over time in upper extremity function with ALND or SLNB.

Methods

Study design

This study was a controlled trial. Patients were allocated to the intervention or control group according to their wishes after receiving full information about the study protocols and providing informed consent.

Study participants

Breast cancer patients who had yet to undergo surgery were recruited in Tohoku University Hospital between January 2010 and April 2012. Data collection ended in July 2012. The inclusion criteria were: 1) age ≥ 20 years; 2) ability to answer a self-administered questionnaire and no history of diagnosis or treatment for any mental illness; and 3) provision of written informed consent to participate in the survey as per the protocol approved by the Ethics Committee of the Research Department at Tohoku University Graduate School of Medicine. Patients with bilateral breast cancer or recurrence were excluded.

Intervention

The theoretical framework of the intervention program was based on the University of California, San Francisco (UCSF) symptom management model (The University of California, San Francisco School of Nursing Symptom Management Faculty Group 1994), which was developed on the basis of self-care theory. The UCSF Model defines a symptom as a subjective experience reflecting changes in biopsychosocial functioning, sensations, or cognition of an individual, and was designed to produce an integrated approach for symptom management through a comprehensive grasp of patient and family symptom experience, symptom management strategies, and outcomes. This framework was intended to guide training and practice, as well as research on symptoms. The program was created to implement educational intervention for the prevention or improvement of postoperative swelling, pain, decreased shoulder ROM, numbness, reduced muscle strength of the arm, or feeling of pulling in the skin of the arm in breast cancer patients, to transform knowledge of the sciences of ecology and health as well as self-care strategies, and to change the symptoms of impaired upper extremity function and QOL. The appropriateness of the contents of the program for cancer nursing researchers, healthcare professionals, and breast cancer patients has been reviewed (Sato 2012a).

The mechanisms and causes of symptom development were explained prior to surgery, and techniques to prevent or improve impairment of upper extremity function potentially occurring as a result of the surgical procedure undergone by the subject were explained after surgery until the patient was discharged from hospital. Methods of arm monitoring, exercises for preventing restricted shoulder ROM or lymphedema, and massaging methods were also demonstrated and implemented with the subject until learned. Patients were asked to incorporate such knowledge and skills in their activities and put them into practice after leaving hospital. During the surveys at 1 and 3 months postoperatively, patients were assessed for upper extremity function, symptom experience, strategies, and outcomes, and individual support was provided to assist and enhance symptom management. Patients in the control group received routine care from on-site staff and were informed of the results of upper extremity function determined in the survey.

Measurement

We measured arm girth, shoulder ROM and grip strength, and administered the Subjective Perception of Post-Operative Functional Impairment of the Arm (SPOFIA) questionnaire (tested for reliability and validity by Sato (2008)), and the Japanese Society for Surgery of the Hand (JSSH) version of the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire (tested for reliability and validity by Jester et al. (2005)) (Table 1) at the hospital admission preoperatively, the day after drain removal (approximately 1 week postoperatively), and at 1 and 3 months postoperatively.

Objective outcomes, including arm girth, shoulder ROM and grip strength, were measured by a specialist with standard methods. Arm girth measurements were taken at 2 points, 10 cm distal to the lateral epicondyle (forearm arm girth), and 15 cm proximal to the lateral epicondyle (upper arm girth) (Kissin et al. 1986; Ivens et al. 1992). The difference between arm girths on the affected and normal sides was calculated. Shoulder ROM measured shoulder flexion, shoulder abduction, and horizontal shoulder extension, and differences between normal and affected sides were calculated. Grip strength measured using a dynamometer, and the difference between normal and affected sides was calculated.

The SPOFIA uses a 2-point assessment (yes, 1 point; no, 0 points) of 15 items related to swelling, pain, decreased shoulder ROM, numbness, reduced muscle strength of the arm, and pulling feeling in the skin of the arm skin. Higher SPOFIA scores indicate a greater perception of postoperative impairment in upper extremity

Table 1. Questionnaire items.

