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The effectiveness of lymphedema self-management in the prevention of breast cancer-related lymphedema and quality of life: A randomized controlled trial

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ABSTRACT

Purpose: The aim of our randomized controlled study is to determine the effect of lymphedema self-management in the prevention of breast cancer-related lymphedema and quality of life.
Method: Sixty-one breast cancer patients were included in the study. In the intervention group, patients were provided training and given a training booklet describing "exercise, massage and prevention methods" by the researchers, as part of the Self-Management of Lymphedema Program. Patients were followed by telephone for 6 months and through monthly clinical check-ups. Patients in the intervention and control groups were evaluated in both the pre-operative and post-operative periods (at one, three and six months) using the "DASH", "Measurement of Upper Extremity", " EORTC QLQ-30 and BR-23 questionnaire". The Mann Whitney *U* test, the Kruskal-Wallis H test, the Wilcoxon test, and the Friedman test were used for the statistical analysis of the data.
Results: At the end of the study, while lymphedema development was not observed in the intervention group, 61.2% of the control patients developed lymphedema. The difference between the intervention and control groups for the development of lymphedema was found to be statistically significant ($\chi 2 = 25{,}943$; $p = 0{,}000$). The quality of life of the intervention group was higher than that of the control group. Moreover, the symptom scores of the intervention group were found to be significantly lower than those of the control group.
Conclusions: As a result of our research, it can be concluded that the Self-Management of Lymphedema Program is effective at preventing lymphedema development following breast cancer treatment.

1. Introduction

Lymphedema is one of the most burdensome complications of breast cancer treatment. It affects approximately one-third of all breast cancer survivors and may significantly impair the physical and psychological well-being of affected women (Ferlay, 2015). Almost 20–21% of all breast cancer survivors will develop the health deviation of lymphedema (Armer and Stewart, 2010; McLaughlin et al., 2013; Ahn and Port, 2016). At 60 months post-treatment, LE incidence using the four criteria ranged from 43% to 94%, with 2 cm associated with the highest frequency for lymphedema occurrence and SS the lowest (Armer and Stewart, 2010). There is a deterioration in the upper extremity lymphatic drainage after the axillary lymph node dissection and radiation in women who have undergone surgery for breast cancer. Axillary therapy is hypothesized to induce damage interrupting lymph transport, such that lymph volume exceeds transport capabilities, eventually leading to abnormal accumulation of tissue protein, edema, and chronic inflammation within the arm. The protein-rich fluid continues to accumulate, leading to even more swelling and hardening of the arm with an asymmetric growth (Kebudi, 2003; Simonavice et al.,2017). Lymphedema is a chronic condition that brings multiple problems, making normal daily activities difficult. Lymphedema causes to pain, loss of sensation, muscular weakness, and a decline in elasticity. When lymphedema is chronic, there is a lack of movement in articulations, and the skin thickens, making it stiffer and more vulnerable to infections. This negatively affects the daily life of individuals, as they are not able to complete daily life activities alone, and they require help from other family members (Ridner, 2005; Heisig et al., 2016; Wanchai et al., 2016).

Physical changes in the lymphedema-affected extremity negatively affect the individuals' body image and bring sexual problems as well (Yildiz and Karayurt, 2011). Radina et al. (2004) examined 18 lymphedema cases and found that there are deteriorations in the body images of the patients, because of the development of lymphedema. In addition,

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researchers found that patients feel ugly, have difficulties choosing what to wear, and have sexual problems based on their negative body perceptions. Researchers say that women limit their social lives for fear of being questioned about their affected extremities (Radian et al., 2004).

Dependency on others for help with their daily life activities and a negative body image related to lymphedema can have an impact on the individuals' psychological, social, and sexual well-being, and reduce their quality of life (Beaulac et al., 2002; Rietman et al., 2004; Ay et al., 2014). Today, there is a great deal of thought for reducing the cancer-treatment related side effects and increasing the quality of life. Reducing side effects is frequently discussed, as advances in the diagnosis and treatment of cancer have resulted in increased survival rates (Aslan, 2016; Radina et al., 2004). Today, the current approach to the treatment of breast cancer is providing a high quality of life as the targeted success in treatment, rather than extending the length of survival (Bakar et al., 2014; Beaulac et al., 2002).

Lymphedema is one of the major serious complications of breast cancer treatment, and it has a significant negative impact on quality of life (Ahn and Port, 2016; Devoogdt et al., 2010). Ozcinar et al. (2010) found that the incidence of lymphedema after surgery during the mid-term period was 24.8%. Soran et al. (2000) included 56 women patients in their study who were contacted for follow-up at least 12 months after surgery; they found that the quality of life scores of the group of patients with lymphedema was lower than the group of patients with no lymphedema. Kwan et al. (2002) found that after treatment, breast cancer patients with pain, and chronic arm morbidity, including lymphedema, had significantly lower scores for physical, social, or pain sub-scores of quality of life, compared to the patients without any symptoms. Aslan (2016) indicated that patients with lymphedema problems experience limitation in articulation and shoulder movement, and have lower scores of quality of life.

Possible lymphedema risk factors among women diagnosed with breast cancer are: being above normal weight and obesity, age, having cancer on the dominant arm side, axillary lymph node metastasis, advanced stage cancer, tumor size, wide incision cuts, having axillary lymph node dissection and number, the number of lymph nodes removed, and axillary radiotherapy and chemotherapy after the surgery. In addition to these risk factors, the risk of lymphedema development increases if the arm becomes infected, if there is a lack of education regarding lymphedema, and if the patient is unable to exercise and complete self-care activities to prevent the lymphedema development (Golshan and Smith, 2006; Park et al., 2008).

It is observed that precautionary measures and education in preventing the development of lymphedema are effective at the early stage. In addition, the active range of movement is recommended for patients to provide scapulothoracic rhythm, elbow, wrist and hand mobility (Basaran and Kozanoglu, 2009; Buyukakincak et al., 2014). However, the literature emphasizes (Demir, 2008; Guzelant et al., 2004) the importance of practices to prevent the development of lymphedema rather than advanced lymphedema treatment. Treatment of lymphedema is a long-term, expensive and difficult process, and lymphedema cannot be totally cured. In cases of lymphedema, patients should be included in a long-term, physical treatment program to reduce edema, and should be followed by a physiotherapist (Huang et al., 2013). Lymphedema cannot be totally cured, but its development can be prevented. Nurses should evaluate patients to determine which patients are at high risk for lymphedema. Therefore, they can help patients through early detection of developing lymphedema. Lee et al. (2001) conducted a survey with 171 patients following completion of treatment for breast cancer and revealed that 82.5% of patients knew they were at risk for developing lymphedema, however, the level of knowledge about preventive care in lymphedema was inadequate. It was found that nurses were the most frequently cited resource for information. In order to improve patients' level of knowledge and their awareness of lymphedema care, the provision for systematic and comprehensive patient education needs to be addressed. Education and training will be essential components of efforts to ensure self-care management for lymphedema patients (Stevinson et al., 2004; Galvão and Newton, 2005; Knols et al., 2005; McNeely et al., 2006). Self-management of lymphedema includes: knowing possible lymphedema risk factors and signs, being able to evaluate the affected arm in terms of lymphedema, preventing trauma of the affected extremity and reducing the risk of infection, protecting and maintaining the skin integrity, maintaining a body mass index within the normal range, and regular exercise (Demir, 2008).

Nurses play significant roles in teaching the lymphedema self-management method to the patients. An education plan should be designed to teach self-management of lymphedema to the patients who are at risk of developing lymphedema. In addition, nurses should be able to evaluate the patient for lymphedema in order to make an early diagnosis and educate the patient in prevention. Early diagnosis and prevention can contribute to a higher quality of life for the patient (Gul &Erdim, 2009; McCaulley and Smith, 2014). This study aims to teach the self-management of lymphedema method, prevent lymphedema development and improve the quality of life of the patients who have undergone breast cancer surgery.

Hypothesis;

- $H_{1\text{-}a}$: The Self-Management of Lymphedema Program is effective at preventing breast cancer-related lymphedema.
- $H_{1\text{-}b}$: The Self-Management of Lymphedema Program is effective at improving the quality of life of patients.

2. Method

2.1. Design and participants

The research is a parallel design, single-blind, randomized, and controlled trial. The research was carried out in a state university, the Adult Hospitals General Surgery Department, between November 20, 2015 and November 20, 2016 with breast cancer patients who planned to undergo a mastectomy.

