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Nurse-assisted education and exercise decrease the prevalence and morbidity of lymphedema following breast cancer surgery

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Summary

Purpose: *To evaluate an educational and exercise program for the prevention and progression of post-mastectomy lymphedema of the arm açnd shoulder.*

Methods: *Fifty-five patients who had undergone mastectomy and axillary lymph node dissection between June 2009 and January 2010 were included in this study. The patients were informed by a trainer nurse about the precautions they should take to prevent the development of lymphedema. The patients were also trained for the appropriate exercises and were given written educational material prepared by the investigators.*

Results: *Among the participants, 96.4% underwent modified radical mastectomy (MRM) and 3.6% breast-conserving (BCS) surgery. The mean postoperative follow-up period was 9.87 ± 17.55 months. The degree of lymphedema was found lower, even within 6 months, in the patients that exercised as compared to the patients that did not ($p<0.05$).*

Conclusions: *The results indicate that the risk of development and progression of mastectomy-related lymphedema was reduced with education and exercise provided by trained nurses at an early stage.*

Key words: breast cancer, education, exercise, lymphedema

Introduction

Survival of breast cancer patients has increased along with advances in early diagnosis and effective therapy, and therefore increasing post-treatment quality of life has gained more importance [1,2]. MRM remains the most common surgical method in the treatment of breast cancer. Lymphedema in the shoulder and arm on the operation side is the most common problem following MRM [3]. Lymphedema following mastectomy is the accumulation of lymphatic fluid in the interstitial space, particularly in subepidermal adipose tissue, which is the result of impaired lymphatic drainage due to the removal of axillary lymph nodes [4-6]. Shunemann and Wilichn reported 39.5% cases with lymphedema of the arm on the operation side following radical mastectomy and MRM, and in 9.3% following BCS [7]. These rates vary according to different factors, such as axillary surgery, radiotherapy (RT), obesity, venous obstruction, delay in wound healing, infection, advanced age, tumor stage, and axillary metastasis. Additional risk factors include postoperative overuse or nonuse of the arm on the operation side, trauma, and thermal alterations [8-10]. Lymphedema can result in cosmetic deformity, loss of function of the arm, and recurrent cellulitis and/or lymphangitis attacks in the long-term [3].

Sense of tension, swelling, and heaviness in the arm, as well as pain and increased warmth in the extremities without erythema negatively affect patient's quality of life and daily functioning [7,8]. Prevention of lymphedema is important in reducing these complaints and improving quality of life. Woods et al. compared women with and without lymphedema, and found that 81% of women with lymphedema experienced increased psychosocial maladjustment and psychological disorders due to cancer and lymphedema when compared with a group of patients with breast cancer who did not have lymphedema [11]. Postoperative exercises and the education on arm elevation and skin care can preserve blood flow, eliminate movement restriction in a short time, and lower the risk for lymphedema [12].

We prospectively investigated the effect of edu-

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cation and exercises, provided in our center on the development and progression of lymphedema following surgery for breast carcinoma, as well as on the pre-existent lymphedema.

Methods

Fifty-five patients, who had undergone mastectomy and axillary lymph node dissection at the Cukurova University, Medical Faculty, Balcali Hospital, Medical Oncology Outpatient Clinic between June 2009 and January 2010, and who accepted to participate in the study after being informed, were included. The patients completed a questionnaire prepared in reference to the booklet of 17th Oncology Nursing Course (Table 1).

Arm circumference and body weight of the patients were measured monthly for 6 months. The arms of the participants were measured 7.5 cm over and 7.5 cm below the elbow and the two arms were compared [13]. Arm circumference measurements were classified as follows: 0-1.5 cm: no lymphedema; 1.5-3 cm: minimal lymphedema; 3-5 cm: moderate lymphedema; and 5 cm and over: severe lymphedema [13]. The patients were informed by a trainer nurse about the measures to prevent lymphedema development. They were also trained about the exercises and were given written educational material prepared by the investigators.

Statistical analysis

All data were analyzed using SPSS 11.5 (Statistical Package for Social Sciences) for Windows. Categorical variables were summarized as numbers and percentages, whereas numeric variables were given as average and standard deviation. The chi-squared test was used in the comparison of categorical variables between different groups. The level of statistical significance was set at 0.05 in all tests.

Results

Patient characteristics are summarized in Table 2. Among the participants, 96.4% underwent MRM and 3.6% BCS. The mean number of the lymph nodes removed during surgery was 25.44 ± 8.33, and the mean

Table 1. The questionnaire used in this study

Patient first-last name:
Single/married:
Age:
Male/female:
Occupation:
Height:
Weight:
Diagnosis:
Other diseases (non cancerous)
Do you know self breast examination:
Family history of breast cancer:
Age at menopause:
Number of deliveries:
Duration of breast feeding:
Nutritional habits (Rich in fat; Rich in vegetables)
Cigarette, alcohol use:
Exercise:
Do you have benign breast disease:
Do you take hormonotherapy (if yes, how long for?):
Which contraception method do you use:
When/how did you notice your disease:
Did you receive radiation therapy (if yes, how long for):
Did you have any infection in the axilla after operation:
Operation date:
Operation type:
Lateralization (right/left):
Body weight:
1st month:
2nd month:
3rd month:
4th month:
5th month:
6th month:
Measurements performed every month for 6 months:
Right upper arm measurement:
Right lower arm measurement:
Left upper arm measurement:
Left lower arm measurement:

Table 2. Patient characteristics

Characteristics	*N*	*%*
Gender		
Female	54	98.2
Male	1	1.8
Marital status		
Married	44	80
Single	11	20
Occupation		
Housewife	42	76.4
Teacher	6	10.9
Retired	3	5.5
Worker	3	5.5
Officer	1	1.8
Tumor stage		
I	7	12.7
II	25	45.5
III	20	36.4
IV	3	5.5
Postoperative infection		
Yes	4	7.3
No	51	92.7
Type of surgery		
Modified radical mastectomy	53	96.4
Breast-conserving surgery	2	3.6
Radiotherapy 50 Gy in 25 days		
Yes	25	45.5
No	30	54.5
Estrogen receptor		
Positive	30	61.8
Negative	21	38.8
Progesterone receptor		
Positive	30	54.5
Negative	25	45.5
HER2 receptor		
Positive	32	58.2
Negative	23	41

number of positive lymph nodes was 4.55 ± 6.40. The mean postoperative follow-up period was 9.87 ± 17.55 months (range 1-105).

The degrees of lymphedema are shown in Table 3. At the end of the 6th month, lymphedema was not observed in 24 of 27 (49%) patients who entered the study without lymphedema and regularly exercised and followed the recommendations (Table 4). Of the remaining patients lymphedema was minimal in 2 of the 3 patients, whereas it was moderate in one that did not follow the recommendations.

Lymphedema disappeared at the end of the 6th month in 8, 5 and 1 patients that entered the study with mild, moderate and severe lymphedema, respectively. At this time, moderate lymphedema regressed to minimal in 1 of the patients; however, moderate lymphedema in one patient and minimal lymphedema in 2 remained the same.

Eighteen of 27 patients who had initial lymphedema received RT, whereas 9 did not. The mean number of the lymph nodes removed during surgery was 25.44 ± 7.57 and the mean number of positive nodes was 6.17 ± 8.33. Fourteen patients continued to use the extremity of the operation side for the daily choirs. All of the patients had undergone MRM.

Eleven of the 24 patients, who began the study without lymphedema and did not develop lymphedema in 6 months, received RT. The mean number of the removed nodes was 25.33 ± 12.09 and the mean number of the positive nodes was 4.67 ± 3.21. Fourteen patients have been using the extremity of the operation side. Two of the patients had undergone BCS, whereas 22 had undergone MRM.

One of the 4 patients that began the study without lymphedema but developed it at the end of the 6th month had received RT. The mean number of the removed lymph nodes was 25.33 ± 12.9 and the mean number of the positive nodes was 4.67 ± 3.21. Two of the patients were using the extremity of the operation side. All of the patients had undergone MRM.

Table 4 shows the monthly distribution of the degree of lymphedema in the patients regularly doing arm exercises. The degree of lymphedema was found lower, even within 6 months, in the patients that exercised as compared to the patients that did not ($p<0.05$).

Table 3. Degrees of lymphedema in relation with the postoperative months

Post-operative months	*No lymphedema N (%)*	*Minimal lymphedema N (%)*	*Moderate lymphedema N (%)*	*Severe lymphedema N (%)*
1st month	28 (50.9)	11 (20)	12 (21.8)	4 (7.3)
2nd month	36 (65.5)	6 (10.9)	9 (16.4)	4 (7.3)
3rd month	33 (60)	10 (18.2)	7 (12.7)	5 (9.1)
4th month	34 (61.8)	9 (16.4)	6 (10.9)	6 (10.9)
5th month	34 (61.8)	10 (18.2)	8 (14.5)	3 (5.5)
6th month	36 (65.5)	7 (12.7)	10 (18.2)	2 (3.6)

Discussion

Being diagnosed with breast cancer is traumatic enough for a patient, even in the absence of lymph-

Table 4. Degrees of lymphedema in the exercising patients

Postoperative months	*No lymphedema N (%)*	*Minimal lymphedema N (%)*	*Moderate lymphedema N (%)*	*Severe lymphedema N (%)*	*p-value*
1st month					
Exercising	27 (60)	10 (22.2)	7 (15.6)	2 (2.2)	0.0001
Not exercising	1 (10)	1 (10)	5 (50)	3 (30)	
2nd month					
Exercising	34 (75.6)	5 (11.1)	5 (11.1)	1 (2.2)	0.0001
Not exercising	2 (20)	1 (10)	4 (40)	3 (30)	
3rd month					
Exercising	32 (71.1)	8 (17.8)	4 (8.9)	1 (2.2)	0.0001
Not exercising	1 (10)	2 (20)	3 (30)	4 (40)	
4th month					
Exercising	33 (73.3)	8 (17.8)	2 (4.4)	2 (4.4)	0.0001
Not exercising	1 (10)	1 (10)	4 (40)	4 (40)	
5th month					
Exercising	34 (75.6)	8 (17.8)	3 (6.7)	0 (0)	0.0001
Not exercising	0 (0)	2 (20)	5 (50)	3 (30)	
6th month					
Exercising	35 (77.8)	6 (13.3)	4 (8.9)	0 (0)	0.0001
Not exercising	1 (10)	1 (10)	6 (60)	2 (20)	