SPOFIA (15 items)

1. The forearm is swollen (from elbow to fingertip)
2. The upper arm is swollen (from elbow to shoulder)
3. The arm is heavy
4. The arm is tired
5. Pain when clothes touch the arm
6. Pain when moving the arm
7. Pain even if not moving the arm.
8. Cannot raise the arm on the operated side straight forward to the level of the ear without bending the elbow
9. Cannot raise the arm on the operated side sideways to the level of the ear without bending the elbow
10. Cannot raise the arm on the operated side sideways and backwards without bending the elbow
11. Partial numbness when touching
12. Feeling of numbness
13. Weakness when lifting things
14. Weakness when gripping things
15. Pulling feeling of arm skin when lifting the arm

DASH (30 items)

1. Open a tight or new jar
2. Write
3. Turn key
4. Prepare a meal
5. Push open a heavy door
6. Place an object on a shelf above your head
7. Do heavy household chores (e.g., wash walls, wash floors)
8. Perform gardening or yard work
9. Make a bed or lay out the bedding
10. Carry a shopping bag or briefcase
11. Carry a heavy object (> 5 kg)
12. Change a light bulb overhead
13. Wash or dry your hair
14. Wash your back
15. Put on a pullover sweater
16. Use a knife to cut food
17. Perform recreational activities that require little effort (e.g. card playing, knitting, play go, play shogi etc.)
18. Perform recreational activities involving some force or action through the arm, shoulder or hand (e.g., golf, tennis, playing catch, hammering, etc.)
19. Perform recreational activities in which you move your arm freely (e.g., playing Frisbee, badminton, etc.)
20. Manage transportation needs
21. Perform sexual activities
22. During the past week, to what extent has your arm, shoulder or hand interfered with your normal social activities with family, friends, neighbors or groups*?*
23. During the past week, were you limited in your work or other daily activities as a result of your arm, shoulder or hand problem*?*
24. Arm, shoulder or hand pain
25. Arm, shoulder or hand pain when performing a specific activity
26. Tingling (pins and needles) in the arm, shoulder or hand
27. Weakness in the arm, shoulder or hand
28. Stiffness in the arm, shoulder or hand
29. During the past week, how much difficulty have you had sleeping because of pain in your arm, shoulder or hand*?*
30. I feel less capable, less confident or less useful because of my arm, shoulder or hand problem

function. Cronbach's alpha coefficient for this scale was 0.76.

The DASH is a standardized questionnaire that evaluates impairments and limitations to activity, in addition to restrictions on participation in both leisure activities and work. Response options range from 1 to 5, as follows: 1, no difficulty; 2, mild difficulty; 3, moderate difficulty; 4, severe difficulty; and 5, inability. The DASH produces scores between 0 and 100 for each module, with a high DASH score indicating severe disability (Jester et al. 2005). Cronbach's alpha coefficient for this scale was 0.79.

Demographic characteristics (age, marital status, occupation, child care, caring for an older relative, disease severity, arm dominance, shoulder problems before operation) were self-reported at baseline. History of disease including type of surgery, level of axillary lymph node dissection, and adjuvant treatment were taken from medical records.

The information sheet was read to the patient, upper extremity functions were measured, and the patient was given the questionnaire form and told how to complete it. The questionnaire was then collected after the patient had completed it. When the questionnaire was collected, the patient was asked to check and ensure that all questions

had been answered. For the surveys at 1 and 3 months postoperatively, the interviewers showed up on the days that subjects were scheduled to visit, and surveys were conducted in accordance with the schedules of staff members responsible for the examination and care of the subjects. The consent of subjects was also confirmed.

Statistics

The intervention and control groups were compared according to performance of ALND and SLNB. Demographic variables were compared using the Mann-Whitney *U* test or Fisher's exact test, and changes over time in upper extremity function were compared by two-way repeated-measures analysis of variance. Statistical analysis was performed using PASW Statistics for Windows version 21.0 (SPSS, Tokyo, Japan). The significance level was ≤ 5%.

Results

A total of 162 patients participated this study and were allocated to an intervention group (n = 96) and a control group (n = 66). In the intervention group, a total of 6 patients dropped out due to loss to follow-up, changing hospital, loss of interest or lack of time. In the control group, a total of 7 patients dropped out due to loss to follow-up, changing hospital, loss of interest or lack of time. As a result, 149 patients completed the study (Fig. 1). Of the 149 patients analyzed, 69 underwent ALND, and 80 underwent SLNB. These included 39 patients in the ALND intervention group, 30 patients in the ALND control group, 51 patients in the SLNB intervention group and 29 patients in the SLNB control group.