2.1.1. Research inclusion criteria

- Patients aged between 18 and 65
- Patients with a body mass index (BMI) ≤ 30 (Pre-treatment BMI may be a risk factor for lymphedema) (Ridner et al., 2011)
- Patients who had undergone a modified radical mastectomy and breast-conserving surgery
- Patients who had axillary lymph node dissection (patients in which at least two lymph nodes were dissected)
- Volunteering to participate in the study

2.1.2. Research exclusion criteria

- Patients with a body mass index (BMI) ≥ 30
- Patients who had bilateral lymph node dissection
- Patients who were pregnant or lactating
- Patients who had cancer other than breast cancer

2.1.3. Discharge criteria

- Patients who had wound site infection in the post-operative period
- Patients who required a second surgical intervention in the post-operative period
- Patients who developed skin reaction (swelling and rash in the arm) after radiotherapy
- Patients who missed the steps of SMLP (e.g. missing exercise at least for a week, not performing skin care)

2.2. Sample size

In the study, 108 breast cancer patients were contacted between November 20, 2015 and November 20, 2016. The minimum sample size of

the study was calculated via statistical power analysis using the G*Power software. Through this analysis, a minimum sample size of 40 (20 patients in each group) was determined, accepting as clinically significant a minimum 2 cm difference or more in arm circumference for at least one anatomic point measured between affected and non-affected limbs, an α error value of 5%, and power of 95% for pilot study. Then it was also included in the study. Thirty-six individuals were excluded from the research, as they did not meet the research criteria. However, due to the projection for the loss of patients and six-month follow-up time for each patient, 72 patients (36 patients in the intervention group, 36 patients in the control group) were included in the research sample. These individuals (n = 72) were randomly assigned to either the intervention group (n:36) or the control group (n:36). Two patients from the intervention group and one patient from the control group did not follow the research program; three patients in the intervention group and two patients from the control group had wound site revision in the post-operative period during the research, one patient from the intervention group developed skin reaction after radiotherapy, two patients from the control group had wound site infection and were discharged from the research (11 patients in total) and the 61 breast cancer patients (30 intervention, 31 control) were constituted the research sample (Fig. 1). "G.Power-3.0.1" program was used with a sample size of a 0.90 test power and a significant alpha value of α = 0.05 and 0.72 effect size.

2.3. Randomization and allocation

Block randomization was conducted according to the age and body mass index to determine the patients to be included in the intervention and control groups. Accordingly, the randomization of the patients to be assigned to the intervention and control groups was performed by using the http://www.e-picos.com/randomizer_rpg.php link.

2.4. Research tools

After the literature review was completed, the researcher developed a data sheet. It included questions on socio-demographic and disease-related characteristics. DASH, a Measurement of Upper Extremity" and the EORTC QLQ-30 scale (European Cancer Research and Treatment of Cancer Core QoL Questionnaire) were used to collect the data. The researcher has been trained to use assessment tools especially, DASH and Measurement of Upper Extremity.

2.4.1. Data sheet

The data sheet was developed after the literature reviews to determine some of the socio-demographic and medical characteristics of the patients, as well as characteristics of the disease and treatment. This form includes 22 questions in total, 10 of which are related to socio-demographic characteristics, five questions are related to medical characteristics, and seven questions are related to the treatment characteristics. It was used on five patients to test patients comprehension before the intervention. These patients were not taken to study.

2.4.2. Disabilities of the arm, shoulder, and hand (DASH)

Upper extremity problems, and the ability to perform routine activities of daily living, which require the use of the upper extremity, were evaluated using the DASH in both groups. The DASH, developed by the American Academy of Orthopedic Surgeons, validated in Turkish, is a self-rated questionnaire that measures upper extremity disability and symptoms. It has been indicated that there are no major difficulties in translating and interpreting. DSH-Function/symptom test-retest reliability was found to be 0.910 and DASH -Work Model 0.793 (Gummesson et al., 2003). It has 30 items, with scores ranging from one to five. Higher scores point to greater disability. The first 21 items are related to unease in performing DLAs. Five items assess symptoms like pain, tingling, stiffness, weakness, and the extent to which upper extremity impairment limits the performance of social activities or DLAs. An additional four questions assess social function, work, sleep, and self-confidence (Hudak et al., 1996).

2.4.3. Upper extremity circumference measurement

The upper extremities were measured to examine the presence of lymphedema. Each subject was seated in a chair with the elbow joint flexed out at 90°. The edema was measured with a measuring tape at four different points of metacarpophalangeal joints, at the wrist, 10 cm above and below the lateral epicondylitis, and the obtained value, the difference between two arms (Δ = the circumference of the arm in the operated side – the circumference of the normal arm). Circumferential and volumetric measurements are used to diagnose lymphedema. In the literature, it is stated that lymphedema is clinically diagnosed when there is a difference of 2 cm or more in the arm circumference for at least one anatomic point, measured between the affected and unaffected limbs. (Golshan and Smith, 2006; Gursoy et al., 2006; Armer and Stewart, 2010). Water displacement and circumference measurement are reliable techniques for assessing lymphedema in clinical practice (Chen et al., 2007).

2.4.4. EORTC QLQ-30 (European Organization for Research and Treatment of Cancer Core QoL questionnaire)

The Quality of Life Questionnaire developed by Aaronson et al. (1993) contains 30 questions and three headings of general well-being, functional difficulties, and symptom control. It was adapted for Turkish by Guzelant et al., in 2004 and was proved to be valid and reliable for patients with lung cancer in Turkey with a Cronbach's alpha coefficient ≥0.70. The EORTC QLQ-30 scale is a multi-dimensional questionnaire consisting of questions regarding general well-being, as well as a functional scale (physical, role, cognitive, emotional, and social functioning), and symptom scale. Higher scores of general well-being and functional scales indicate a higher quality of life, while lower scores indicate a lower quality of life (Aaronson et al., 1993; Fayers et al., 2002; Guzelant et al., 2004).

2.4.5. EORTC QLQ-BRE 23 (European Organization for Research and Treatment of Cancer Core QoL questionnaire)

The EORTC QLQ-BRE 23 scale is a sub-module of the European Organization for Research and Treatment-QoL questionnaire for assessing specific quality of life issues relevant to patients with breast cancer. It was developed for patients in varying stages of disease and treatment modality. EORTC QLQ-BRE 23 consists of 23 questions to assess disease symptoms and therapy side effects. It is constituted by two sub-groups as functional, and symptom scales to assess body image, therapy side effects, future perspective, systemic, breast symptoms, arm symptoms, sexual enjoyment, sexual functioning, and the negative emotional effects of hair loss. Higher scores on the functional scale indicate a higher quality of life, while lower scores indicate a lower quality of life. Higher scores on the symptom scale indicate a lower quality of life, while lower scores indicate a higher quality of life (Aaronson et al., 1993; Aslan, 2016). It was adapted for Turkish by Demirci et al. and was proved to be valid and reliable for patients with Turkish breast cancer patients. The QLQ-C30 has been found to have a high reliability of 8 on a multi-item scale (Cronbach's coefficient > 0.7); In cases where physical functioning and pain scores were less reliable (Cronbach's were 0.66 and 0.68, respectively). In QLQ-BR23, 3 of the 3 multi-item scales were found to be reliable, and the less reliable breast and arm indicator scale. The most significant subscales of QLQ-C30 on the global health was emotional function, followed by fatigue, role function and loss of appetite ($p = 0.002$, $p = 0.01$, $p = 0.03$ and p, respectively) ($p = 0.006$, $p = 0.01$ and $p = 0.03$, respectively). Among QLQ-BR23 scales systemic treatment side effects, future perspective and hair loss subscales were found to have a great influence on the global health status (Demirci et al., 2011).

2.5. Intervention

2.5.1. Intervention group

The researcher informed the patients for the Self-Management of Lymphedema Program (SMLP), and its objective and patients were followed for six months.