edema [14]. Cancer-related anxiety and the impact on the sexual life and self-respect constitute already great psychological burden; moreover, physical and psychological problems brought by lymphedema would cause increased cost due to worktime loss and treatment expenses, as well [15]. Movement restriction and functional decrease in the arm due to lymphedema worsen the patient's quality of life and is a trauma constantly reminding the patient of her disease [16,17]. In the studies on lymphedema following breast cancer surgery, it has been reported that most of the patients with lymphedema knew neither the risks and the signs of lymphedema nor the measures that they should take for its prevention. Patient education is the most important factor in preventing lymphedema [18].

Bosompra et al. performed a study using telephone interview in 148 patients operated on for breast cancer. They found that the patients neither made enough effort to protect themselves from lymphedema nor did they exercise [1]. The results of the study performed by Lee et al. in 171 breast cancer patients showed that 82.5% of the patients were aware of the risk of lymphedema [17].

In the present study as well, 90% of the patients who did not exercise regularly and did not follow the recommendations in the course of the study, had lymphedema at the beginning of the study because they have not been educated postoperatively. Usually patients who developed lymphedema before the study entry, had modified their lives to comply with lymphedema. Since all of the patients were married and the majority were housewives, probably they had given priority to their domestic responsibilities, and did not put enough effort for their own health and to improve their quality of life.

In a previous interventional education study by Aslan et al. lymphedema was identified in 5% of the study group who received education and in 42% of the control group, and the difference was statistically significant ($p<0.001$) [19]. As a result of the study, the authors suggested that the comprehensive nursing, exercises, and measurements of the extremity are effective in preventing lymphedema. Turk et al. found significant difference between the arm circumferences of the trained group (study group) and the not trained one (control group). Consequently, it was concluded that exercises done after MRM are effective in preventing lymphedema development [20]. In the present study, the mean patient age was lower and the number of patients who had an occupation was higher in the group with very low lymphedema development rate at the end of the 6th month than the patient group that has not exercised regularly. Because they followed precisely the recommendations about exercising and exercised regularly, lymphedema development rate remained quite low in this group. Three important factors were identified by Girgis et al. These factors were information and support, body image and self esteem, and health system [21].

While our literature review revealed information about the "things needed to do" in patients with lymphedema, we were unable to find any study regarding the effect of exercise and education on lymphedema prevention or treatment. The postoperative period of the patients that began the present study with lymphedema was 11.72 ± 25.3 months and it was determined that they had not been educated about the necessary exercises. Patient education is the most important factor in preventing lymphedema development.

The results of the present study showed that education and exercise could be effective in the prevention and treatment of lymphedema. Significant regression of lymphedema was observed in patients with minimal lymphedema at the beginning of the study. These results are of great importance concerning the positive effects of patient education and exercises even for patients with an already existing lymphedema. Preventing the progression of lymphedema is quite important in terms of patient quality of life [22].

RT causes constriction of lymph vessels, as well as fibrosis in the irradiated area. Fibrosis inhibits the formation of new lymph vessels in the damaged tissues [23]. RT is one of the most important factors of lymphedema development in patients with axillary dissection. Kissin et al. found the incidence of lymphedema to be 7.4% following axillary dissection, 8.3% following RT alone, and 38.3% in patients with axillary dissection plus RT [24]. Schunemann et al. reported that lymphedema occurred in 22.5, 19.1, and 6.7% of patients following radical mastectomy, MRM, and BCS, respectively. The incidence increased up to 44.5, 28.9, and 10%, respectively, when the different operative treatments were combined with RT [25]. The studies conducted by Johanson et al. and Kisin et al. showed that the number of axillary lymph nodes involved is a risk factor for lymphedema development [24].

In the group of patients who were included in the study with lymphedema and received RT, 45% consisted of those that did not exercise regularly despite being educated. The already existing high risk for lymphedema due to lack of regular exercise was even higher with RT. Lack of regular exercise affected the outcomes of the present study. Although the numbers of removed and positive lymph nodes were higher in 18 patients that began the study with lymphedema as compared to the other groups, no significant difference was identified between the groups.

Using the extremity of the operation side can be

considered as a risk factor that enhances lymphedema development in patients that do not exercise regularly. However, when lymphedema development rates were taken into consideration in the other groups, it was seen that the risk was eliminated with the nurse-assisted education and with regular exercise despite the same rate of using the extremity of the operation side.

Conclusion

The present study showed that lymphedema development is significantly decreased when the patients are well informed about the prevention of lymphedema and exercise regularly. The education provided by nurses about the prevention of lymphedema and exercise improved the patients' quality of life by preventing lymphedema development or providing early intervention in the presence of lymphedema.

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