Table 2 shows the characteristics of patients. No significant differences in demographic or disease characteristics were seen between the ALND and SLNB in the intervention group and ALND and SLNB in the control group.

Table 3 shows changes of variables over time in patients with ALND and Table 4 shows the same in patients with SLNB. No significant differences in arm girth, shoulder ROM or DASH were seen between groups with ALND. Significant differences in change in SPOFIA score over time were noted between the ALND intervention group and the ALND control group (F value = 3.34; p = .02). These results suggest a significant improvement over time in SPOFIA score in the intervention group compared to the control group. In ALND groups, the mean difference in grip strength between normal and affected sides in the intervention group did not differ significantly from baseline to 3 months postoperatively, with a low value at 3 months postoperatively compared to baseline. A significant difference over time in the difference in mean grip strength was seen between normal and affected sides in both intervention and control groups (F value = 2.77; p = .04), indicating significantly improved grip strength over time in the intervention group compared to the control group.

Table 4 shows a comparison of changes over time in arm function of patients between the intervention and control groups with SLNB. No significant differences in arm girth, shoulder ROM, grip strength, SPOFIA or DASH were identified between SLNB groups.

Discussion

In this survey, the effectiveness of short-term intervention based on the Program for Preventing and Improving Postoperative Functional Impairment of the Upper Limbs in Breast Cancer Patients was examined on the basis of

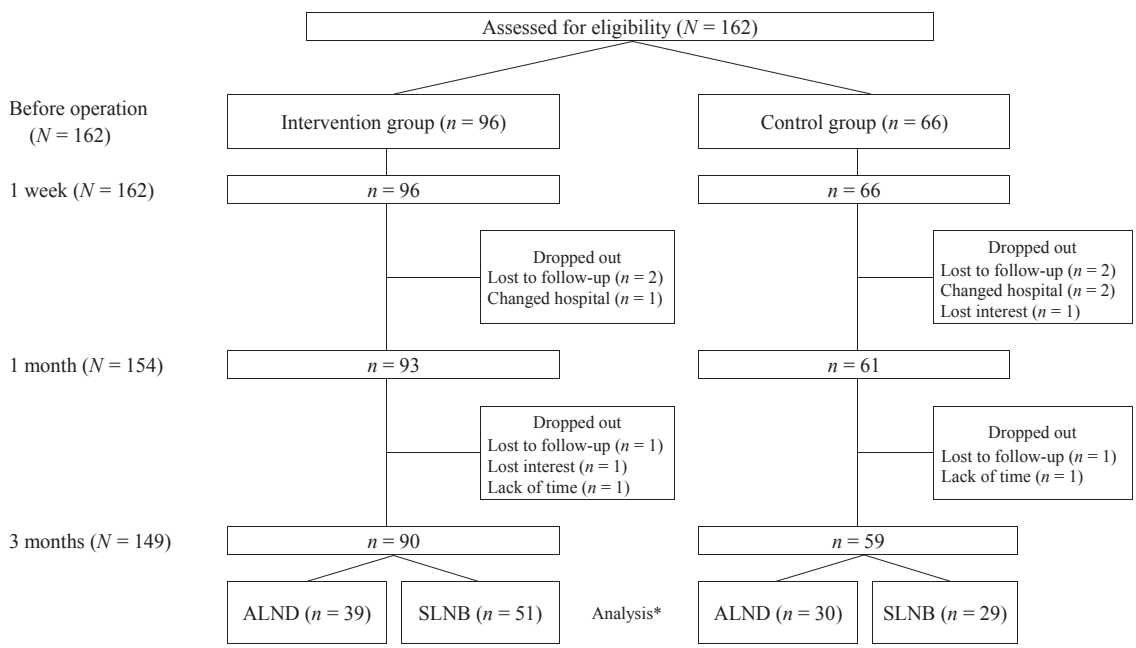

Fig. 1. Flow-chart showing experimental process.
*The intervention and control groups were compared according to performance of axillary lymph node dissection (ALND) and sentinel lymph node biopsy (SLNB).

Table 2. Comparison of patients between groups.