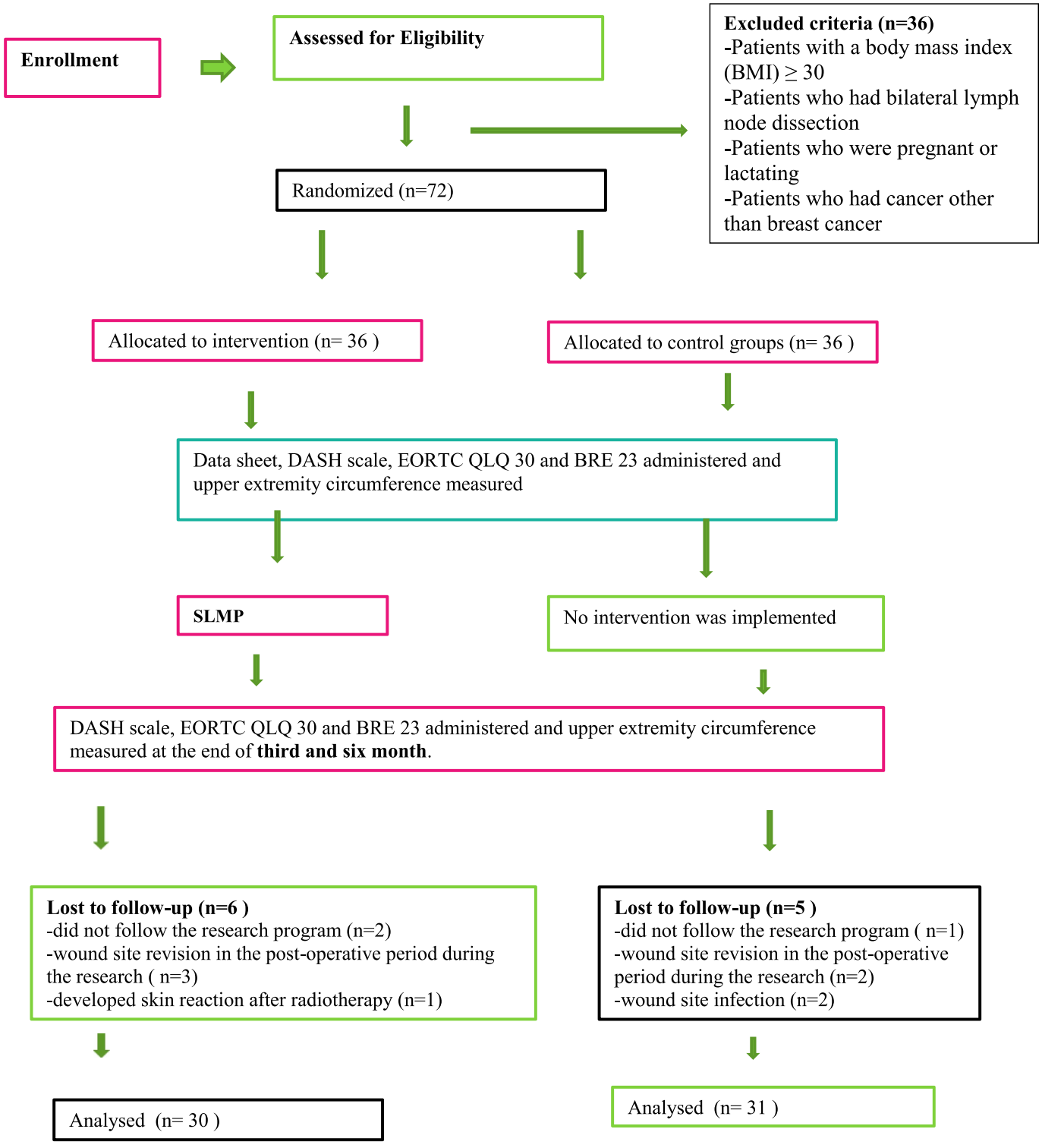


Fig. 1. Study flow chart.

Table 1
Exercise program within the context of self-lymphedema management of lymphedema.

Exercise types	1st month (every day)	3rd month (every day)	6th month (every day)
Exercise 1	3 times a day, repeat by 6 per session	3 times a day, repeat by 8 per session	3 times a day, repeat by 10 per session
Exercise 2	3 times a day, repeat by 6 per session	3 times a day, repeat by 8 per session	3 times a day, repeat by 10 per session
Exercise 3	3 times a day, repeat by 6 per session	3 times a day, repeat by 8 per session	3 times a day, repeat by 10 per session
Exercise 4	3 times a day, repeat by 6 per session	3 times a day, repeat by 8 per session	3 times a day, repeat by 10 per session
Exercise 5	3 times a day, repeat by 6 per session	3 times a day, repeat by 8 per session	3 times a day, repeat by 10 per session
Exercise 6	3 times a day, repeat by 6 per session	3 times a day, repeat by 8 per session	3 times a day, repeat by 10 per session
Exercise 7	3 times a day, repeat by 3 per session	3 times a day, repeat by 5 per session	3 times a day, repeat by 5 per session
Exercise 8	3 times a day, repeat by 5 per session	3 times a day, repeat by 7 per session	3 times a day, repeat by 10 per session
Exercise 9	3 times a day, repeat by 3 per session	3 times a day, repeat by 5 per session	3 times a day, repeat by 5 per session
Exercise 10	3 times a day, repeat by 6 per session	3 times a day, repeat by 8 per session	3 times a day, repeat by 10 per session
Exercise 11	3 times a day, repeat by 3 per session	3 times a day, repeat by 5 per session	3 times a day, repeat by 5 per session
Exercise 12	3 times a day, repeat by 6 per session	3 times a day, repeat by 8 per session	3 times a day, repeat by 10 per session

2.5.1.1. Self-management of lymphedema program(. SMLP) includes being aware of lymphedema symptoms and risk factors, evaluating the extremity in terms of lymphedema, preventing possible infections, maintaining good care of the skin, protecting the affected extremity from traumas, maintaining an ideal weight, and exercising.

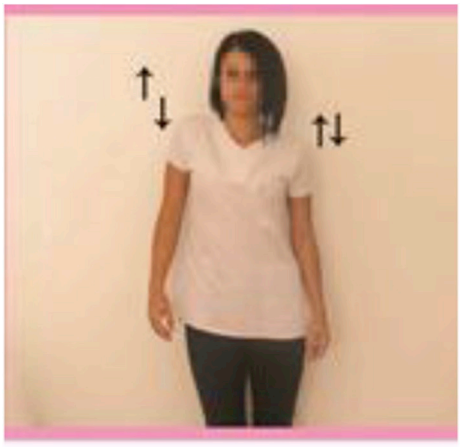
STEP 1: ***Informing;*** The patients were informed about development mechanisms and risk factors of lymphedema in the pre-operative period and during the post-operative period (second and third day). Education themes:

- Symptoms and signs of lymphedema
- Development mechanisms and risk factors of lymphedema
- Evaluation of lymphedema
- Prevention of possible infections
- Skin care
- Protecting the arm and the breast from traumas
- Having ideal weight
- Exercising

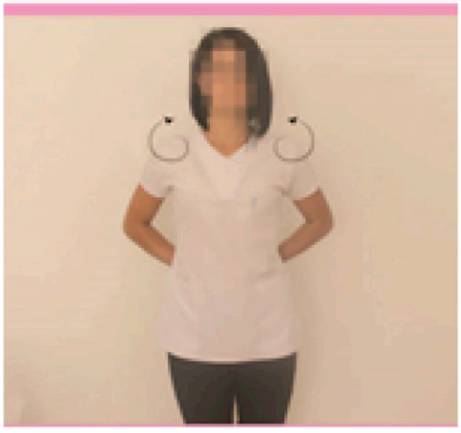
Patients were provided a training booklet containing the above-mentioned headings, and a time schedule for the Self-management of Lymphedema Program was given to the patients.

STEP 2: ***Lymphedema evaluation***; Measurement of the upper extremity circumference was done in the hospital, and the DASH scale was used to evaluate the patients both during the pre-operative and post-operative periods (At one, three and six months).
STEP 3*: Exercising program;* Within the first 24 h after the surgery, patients were asked to do hand squeezing exercises with a medium-level stress ball four times a day, squeezing 15 times each time. The minimum amount of exercises required for the patient and the time to make the patient start exercising were determined by the doctor and nurse together taking into consideration the physical condition of the patient, and the patient's general well-being during the post-operative period. In addition, patients were asked to do active and passive arm exercises three to six times a day at first, and then gradually increase the number to 10, from passive to active within 30–60 min. Before starting to exercise, patients were advised to do warm up movements to prevent any muscle damage and to divide the exercises into 10–15 min sets in case of any pain. The number of exercises within the context of self-management of lymphedema is presented in Table 1.

2.5.1.2. Exercise program. Exercise 1: Stand up and lift one shoulder up and down, then repeat the same movement for the other times 3 times 10 times a day.

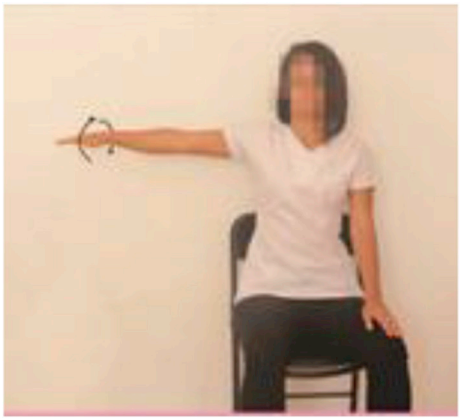


Exercise 2: Move both shoulder joints in a circular motion. This action should be done especially backwards.



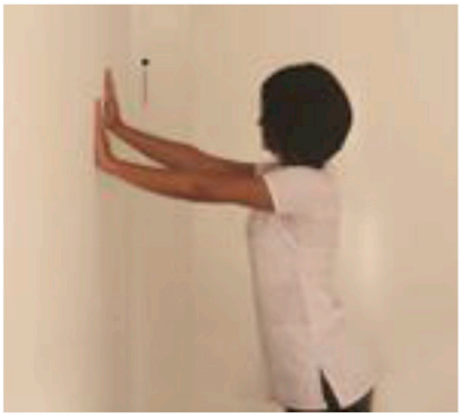
Exercise 3: Sit upright, put your elbow on the table and comb one side of your hair from front to back, then try to comb all of your hair.

Exercise 4: Raise your arms to shoulder level and rotate your arm backwards by making small circular movements in this position.

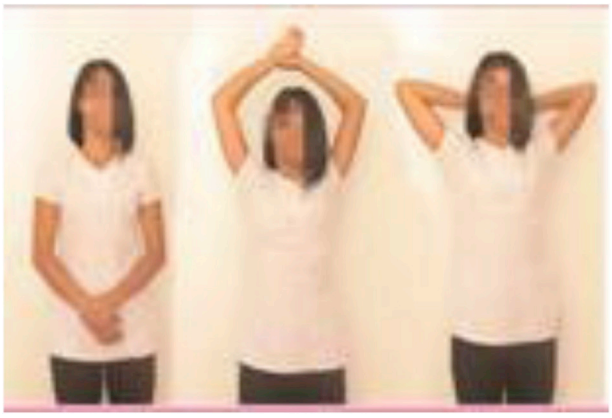


Exercise 5: Sit on the chair, the upper arm should be flat on the shoulder, be careful that your forearm is held perpendicular to the upper arm. Close your hands (punch) and open them. Lower your arms down, loosen and repeat the movement.