$N = 149$

	ALND ($n = 69$)			SLNB ($n = 80$)		
	Intervention	Control	p	Intervention	Control	p
	$n = 39$	$n = 30$		$n = 51$	$n = 29$	
Age, years; mean ± S.D.	52.9 ± 10.1	52.1 ± 12.9	.70	54.3 ± 10.6	53.7 ± 9.5	.91
Marital status, %	87.1	80.0	.51	84.3	82.8	1.0
Occupation, %	35.9	50.0	.32	47.1	37.9	.29
Child care, %	20.5	10.0	.33	11.8	0.0	.08
Caring for an older relative, %	10.3	0.0	.13	7.8	3.4	.65
Disease severity, %						
Stage 0	0.0	6.7		25.5	44.8	
Stage I	7.7	20.0		54.9	48.3	
Stage II	43.6	50.0	.07	17.6	6.9	.22
Stage III	41.0	23.3		2.0	0.0	
Stage IV	7.7	0.0		0.0	0.0	
Type of surgery, %						
Partial mastectomy	43.6	63.3	.15	78.4	75.9	.79
Total mastectomy	56.4	36.7		21.6	24.1	
Level of axillary lymph node dissection, %						
I	23.1	40.0		—	—	
II	59.0	43.3	.30	—	—	
III	17.9	16.7		—	—	
Adjuvant treatment, %						
Radiotherapy	69.2	83.3	.26	58.8	51.7	.64
Chemotherapy, molecular targeting therapy	79.5	86.7	.36	11.8	24.1	.21
Hormone therapy	82.1	63.3	.10	80.4	75.9	.78
Arm dominance, %	56.4	46.7	.47	54.9	55.2	1.0
Shoulder problem before operation, %	20.5	20.0	1.0	29.4	17.2	.29

Age: Mann-Whitney U test; other details: Fisher's exact test.

Table 3. Comparison of changes in arm function over time for patients with ALND.

	Intervention ($n = 39$)				Control ($n = 30$)				F	p
	Baseline[a]	1 week[b]	1 month[c]	3 months[d]	Baseline[a]	1 week[b]	1 month[c]	3 months[d]		
	Mean (S.D.)				Mean (S.D.)					
SPOFIA (0-15)	1.1 (1.9)	6.1 (2.7)	4.6 (3.4)	2.5 (1.9)	0.6 (1.0)	6.2 (3.0)	3.4 (2.7)	3.2 (2.6)	3.34	.02*
DASH (0-100)	8.9 (9.9)	24.9 (15.8)	15.0 (10.2)	10.5 (8.7)	6.0 (10.1)	26.8 (18.2)	12.1 (0.1)	10.4 (8.1)	0.94	.38
Upper arm girth	0.5 (1.1)	0.6 (1.1)	0.6 (1.1)	0.6 (1.1)	−0.2 (1.0)	0.4 (1.1)	0.1 (1.0)	−0.1 (1.0)	2.42	.08
Forearm arm girth	0.4 (1.1)	0.4 (1.2)	0.2 (1.2)	0.3 (1.1)	−0.1 (0.8)	0.1 (1.0)	0.1 (1.2)	0.2 (1.2)	0.70	.54
Flexion shoulder	1.2 (8.1)	30.3 (28.8)	11.3 (16.7)	6.4 (9.6)	−2.4 (7.3)	31.8 (30.4)	3.8 (7.2)	2.9 (10.1)	0.93	.38
Abduction shoulder	3.5 (12.3)	30.9 (30.5)	11.4 (14.8)	3.6 (10.5)	−1.6 (9.2)	31.2 (33.3)	3.6 (8.0)	3.0 (10.4)	0.90	.38
Horizontal extension shoulder	0.5 (7.5)	3.6 (5.8)	2.0 (4.4)	0.5 (6.4)	−0.9 (5.7)	1.4 (7.0)	0.7 (6.6)	0.6 (5.3)	0.47	.70
Grip strength	−0.2 (2.9)	0.6 (3.0)	0.2 (1.2)	−0.8 (4.0)	0.9 (2.9)	2.7 (3.9)	0.1 (1.2)	1.2 (3.6)	2.77	.04*

Two-way repeated-measures ANOVA *$p < .05$.

[a]at hospital admission before operation; [b]day after drain removal (approximately 1 week after operation); [c]1 month after operation; [d]3 months after operation.

Table 4. Comparison of changes in arm function over time for patients with SLNB.