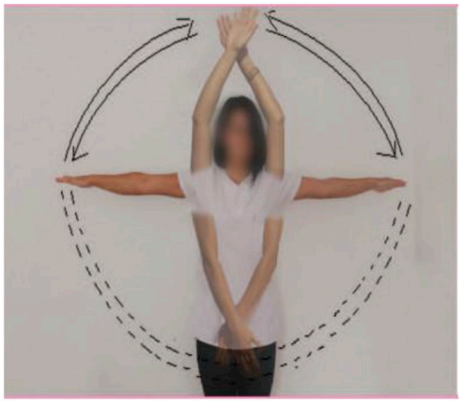
Exercise 6: Turn your face to the wall. Get closer to the wall. Make your hands like climbing the wall. When you feel pain or pain in your arm, stop acting. With this move, you will see that you can raise your arm a little higher each day.



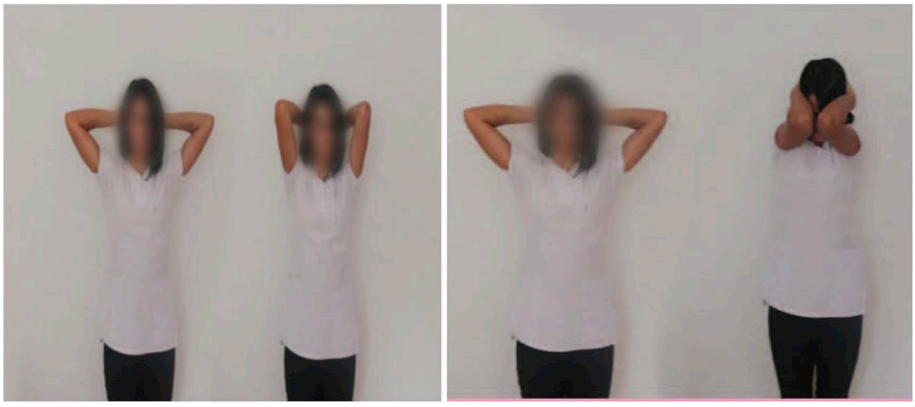
Exercise 7: Stand with your legs open. Put your hands ahead. Take them slowly to your head. Bend the elbows up and down behind your head, lift up, rest.



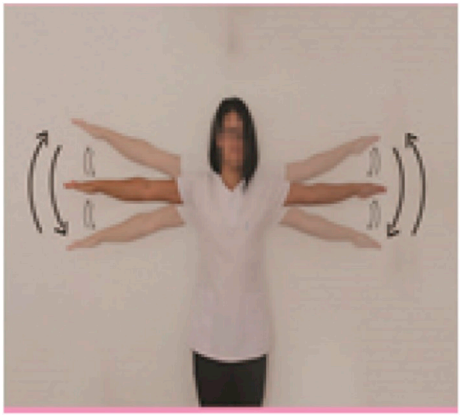
Exercise 8: Slowly circle large circles around your body with your arms, rest. Slowly rotate your arms around your body, making big circles. Then repeat the reverse movement and relax.



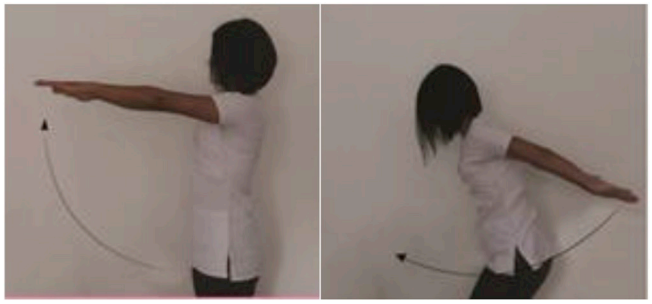
Exercise 9: Extend your arms to the side. Bend your elbows and place them behind your head. Try to touch at the tip of your elbows facing towards eachother place them at the front of your chin.



Exercise 10: Extend your arms to the side. Make small circles. Then complete the movement by shrinking the circles.



Exercise 11: Extend your arms at shoulder height in front of you. Swing your arms forward and backward.



Exercise 12: Make a gentle supportive movement with a piece of towel or fabric (move it back and forth on your back?). Repeat the movement in the same way as above on both sides.

STEP 4*: Simple lymphatic drainage;* Within the context of patient massaging, the researcher demonstrated and taught deep diaphragmatic breathing exercises, neck drainage, unaffected side axillary drainage, affected side axillary drainage, and upper extremity drainage. Before the massaging started, the patients performed breathing exercises. Initially, breathing exercises were done 3 times a day for 3 min, and then 3 times a day for 5 min in the following months, to stimulate the lymphatic system. The number of massaging and breathing exercises within the context of self-management of lymphedema is presented in Table 2.

First Month: Upper extremity circumference was measured and the DASH evaluation was conducted in the clinics. Patients' questions were answered and they were informed about the study.

Second Month: Patients were followed by telephone.

Table 2
Massage and breathing exercise program within the context of self-lymphedema management of lymphedema.

STEP 5: *Monitoring;* After discharge from the hospital, patient follow-up was done through telephone calls at regular times each week during the first month by the researcher (The researcher participated in the Lymphoedema Management Training Program after Breast Surgery organized by Hacettepe University Lymphoedema Diagnosis and Treatment Application and Research Center). Then the patients received regular monthly calls and were encouraged to do their exercises and to follow the instructions provided through the education.

Exercise types	1st month (every day)	3rd month (every day)	6th month (every day)
Self-massage	2 times a day, repeat by 8 per session	2 times a day, repeat by 10 per session	2 times a day, repeat by 10 per session
Breathing exercise	3 times a day, 3 min per session	3 times a day, 5 min per session	3 times a day, 5 min per session

Third Month: Upper extremity circumference measurement and the DASH evaluation were conducted in the clinics. Patients' questions were answered and they were given further information.

Fourth Month: Patients were followed by telephone.

Fifth Month: Patients were called by phone and encouraged to follow their exercise programs.

Sixth Month: Upper extremity circumference was measured and the DASH evaluation was conducted in the clinics. The patients were informed that the program was ended.

2.5.2. Control group

The following was applied to this group of patients:

1. The researcher used the "Questionnaire Form", "Questionnaire on Arm, Shoulder and Hand Problems", and "EORTC Quality of Life Survey Questionnaire QLQ-30″ in the first interview in the pre-operative period.
2. After the mastectomy and at the end of the first, third, and sixth months of the study, patients were called into the clinics for follow-up, and the "Questionnaire on Arm, Shoulder and Hand Problems", "Measurement of Upper Extremity" were used to survey the patients, and the "EORTC Quality of Life Survey Questionnaire QLQ-30″ was applied at the end of the third and the sixth months. Training booklets were distributed at the end of the study, and patients who volunteered for education were trained about SMLP. Even the maximum benefit is questionable, the rationale behind the introduction of booklet and SMLP was to develop an opportunity for the control group receiving the routine standard lymphedema prevention care (hospital standard care includes; giving information about lymphedema prevention is provided by a nurse in postop 14th days). This group did not receive any intervention except for the usual care.

2.5.2.1. Statistical methods. Statistical analyses were done using the SPSS (IBM SPSS Statistics 20) program. Frequency tables and descriptive statistics were used to interpret the findings. Non-parametric methods were used to test the data without normal distribution. As appropriate to the non-parametric methods, the "Mann-Whitney *U* Test" (Z table value) was used to compare outcomes between two independent groups, the "Kruskal-Wallis H Test" (χ^2 table value) was used to compare outcomes among more than two independent groups and the "Bonferroni Correction" was used to counteract the problem of these multiple comparisons. The "Wilcoxon" test was used to compare scores between two groups and the "Friedman Test" (χ^2 table value) was used to compare three or more paired groups. The Spearman correlation coefficient was used to examine the relationship between the parameters evaluated.

2.5.3. Ethical considerations

This study was approved by the ethics committee of the private University Ankara on August 10th, 2015 (No: 99950669/172). In addition, permission from the institution and written approval were obtained from the volunteer participants. The patients were informed about the objective and the participants' rights by researcher of the study after the necessary permissions were obtained, and a verbal and written consent was obtained from all subjects who agreed to participate in the research.

3. Results

3.1. Demographics and clinical characteristics

The average age of the patients was 47.6 ± 8.96 years in the intervention group, and 45.6 ± 9.03 years in the control group. The majority of patients in the intervention and control groups were married and were primary school graduates. The majority in each group of patients had stage II breast cancer with modified mastectomy surgery and had undergone radiotherapy. The average number of dissected lymph nodes of those in the intervention group of patients was 17.5 ± 9.72, while it was 18.8 ± 8.22 in the control group. The characteristics of the patients in both groups were similar in terms of socio-demographic, disease-related, and medical treatment features (p > 0.05) (Table 3).

Table 3
Comparison of the intervention and control groups according to the descriptive Characteristics.