	Intervention (n = 51)				Control (n = 29)				F	p
	Baseline[a]	1 week[b]	1 month[c]	3 months[d]	Baseline[a]	1 week[b]	1 month[c]	3 months[d]		
	Mean (S.D.)				Mean (S.D.)					
SPOFIA (0-15)	0.7 (1.4)	3.7 (2.9)	1.7 (2.3)	1.1 (1.7)	0.3 (0.8)	3.2 (2.3)	1.4 (1.7)	1.1 (1.4)	0.28	.81
DASH (0-100)	6.7 (11.6)	23.4 (18.5)	9.5 (13.3)	7.4 (11.8)	4.7 (9.0)	16.6 (16.3)	9.6 (11.3)	5.6 (6.1)	2.13	.14
Upper arm girth	0.1 (1.2)	0.1 (0.9)	0.1 (0.8)	0.0 (0.9)	0.1 (1.0)	0.1 (1.2)	0.1 (1.0)	0.1 (1.3)	0.10	.95
Forearm arm girth	0.1 (1.0)	0.1 (0.9)	0.0 (1.0)	0.1 (1.0)	0.0 (0.9)	0.1 (1.2)	0.0 (1.3)	−0.1 (1.1)	0.66	.57
Flexion shoulder	1.7 (8.1)	18.9 (26.3)	3.9 (9.3)	3.8 (14.8)	2.1 (9.1)	20.1 (26.2)	8.1 (14.4)	2.0 (10.7)	0.52	.57
Abduction shoulder	−0.1 (8.9)	17.8 (28.8)	2.3 (8.5)	3.7 (11.5)	2.1 (8.9)	18.3 (26.8)	7.2 (16.7)	1.3 (12.1)	0.72	.46
Horizontal extension shoulder	1.3 (5.3)	3.0 (8.1)	1.2 (3.8)	0.2 (4.9)	−0.4 (7.0)	2.4 (7.5)	1.2 (6.9)	0.4 (4.9)	0.55	.64
Grip strength	−0.3 (2.5)	1.1 (3.5)	0.3 (2.9)	−0.2 (2.4)	−0.6 (3.8)	2.2 (3.6)	−0.4 (4.6)	−0.2 (3.5)	2.12	.11

Two-way repeated-measures ANOVA.

[a]at hospital admission before operation; [b]day after drain removal (approximately 1 week after operation); [c]1 month after operation; [d]3 months after operation.

changes over time in upper extremity function in 149 patients who had undergone surgery for primary breast cancer. The results thus suggest that this program provides significant improvement in grip strength and subjective perception of impaired upper extremity function in breast cancer patients undergoing ALND, which is significantly more invasive than SLNB. This discussion focuses on the effectiveness of short-term intervention using this program based on the present results.

We first discuss whether the program resulted in effective improvement over time in SPOFIA score. The first reason for improvement in SPOFIA score is the SPOFIA scale. The SPOFIA scale used in this survey encompassed swelling, decreased shoulder ROM, and reduced muscle strength of the arm, which were assessed both objectively and subjectively in this survey, as well as symptoms related to pain, numbness, and pulling feeling in the skin of the arm, which could only be assessed subjectively by patients. Subjective symptom experience is the most important measure in the assessment of physical function (Segerström et al. 1991), and is often considerably distressing to patients (Petrek et al. 2000; Sato 2012b). Avoidance behavior is followed more often by patients who perceive lymphedema (McLaughlin et al. 2008). In this program, differences in measured symptoms and methods of measurement, as well as the presence or absence of perceptions of pain, appeared to be reflected in the subjective assessment of upper extremity function. The second reason for the improvement of SPOFIA may be the appropriate assessment and proper management of symptoms through the discussion between nurses and the patient. Patients in control group generally did not discuss their symptoms with healthcare workers. Patients in the control group were not educated about addressing their symptoms to healthcare workers and they might have thought that symptoms were unable to be managed. According to a fact-finding study on care for impaired upper extremity function following breast cancer surgery in Japan, virtually no patients received treatment for post-mastectomy pain syndrome (PMPS), even though it could be relieved with pharmacotherapy (Yamauchi and Kitahara 2003), and 30% of patients felt unable to broach the subject of PMPS with their doctors. Healthcare professional-based treatment or care systems may not function very well as systems reflecting patient symptom experience. Healthcare professionals must not only have a biological understanding of the postoperative impairment of upper extremity function in breast cancer patients, but also understand and prospectively assess such impaired function as pain that is felt physically and mentally, depending on the connection with social activities and environment. The third reason is the strategy used in the program. This program proposes a strategy in which information on symptom management is provided as needed to breast cancer patients, and symptoms are reported without reservation to healthcare professionals. This strategy may help to alleviate anxiety over symptoms in breast cancer patients and may be applicable to symptom management strategies. The program also incorporates abdominal breathing exercises, and massaging of the upper extremities and areas around the mastectomy wound. These methods may enhance relaxation and circulation, and may improve subjective perception of symptoms.