Characteristics	Intervention Group (n = 30)		Control Group (n = 31)		Statistical[a] p value
	n	%	n	%	
Mean ± SD (Min-max)	47,6 ± 8,96 (29–64)		45,6 ± 9,03 (29–62)		
Age					
42 age ↓	10	33,3	11	35,5	χ^2 = 0,934
43-51 age	8	26,7	11	35,5	p = 0,627
52 age↑	12	40,0	9	29,0	
Marital Status					
Married	25	83,3	29	93,5	χ^2 = 0,722
Single	5	16,7	2	6,5	p = 0,396
Education Level					
Primary School	12	40,0	13	41,9	
Secondary School	2	6,6	1	3,2	χ^2 = 0,416
High School	8	26,7	8	25,8	p = 0,937
University	8	26,7	9	29,1	
Disease stage (pathology report)					
Stage 1	2	6,7	2	6,5	χ^2 = 0,024
Stage 2	16	53,3	16	51,6	p = 0,988
Stage 3	12	40,0	13	11,9	
Affected ExtremityLeftLeft					
Right	14	46,7	16	51,6	χ^2 = 0,149
Left	16	53,3	15	48,4	p = 0,699
OperationBreast Care Surgery					
Modified Radical Mastectomy	22	73,3	17	54,8	χ^2 = 2435
Breast Care Surgery	8	26,7	14	45,2	p = 0,296
BMI[b] (kg/m2)					
24,9 and ↓	11	36,7	12	38,7	χ^2 = 0,027
25 and ↑	19	63,3	19	61,3	p = 0,870
Number of lymph nodes extracted	**X̄ ± SD** 17,5 ± 9,72		**X̄ ± SD** 18,8 ± 8,22		t = −0,567 p = 0,573

[a] χ^2-mutltiplication tables" are used, n examing the relationship between qualitative variables.

3.2. SMLP output measurements

At the end of the study, while lymphedema development was not observed in the intervention group, 61.2% of the control patients developed lymphedema (The presence of lymphedema was confirmed at 2-cm with a minimum difference in two arms). The difference between the intervention and control groups for the development of lymphedema was found to be statistically significant (χ2 = 25,943; p = 0,000) (Tables 4–7).

3.2.1. DASH assessment

Table 4 presents a comparison of the DASH scores of the two groups. The mean DASH scores, over time, were significantly different between the groups during the sixth month (p < 0.05). DASH scores decreased progressively in the intervention group during the third and sixth months, while these scores increased in the control group.

3.2.2. Upper extremity measurements

In the first, third and sixth months, upper extremity measures of the intervention group were significantly lower than the measurements of the control group (p < 0.05). The highest measurement of the upper

Table 4
Comparison of the mean DASH scores of the intervention and control groups by months.

Monthly/DASH scores	Intervention Group (n = 30)		Control Group (n = 31)		Statistical[a]
	Median	Min-Max	Median	Min-Max	
0.month (Pre operative term) (1)	4,2	0-66,7	5,0	0,0–52,5	Z = −1055 p = 0,291
1. Month (2)	15,0	1,7–43,3	34,2	13,3–69,2	Z = −4807 p = **0,000**
3. Month (3)	7,5	1,7–30,8	57,5	11,7–86,7	Z = −6279 p = **0,000**
6. Month (4)	2,9	0,8–19,2	75,0	10,8–91,7	Z = −6655 p = **0,000**
Statistical Analysis[a]	χ^2 = 52,172		χ^2 = 73,026		
probability	p = **0,000**		p = **0,000**		
difference	[2-1,3,4] [3–4]		[1–2,3,4] [2–3,4] [3–4]		

[a] Mann-Whitney U" teststatistics are used for comparision of an independent groups of non-normal distributions."Friedman" test (χ^2-table valve) statistics are used

extremity in the control group was observed during the sixth month (Tables 5–7).

3.3. Quality of life assessment: EORTC QLQ-30 and EORTC QLQ-BR23

It was determined that there is a significant difference between the general health perception, physical function, role function, emotional function, cognitive function, and social function scores of the intervention and control groups ($p \leq 0.05$), and the scores of the intervention group were found to be higher than the scores of the control group. It was found that the quality of life of those in the intervention group was higher than the quality of life of those in the control group (Table 8).

In the third and sixth months, the scores related to the symptoms of *fatigue, pain, and insomnia* of the intervention group were found to be significantly lower than the scores of those in the control group. The difference between the groups was also significant ($p \leq 0.05$).

The EORTC QLQ-BR23 results suggest that, within the groups, symptom (therapy side effects, breast and arm symptoms, and negative emotions due to hair loss) scores of the intervention group progressively decreased in the third and sixth months, while symptom scores progressively increased in the control group (Table 9).

4. Discussion

In our randomized, controlled, experimental study, 30 patients who had undergone breast cancer surgery were accepted for the SMLP for six months. In this program, patients who had undergone breast cancer surgery were accepted for the SMLP for six months. In this program, patients were educated on lymphedema symptoms, how to protect the affected arm from infection and trauma, the importance of maintaining a proper weight, exercise, skin care, and simple lymphatic drainage massage. The patients were instructed in the importance of follow-up care. SMLP is effective at preventing lymphedema development following breast cancer treatment and improving the quality of life of patients.

4.1. The impact of the SMLP on lymphedema development

It was observed at the end of the six-month follow-up that the patients in the intervention group did not develop lymphedema, while more than half of the patients in the control group developed lymphedema during the third month (61.2%). Meric et al. (2002) found that lymphedema developed in the first month at the earliest and in the 109th month at the latest, while it was observed in the 17th month on average. Todd et al. (2008) found that 10% of patients in the intervention group developed lymphedema while 20% of those in the control group developed it in a 1 year follow up. Our results are similar to the Todd study and they may have been higher due to a 6-month study. If we could do one year follow-up, the result could be lower. Because the patients' acute inflammation and healing processes may also have been effective at the postop process.

The DASH questionnaire, which evaluated the disability, activity limitations, leisure time activities, and limitations related to being able to work outside home resulting from upper extremity injuries of the participating women, was given to the patients during the first, third, and sixth months in both the pre-operative and post-operative periods. At the end of the study, there was a decline in the DASH scores of the patients in the intervention group. The decline in the DASH scores of the patients in the intervention group should be an effect of the exercise program which started in the early post-operative period in order to promote muscle strength, resistance, and elasticity. The findings support the hypotheses that SMLP can be effective at the prevention of BCRL, and it can also be effective at improving the quality of life of patients. The current study provides preliminary evidence on the effectiveness of SMLP in the prevention and management of BCRL as it is conducted in a single center and on a small sample size. It is assumed that this success is based on a regular exercise schedule, as well as proper skin care, which is a part of SMLP. Success was also due to the controlled follow-ups by the patient and researcher. The literature (Dawes et al., 2008; Smoot et al., 2010) on DASH suggests the following: Dawes et al. (2008) found that women with breast cancer-related lymphedema had higher DASH scores compared with the women without any lymphedema. Smoot et al. (2010) conducted a study to examine the upper extremity problems in women who had breast

Table 5
Comparison of mean metacarpophalangeal measurements of the intervention and control groups by months.

Anatomic Localization	Months	Intervention Group (n:30)	Control Group (n:31)	Statistical Evaluation[a]	
		$\bar{X} \pm SD$	$\bar{X} \pm SD$	Z	p
MCP	0.month (Pre operative term) (1)	0,02 ± 0,04	0,03 ± 0,05	−1402	0,161
	1. Month (2)	0,16 ± 0,09	0,41 ± 0,13	−6137	0,000
	3. Month (3)	0,10 ± 0,07	0,56 ± 0,18	−6808	0,000
	6. Month (4)	0,07 ± 0,05	0,73 ± 0,27	−6828	0,000

**MCP: Metacarpophalangeal.*
[a] General linear models with repeated measures.

Table 6
Comparison of mean forearm measurements of the intervention and control groups by months.

Anatomic Localization	Months	Intervention Group (n:30)	Control Group (n:31)	Statistical Evaluation[a]	
		$\bar{X} \pm SD$	$\bar{X} \pm SD$	Z	p
Wrist joints 10 cm below	0.month (Pre operative term) (1)	0,02 ± 0,04	0,01 ± 0,03	−1051	0,293
	1. Month (2)	0,18 ± 0,06	0,36 ± 0,10	−6403	0,000
	3. Month (3)	0,10 ± 0,05	0,50 ± 0,12	−6936	0,000
	6. Month (4)	0,09 ± 0,03	0,67 ± 0,22	−7008	0,000

*Points above the forearm.
[a] General linear models with repeated measures.

cancer-related lymphedema, and who did not have lymphedema. They found that women with breast cancer-related lymphedema had significantly higher DASH scores. Baran (2016) indicated that as the severity of lymphedema increased, the DASH score increased, and daily life activities were affected accordingly. These findings are compatible with our findings, as it is believed that breast cancer-related lymphedema leads to limitations in the arm, shoulder, and hand movements. These limitations also cause problems in handling daily life activities.

The development of breast cancer-related lymphedema can be prevented. Patients should be informed about lymphedema, and take the necessary precautions to prevent its development. In the studies conducted on breast cancer-related lymphedema, it was determined that a majority of patients do not know lymphedema and how to reduce the risks and symptoms of lymphedema (Gul and Erdim, 2009). Patient education is the most significant factor in preventing lymphedema (Cheville et al., 2003; Evsine and Karayurt, 2014; Poage et al., 2014). Aybala et al. (2014) indicated that the most successful method in managing lymphedema is preventing its development. Therefore, they emphasized the importance of the requirement that the patients should be informed about the lymphedema risk factors. Fu et al. (2010) conducted a study to examine the effects of becoming informed about breast cancer-related lymphedema symptoms, and educated the patients on how to reduce breast cancer-related lymphedema and its symptoms. It was found that there was a reduction in both the lymphedema and its symptoms in the informed group of patients.

In our study, an objective and valid evaluation was done through the early stage patient evaluation during the pre-operative period, giving support to make them believe in the benefits of regular participation of patients in the program, including exercise, simple lymph drainage massage, and skin care. The evaluation also provides motivation for the patients. Therefore, it can be concluded that the self-management of lymphedema program became successful through follow-up after discharging from the hospital. In addition, the importance of this study increases with the active role of the patients in lymphedema management by comparison after the training provided during pre-operative and post-operative periods.

4.2. The impact of the SMLP on quality of life

In our study, our evaluations in the third and sixth months showed that quality of life scores of the patients using the SMLP was found to be higher than the quality of life scores of the patients in the control group. We are of the opinion that the SMLP can be a promoting factor in improving the quality of life, in the prevention of lymphedema development.

The literature on the relationship between quality of life and lymphedema, Kwan (2002) found that EORTC QLQ C-30 quality of life scores of the individuals who had lymphedema, pain and shoulder movement limitations after breast cancer therapy were higher compared to healthy individuals without any sub-scores of physical, social, and pain symptoms. Aslan (2016) indicated that there is a negative correlation between the presence of lymphedema and role function, the sub-parameter of the quality of life scale of EORTC QLQ-C30. Soran et al. (2000) included 56 women patients in their study who were followed up at least 12 months after surgery and found that the quality of life scores of the group of patients with lymphedema was higher than the group of patients with no lymphedema. Beaulac (2002) explored the association between lymphedema and quality of life in survivors of early-stage breast cancer and found a negative correlation between lymphedema and quality of life. Individuals who have lymphedema have difficulties in performing their daily life activities. Their role in the family is affected, and they see themselves different. Lymphedema becomes a factor, which is a constant reminder of the disease and makes women feel that they are not yet recovered. Based on all of these factors mentioned above, people with lymphedema are expected to have a lower quality of life. In our study, the quality of life of those in the intervention group was higher than the quality of life of those in the control group. It is believed that this finding is due to the lymphedema management program the patients participated in. This included encouraging the patients to change their lifestyles, increasing their motivation, improving their understanding, and encouraging self-acceptance. Feedback was received from the patients during the interviews, and it was found that telephone calls relieve and motivate the patients.

Table 7
Comparison of mean lateral epicondylitis measurements of the intervention and control groups by months.

Anatomic Localization	Months	Intervention Group (n:30)	Control Group (n:31)	Statistical Evaluation[a]	
		$\bar{X} \pm SD$	$\bar{X} \pm SD$	Z	p
The lateral epicondylitis measurements joints (10 cm below)	0.month (Pre operative term) (1)	0,02 ± 0,04	0,01 ± 0,03	−1051	0,293
	1. Month (2)	0,18 ± 0,06	0,36 ± 0,10	−6403	0,000
	3. Month (3)	0,10 ± 0,05	0,50 ± 0,12	−6936	0,000
	6. Month (4)	0,09 ± 0,03	0,67 ± 0,22	−7008	0,000
The lateral epicondylitis measurements joints (10 cm above)	0.month (Pre operative term) (1)	0,02 ± 0,04	0,01 ± 0,03	−0,742	0458
	1. Month (2)	0,16 ± 0,07	0,34 ± 0,13	−5675	0,000
	3. Month (3)	0,11 ± 0,06	0,44 ± 0,15	−6882	0,000
	6. Month (4)	0,08 ± 0,06	0,61 ± 0,21	−6852	0,000

*Points above the forearm.
[a] General linear models with repeated measures.

Table 8
Comprasion of EORTC QLQ-30 for Intervention Group and Control groups by months.

Variate	Intervention Group	Control Group	Statistical Analysis[a]	Intervention Group	Control Group	Statistical Analysis[a]	Intervention Group	Control Group	Statistical Analysis[a]	Intervention Group Examination of he differences by months	Control Group Examination of he differences by months
	Pre operative term Median (Min.−Max)	Pre operative term Median (Min.−Max)		3.Month (2) Median (Min.−Max)	3. Month (2) Median (Min.−Max)		6. Month (3) Median (Min.−Max)	6. Month (3) Median (Min.−Max)			
Global health status	66,7 [16,7–91,7]	66,7 [25,0–83,3]	Z = −0,944 p = 0,345	66,7 [50,0–83,3]	50,0 [25,0–66,7]	Z = −4823 p = **0,000**	83,3 [66,7–100,0]	41,7 [25,0–66,7]	Z = 6745 p = **0,000**	χ^2 = 43,062 p = **0,000 [1,2–3]**	χ^2 = 38,552 p = **0,000 [1–2,3] [2–3]**
Functional Scales	**Median (Min.-Max)**	**Median (Min.-Max)**		**Median (Min.-Max)**	**Median (Min.-Max)**		**Median (Min.-Max)**	**Median (Min.-Max)**			
Physical functioning	86,7 [60,0–100,0]	86,7 [53,3–100,0]	Z = −0,646 p = 0,518	93,3 [60,0–100,0]	53,3 [13,3–93,3]	Z = −5428 p = **0,000**	100,0 [80,0–100,0]	40,0 [6,7–86,7]	Z = −6591 p = **0,000**	χ^2 = 22,884 p = **0,000 [1,2–3]**	χ^2 = 52,317 p = **0,000 [1–2,3] [2–3]**
Role functioning	83,3 [33,3–100,0]	100,0 [16,7–100,0]	Z = −1561 p = 0,119	66,7 [50,0–100,0]	33,3 [0,0–83,3]	Z = −5933 p = **0,000**	100,0 [83,3–100,0]	16,7 [0,0–100,0]	Z = −6581 p = **0,000**	χ^2 = 10,037 p = **0,007 [2–3]**	χ^2 = 46,486 p = **0,000 [1–2,3] [2–3]**
Emotional functioning	66,7 [8,3–100,0]	66,7 [8,3–100,0]	Z = −0,630 p = 0,529	70,8 [41,7–100,0]	41,7 [8,3–66,7]	Z = −5617 p = **0,000**	91,7 [58,3–100,0]	16,7 [0,0–83,3]	Z = −6557 p = **0,000**	χ^2 = 26,299 p = **0,000 [1,2–3]**	χ^2 = 39,051 p = **0,000 [1–2,3] [2–3]**
BF Cognitive functioning	83,3 [33,3–100,0]	100,0 [33,3–100,0]	Z = −0,238 p = 0,812	100,0 [66,7–100,0]	83,3 [33,3–100,0]	Z = −4133 p = **0,000**	100,0 [33,3–100,0]	83,3 [33,3–100,0]	Z = −5915 p = **0,000**	χ^2 = 16,360 p = **0,000 [1–2,3]**	χ^2 = 7748 p = **0,021 [1–2,3]**
Social functioning	100,0 [50,0–100,0]	100,0 [33,3–100,0]	Z = −1119 p = 0,263	83,3 [50,0–100,0]	33,3 [33,3–100,0]	Z = −5716 p = **0,000**	100,0 [50,0–100,0]	16,7 [0,0–100,0]	Z = −6381 **p = 0,000**	χ^2 = 12,277 **p = 0,002 [1,3-2]**	χ^2 = 52,629 **p = 0,000 [1–2,3] [2–3]**

[a] Mann-Whitney U" teststatistics are used for comparision of an independent groups of non-normal distributions."Friedman" test (χ^2-table valve) statistics are used for comparison of 3 dependent group. Impressions on non prametric variables are displayed with "Median [Min.-Max.]".

Table 9
Comprasion of EORTC QLQ-BR23 for Intervention Group and Control groups by months.

Variate	Intervention Group Pre operative term Median (Min. – Max)	Control Group Pre operative term Median (Min. – Max)	Statistical Analysis[a]	Intervention Group 3.Month (2) Median (Min. – Max)	Control Group 3. Month (2) Median (Min. – Max)
Functional scales					
Body image	100,0 [8,3–100,0]	100,0 [50,0–100,0]	Z = −0,205 p = 0,838	75,0 [41,7–100,0]	33,3 [0,0–100,0]
Sexual functioning	100,0 [33,3–100,0]	83,3 [33,3–100,0]	Z = −3319 p = **0,001**	100,0 [50,0–100,0]	100,0 [66,7–100,0]
Sexual enjoyment	100,0 [33,3–100,0]	66,7 [0,0–100,0]	Z = −1032 p = 0,302	66,7 [33,3–100,0]	100,0 [33,3–100,0]
Future perspective	66,7 [0,0–100,0]	66,7 [0,0–100,0]	Z = −1238 p = 0,216	33,3 [0,0–100,0]	0,0 [0,0–100,0]
Symptom scales	**Median (Min.-Max) < !–Para Run-on– >**	**Median (Min.-Max) < !–Para Run-on– >**		**Median (Min.-Max) < !–Para Run-on– >**	**Median (Min.-Max) < !–Para Run-on– >**
Systemic therapy side effects	11,9 [0,0–47,6]	14,3 [0,0–71,4]	Z = −1670 p = 0,095	9,5 [0,0–66,7]	28,6 [4,7–66,7]
Breast symptoms	8,3 [0,0–33,3]	8,3 [0,0–75,0]	Z = −0,487 p = 0,626	0,0 [0,0–25,0]	33,3 [0,0–66,7]
Arm symptoms	11,1 [0,0–33,3]	11,1 [0,0–44,4]	Z = −0,581 p = 0,561	11,1 [0,0–77,8]	55,6 [11,1–77,8]
Upset by hair loss	33,3 [0,0–100,0]	33,3 [0,0–100,0]	Z = 0,000 p = 1000	33,3 [0,0–66,7]	66,7 [33,3–100,0]