We now discuss the fact that the grip strength of breast cancer patients in the ALND group who selected the intervention program improved significantly over time compared to that in the control group. Active upper-extremity stretching exercises are recommended to start 1 week after surgery or after the drain is removed and should be continued until full ROM is achieved (Harris et al. 2012). The reason for the lack of any significant difference in shoulder ROM between the intervention and control groups in this program may have been that these upper extremity rehabilitation guidelines are well known and practiced. However, grip strength rehabilitation does not appear to be continued

to the same extent as rehabilitation to improve the shoulder ROM. No studies have assessed intervention for facilitating and maintaining recovery from decreased muscle strength, including grip strength. A woman with breast cancer 5 years after ALND whom we had previously interviewed told us that her pen pressure had decreased as a result of her operation, making it difficult to write, and as a result she lost her job as a primary school teacher. Grip strength is used in activities such as writing and opening or closing jars, and is a daily activity function that is as important as shoulder ROM. The present program includes an exercise that begins by gripping a heart-shaped ball with both hands starting on Day 1 after surgery. Continuing this exercise may be a reason for the improvement in grip strength over time.

We will now consider the background against which the ALND group, but not the SLNB group, showed changes over time in SPOFIA score and grip strength intervention in this program. The causes and mechanisms involved in the development of symptoms were explained to the intervention group prior to surgery. The intervention group of the ALND group also received an explanation of the duration of symptoms, symptoms that could potentially develop in the future, activities that should be avoided, and so forth, following individual assessment of the extent of lymph node dissection, neurectomy status, and the like. The importance of making life adjustments based on patient symptom experience, strategies, and outcomes was also discussed starting 1 month after surgery, and support was provided to help patients decide on subsequent symptom strategies. The same strategy was used in the intervention group undergoing SLNB. However, it is assumed that the outcomes are reflective of the lower incidence of SLNB symptoms compared to ALND (Wilke et al. 2006; Ashikaga et al. 2010) as well as differences in the sense of crisis concerning impaired upper extremity function and awareness of the need for modifying daily activities.

DASH score and circumference of the arm showed no significant differences. The DASH used in this survey is a scale for evaluating overall loss of upper extremity function seen in the context of daily activities and environment. The highest DASH score in this survey was 20 out of 100 possible points at 1 week after surgery, indicating a smaller than expected decrease in upper extremity ability. This may have happened because the DASH scale is not limited to upper extremities on the affected side and assesses upper extremity ability on both sides. How this program affects the daily activities of breast cancer survivors should be analyzed in the future, with the inclusion of QOL measurements or qualitative date in addition to DASH measurements. A review of changes over time showed that DASH scores still had not returned to preoperative levels by 3 months after surgery, regardless of differences between ALND and SLNB therapy and whether intervention was used. DASH did not show a significant difference because no patients experienced severe impairment in their life after the operation. The lack of a significant difference in the circumference of the arm between groups may be due to the study period being too short to detect lymphedema. In this survey, the effectiveness of the program was explained on the basis of changes over time in upper extremity function up to 3 months after surgery. However, lymphedema occurs for several years after surgery in relation to activities and environment (Warmuth et al. 1998). A longitudinal survey should be conducted in the future to explore the effectiveness of long-term intervention.

In conclusion, after a 3-month perioperative educational program, SPOFIA and grip strength were significantly improved in the intervention group with ALND. This program may improve the postoperative upper arm function and discomfort in patients who undergo ALND. The long-term effectiveness of the program should be studied in the future.

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Conflict of Interest

The authors declare no conflict of interest.

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