Variate	Statistical Analysis[a]	Intervention Group 6. Month (3) Median (Min. – Max)	Control Group 6. Month (3) Median (Min. – Max)	Statistical Analysis[a]	Intervention Group Examination of he differences by months	Control Group Examination of he differences by months
Functional scales						
Body image	Z = −5779 p = **0,000**	100,0 [66,7–100,0]	8,3 [0,0–100,0]	Z = −6061 p = **0,000**	χ^2 = 19,310 p = **0,000 [2–3]**	χ^2 = 51,322 p = **0,000 [1–2,3] [2–3]**
Sexual functioning	Z = −0,323 p = 0,747	83,3 [50,0–100,0]	100,0 [66,7–100,0]	Z = −4726 p = **0,000**	χ^2 = 21,419 p = **0,000 [1,2–3]**	χ^2 = 19,825 p = **0,000 [1–2,3]**
Sexual enjoyment	Z = −1057 p = 0,291	33,3 [0,0–100,0]	100,0 [33,3–100,0]	Z = −4774 p = **0,000**	χ^2 = 16,915 p = **0,000 [1,2–3]**	χ^2 = 1806 p = 0,405 –
Future perspective	Z = −4231 p = **0,000**	66,7 [33,3–100,0]	0,0 [0,0–100,0]	Z = −6219 p = **0,000**	χ^2 = 14,112 p = **0,001 [2–3]**	χ^2 = 33,902 p = **0,000 [1–2,3]**
Symptom scales		**Median (Min.-Max) < !–Para Run-on– >**	**Median (Min.-Max) < !–Para Run-on– >**			
Systemic therapy side effects	Z = −3872 p = **0,000**	9,3 [0,0–23,8]	42,9 [4,8–79,2]	Z = −6025 p = **0,000**	χ^2 = 8563 p = **0,014 [1–3]**	χ^2 = 15,846 p = **0,000 [1–2,3] [2–3]**
Breast symptoms	Z = −6301 p = **0,000**	0,0 [0,0–8,3]	50,0 [8,3–75,0]	Z = −6988 p = **0,000**	χ^2 = 24,976 p = **0,000 [1–2,3]**	χ^2 = 43,350 p = **0,000 [1–2,3] [2–3]**
Arm symptoms	Z = −5494 p = **0,000**	0,0 [0,0–33,3]	77,8 [11,1–100,0]	Z = −6786 p = **0,000**	χ^2 = 22,434 p = **0,000 [1,2–3]**	χ^2 = 50,889 p = **0,000 [1–2,3] [2–3]**
Upset by hair loss	Z = −3258 p = **0,001**	16,7 [0,0–100,0]	100,0 [33,3–100,0]	Z = −4140 p = **0,000**	χ^2 = 0,000 p = 1000	χ^2 = 2000 p = 0,368

[a] Mann-Whitney U″ teststatistics are used for comparision of an independent groups of non-normal distributions.“Friedman” test (χ^2-table valve) statistics are used for comparison of 3 dependent groups. Impressions on non prametric variables are displayed with “Median [Min.-Max.]”.

The inclusion of the researcher's photograph in the booklet increased their motivation and adaptation to the program ("when I open the booklet, I see your photograph and more willingly do my exercises, I feel as you were here", "hearing your voice makes me feel more relaxed and comfortable"). This verifies that the SMLP has positive effects on the quality of life by increasing motivation as well.

In the third and sixth months, the scores related to the symptoms of fatigue, pain, insomnia and financial difficulty of the patients in the intervention group were found to be significantly lower than those of the control group ($p \leq 0.05$). In the third month, there was an increase in the fatigue and pain symptoms of the patients in the intervention and control groups, while the scores of both symptoms of those in the intervention group were lower in the sixth month, these scores were even lower than the scores recorded during the pre-operative period. It is believed that the SMLP is also effective at managing the side effects of postoperative treatments like chemotherapy and radiotherapy. Pyzel et al. (2006) conducted a study using the quality of life scale of EORTC QLQ- 30 and the study indicated that patients with lymphedema experience higher physical, mental, and social deterioration, as well as greater feelings of pain and fatigue (Pyszel et al., 2006).

In our study, the difference between the body image and future expectation scores of those in the intervention and control groups were found to be statistically significant, and higher in the intervention group. In addition, the symptom scores of those in the intervention group were found to be significantly lower than those in the control group. It is considered that the self-management of lymphedema program is also effective at increasing self-awareness and self-management for the individual, in addition to supporting health-promoting activities.

5. Conclusions

As a result of our research, it can be concluded that the SMLP is effective at preventing lymphedema development following breast cancer treatment and improving the quality of life of patients. It is observed that breast cancer-related lymphedema has negative effects on individuals in terms of their physical, social, and psychological well-being. Therefore, precautions related to preventing lymphedema before it occurs should be considered. Education and consultancy and routine follow-ups within the context of self-management of lymphedema are effective at providing physical and psychological relaxation for the patients and increasing their motivation. Evaluations of the researcher and feedback from the patients were evidence of the effectiveness of the study. We recommend that the SMLP should be facilitated by nurses for the prevention and management of breast cancer-related lymphedema.

6. The limitations of the study

Patients with a BMI ≥ 30 higher risk of lymphedema were not included in this study. Specifically, larger physical size places a greater demand on both the blood circulatory and lymphatic systems to move the fluid. In breast cancer survivors with treatment-related lymphatic damage, it is possible that the additional demand created by a larger body size may cause an imbalance in lymphatic fluid volume and transport capacity. Increased secretory peptides may contribute to tissue inflammation and trigger lymphedema in at-risk arms as well (Ridner et al., 2011). Therefore, research findings cannot be generalized to breast cancer patients with a BMI ≥ 30.

References

Aaronson, N.K., Ahmedzai, S., Bergman, B., Bullinger, M., Cull, A., Duez, N.J., Filiberti, A., Flechtner, H., Fleishman, S.B., de Haes, J.C., 1993. The European Organization for Research and Treatment of Cancer QLQ-C30: a quality-of-life instrument for use in international clinical trials in oncology. J. Natl. Cancer Inst. 85 (5), 365–376.

Ahn, S., Port, E.R., 2016. Lymphedema precautions: time to abandon old practices? J.Clin.Oncol. 34 (7), 655–658.

Armer, J.M., Stewart, B., 2010. Post-breast cancer lymphedema: incidence increases from 12 to 30 to 60 months. Lymphology 43, 118–127.

Aslan, I., 2016. Long-term effects of treatment methods on breast cancer patients on shoulder and upper extremity morbidity, lymphodemia and quality of life. In: Faculty of Medicine Physical Medicine and Rehabilitation. Department Uludağ University.

Aybala, A., Kutun, S., Cetin, A., 2014. Lymphoedema after mastectomy for breast cancer: importance of supportive care. S. Afr. J. Surg. 52 (2), 41–44.

Ay, A.A., Kutun, S., Cetin, A., 2014. Lymphoedema after mastectomy for breast cancer: importance of supportive care. S. Afr. J. Surg. 52 (2), 41–44.

Bakar, Y., Berdici, B., Sahin, N., Pala, O.O., 2014. Breast cancer-related lymphedema and its treatment. Journal of Breast Health 10 (1), 6–14.

Baran, E., 2016. Mastektomi sonrası gelişen lenfödem şiddetinin skapular kinematiklere etkisinin incelenmesi (Investigation of the effect of lymphoedema severity after mastectomy on scapular kinematics). Hacettepe Üniversity, Ankara.

Basaran, S., Kozanoğlu, E., 2009. Breast cancer-related lymphedema and conservative treatment. Turkish J. Phys. Med. Rehab. 55 (1), 30–35.

Beaulac, S.M., McNair, L.A., Scott, T.E., LaMorte, W.W., Kavanah, M.T., 2002. Lymphedema and quality of life in survivors of early-stage breast cancer. Arch. Surg. 137 (11), 1253–1257.

Buyukakincak, O., Akyol, Y., Özen, N., Ulus, Y., Canturk, F., Tander, B., Buyukakincak, S., Bilgici, A., Kuru, O., 2014. Quality of life in patients with breast cancer at early postoperative period: relationship to shoulder pain, handgrip strength, disability, and emotional status. Turkish J. Phys. Med. Rehab. 60, 1–6.

Cheville, A.L., McGarvey, C.L., Petrek, J.A., Russo, S.A., Taylor, M.E., Thiadens, S.R., 2003. Lymphedema management. Semin. Radiat. Oncol. 13 (3), 290–301.

Chen, Y.W., Tsai, H.J., Hung, H.C., Tsauo, J.Y., 2007. Reliability study of measurements for lymphedema in breast cancer patients. Am. J. Phys. Med. Rehabil. 87 (1), 33–38.

Dawes, D.J., Meterissian, S., Goldberg, M., Mayo, N.E., 2008. Impact of lymphoedema on arm function and health-related quality of life in women following breast cancer surgery. J. Rehabil. Med. 40 (8), 651–658.

Demir, S.G., 2008. Self-management of lymphedema in patients undergoing surgery for breast cancer. J. Breast Health 4 (2), 62–69.

Demirci, S., Eser, E., Ozsaran, Z., Tankisi, D., Aras, B.A., Ozaydemir, G., Anacak, Y., 2011. Validation of the Turkish versions of eortc qlq-c30 and br23 modules in breast cancer patients. Asian Pac. J. Cancer Prev. 12, 1283–1287.

Devoogdt, N., Van Kampen, M., Geraerts, I., Coremans, T., Christiaens, M.R., 2010. Different physical treatment modalities for lymphoedema developing after axillary lymph node dissection for breast cancer: a review. Eur. J. Obstet. Gynecol. Reprod. Biol. 149, 3–9.

Evsine, N.M., Karayurt, Ö., 2014. An examination of the experiences of women with lymphadenopathy due to breast cancer treatment and their expectations from nurses. J. Breast Health 10 (1), 23–29.

Fayers, P., Bottomley, A., Group, E.Q.o.L., 2002. Quality of life research within the EORTC—the EORTC QLQ-C30. Eur. J. Cancer 38, 125–133.

Ferlay, J., Soerjomataram, I., Dikshit, R., Eser, S., Mathers, C., Rebelo, M., et al., 2015. Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. Int. J. Cancer 136 (5), 359–386.

Fu, M.R., Chen, C.M., Haber, J., Guth, A.A., Axelrod, D., 2010. The effect of providing information about lymphedema on the cognitive and symptom outcomes of breast cancer survivors. Ann. Surg. Oncol. 17 (7), 1847–1853.

Galvao, D.A., Newton, R.U., 2005. Review of exercise intervention studies in cancer patients. J. Clin. Oncol. 23 (4), 899–909.

Golshan, M., Smith, B., 2006. Prevention and management of arm lymphedema in the patient with breast cancer. J. Support Oncol. 4 (8), 381–386.

Guzelant, A., Goksel, T., Ozkok, S., Tasbakan, S., Aysan, T., Bottomley, A., 2004. The European Organization for Research and Treatment of Cancer QLQ-C30: an examination into the cultural validity and reliability of the Turkish version of the EORTC QLQ-C30. Eur. J. Cancer Care 13 (2), 135–144.

Gul, A., Erdim, L., 2009. Training approach of nurses in the prevention of lymphoedema after breast cancer surgery. J. Breast Health 5 (2), 82–86.

Gummesson, C., Atroshi, I., Ekdahl, C., 2003. The disabilities of the arm, shoulder and hand (DASH) outcome questionnaire: longitudinal construct validity and measuring self-rated health change after surgery. BMC Muscoskelet. Disord. 4, 1–6.

Gursoy, A.A., Erdol, H., Okuyan, M., 2006. Lymphedema. J. Anatol. Nurs. Health Sci. 9 (4), 82–90.

Heisig, S.R., Shedden-Mora, M.C., von Blanckenburg, P., Rief, W., Witzel, I., Albert, U.S., et al., 2016. What do women with breast cancer expect from their treatment? Correlates of negative treatment expectations about endocrine therapy. Psycho Oncol. 25 (12), 1485–1492.

Hudak, P.L., Amadio, P.C., Bombardier, C., Beaton, D., Cole, D., Davis, A., Hawker, G., Katz, J.N., Makela, M., Marx, R.G., 1996. Development of an upper extremity outcome measure: the DASH (disabilities of the arm, shoulder, and hand). Am. J. Ind. Med. 29 (6), 602–608.

Huang, T.W., Tseng, S.H., Lin, C.C., Bai, C.H., Chen, C.S., Hung, C.S., Wu, C.H., Tam, K.W., 2013. Effects of manual lymphatic drainage on breast cancer-related lymphedema: a systematic review and meta-analysis of randomized controlled trials. World J. Surg. Oncol. 11 (15), 2–8.

Kebudi, A., 2003. Early and Late Complications of Breast Surgeon. Nobel Medical, Ankara.

Knols, R., Aaronson, N.K., Uebelhart, D., Fransen, J., Aufdemkampe, G., 2005. Physical exercise in cancer patients during and after medical treatment: a systematic review of randomized and controlled clinical trials. J. Clin. Oncol. 23 (16), 3830–3842.

Kwan, W., Jackson, J., Weir, L.M., Dingee, C., McGregor, G., Olivotto, I.A., 2002. Chronic arm morbidity after curative breast cancer treatment: prevalence and impact on quality of life. J. Clin. Oncol. 20 (20), 4242–4248.

Lee, Y., Mak, S., Tse, S., Chan, S., 2001. Lymphoedema care of breast cancer patients in a

breast care clinic: a survey of knowledge and health practice. Support. Care Canc. 9 (8), 634–641.
McCaulley, L., Smith, J., 2014. Diagnosis and treatment of lymphedema in patients with breast cancer: an overview of an interdisciplinary and patient-centered approach. Clin. J. Oncol. Nurs. 18 (5), 97–102.
McNeely, M.L., Campbell, K.L., Rowe, B.H., Klassen, T.P., Mackey, J.R., Courneya, K.S., 2006. Effects of exercise on breast cancer patients and survivors: a systematic review and meta-analysis. Can. Med. Assoc. J. 175 (1), 34–41.
McLaughlin, S.A., Bagaria, S., Gibson, T., Michelle Arnold, M., Diehl, N., Julia Crook, J., Parker, A., Nguyen, J., 2013. Trends in risk reduction practices for the prevention of lymphedema in the first 12 months after breast cancer surgery. J. Am. Coll. Surg. 1–10. https://doi.org/10.1016/j.jamcollsurg.2012.11.004.
Meric, F., Buchholz, T.A., Mirza, N.Q., Vlastos, G., Ames, F.C., Ross, M.I., Kuerer, H.M., 2002. Long-term complications associated with breast-conservation surgery and radiotherapy. Ann. Surg. Oncol. 9 (6), 543–549.
Ozcinar, B., Guler, S.A., Ozmen, V., Gulluoglu, B.M., Kocaman, N., Ozkan, M., Sarıcam, G., Muslumanoglu, M.E., Igci, A., Kecer, M., 2010. Complications after local/regional treatment in breast cancer and their effects on patient quality of life. J. Breast Health 6 (1), 9–16.
Park, J.H., Lee, W.H., Chung, H.S., 2008. Incidence and risk factors of breast cancer lymphoedema. J. Clin. Nurs. 17 (11), 1450–1459.
Poage, E., Singer, M., Armer, J., Poundall, M., Shellabarger, J., 2014. Demystifying lymphedema:development of the lymphedema putting evidence into practice card. Clin. J. Oncol. Nurs. 18, 68–79.
Pyszel, A., Malyszczak, K., Pyszel, K., Andrzejak, R., Szuba, A., 2006. Disability, psychological distress and quality of life in breast cancer survivors with arm lymphedema. Lymphology 39 (4), 185–192.
Radina, M.E., Armer, J.M., Culbertson, S.D., Dusold, J.M., 2004. Post-breast cancer lymphedema: understanding women's knowledge of their condition. Oncol. Nurs. Forum 31 (1), 97–104.
Ridner, S.H., 2005. Quality of life and a symptom cluster associated with breast cancer treatment-related lymphedema. Support. Care Canc. 13 (11), 904–911.
Ridner, S.H., Dietrich, M.S., Stewart, B.R., Armer, J.M., 2011. Body mass index and breast cancer treatment-related lymphedema. Support. Care Canc. 19 (6), 853–857.
Rietman, J.S., Dijkstra, P.U., Debreczeni, R., Geertzen, J.H., Robinson, D.P., de Vries, J., 2004. Impairments, disabilities and health related quality of life after treatment for breast cancer: a follow-up study 2.7 years after surgery. Disabil. Rehabil. 26 (2), 78–84.
Simonavice, E., Kim, J.S., Panton, L., 2017. Effects of resistance exercise in women with or at risk for breast cancer-related lymphedema. Support. Care Canc. 25, 9–15.
Smoot, B., Wong, J., Cooper, B., Wanek, L., Topp, K., Byl, N., et al., 2010. Upper extremity impairments in women with or without lymphedema following breast cancer treatment. J. Cancer Surviv. 4 (2), 167–178.
Soran, A., Bulut, F., Yildirim, O., Cengiz, O., 2000. Determination of quality of life in SF-36 scale in patients who have been opposed to breast cancer. Natl. Surg. J. 16 (2), 109–115.
Stevinson, C., Lawlor, D.A., Fox, K.R., 2004. Exercise interventions for cancer patients: systematic review of controlled trials. Cancer Causes Control 15 (10), 1035–1056.
Todd, J., Scally, A., Dodwell, D., Horgan, K., Topping, A., 2008. A randomised controlled trial of two programmes of shoulder exercise following axillary node dissection for invasive breast cancer. Physiotherapy 94, 265–273.
Wanchai, A., Armer, J.M., Stewart, B.R., Lasinski, B.B., 2016. Breast cancer-related lymphedema: a literature review for clinical practice. Int. J. Nurs. Sci. 3 (2), 202–207.
Yildiz, A., Karayurt, O., 2011. Women with breast cancer have difficulty living with lymphedema. J. Breast Health 7 (3), 154–162.