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Original Article

The effect of evidence-based nursing program of progressive functional exercise of affected limbs on patients with breast cancer-related lymphoedema

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Abstract: Objective: This study explored and analyzed the effect of evidence-based nursing program of progressive exercise on patients with breast cancer-related lymphoedema. Methods: 78 breast cancer patients who underwent breast cancer surgery in our hospital from January to December 2018 were chosen as the control group, and 83 patients enrolled from January to December 2019 with the same condition were selected as the observation group. The control group was given routine nursing measures after surgery, while the observation group was given the evidence-based nursing (EBN) program of progressive functional exercise on affected limbs after breast cancer surgery. The postoperative lymphedema, function recovery of upper limb, score of quality life and the satisfaction of patients to nursing were compared between the two groups. Results: The degree of lymphedema in the observation group was significantly lower than that in the control group 4 weeks after surgery ($P<0.05$). The limb lifting function, abduction function and rotatory function of the observation group were significantly superior to those of the control group ($P<0.05$). The scores of physiological status, emotional status, functional status and additional concerns in the observation group were significantly higher than those in the control group 4 weeks after operation (25.46±3.97 vs. 16.95±4.17; 24.74±3.11 vs. 17.42±2.86; 25.48±1.69 vs. 25.48±1.69; 24.51±4.12 vs. 18.32±2.56) ($P<0.05$). There was no significant difference in social/family status scores between the two groups ($P>0.05$). Additionally, the satisfaction of patients in the observation group to nursing care was also significantly higher than that in control group ($P<0.05$). Conclusion: The evidence-based nursing program of progressive exercise can effectively reduce the lymphedema of patients after breast cancer surgery, improve their postoperative upper limbs function, and effectively promote the quality of life and nursing satisfaction, which is worthy of clinical promotion.

Keywords: Function exercise of progressive limbs, evidence-based nursing program, breast cancer-related lymphoedema

Introduction

Breast cancer is one of the most common malignant tumors in women, and is also the leading cause of cancer deaths in women worldwide. According to results of epidemiological investigations and studies, the incidence and mortality of breast cancer have shown an increasing trend year by year in recent years, along with the younger age of onset [1]. Surgery is the first choice for breast cancer treatment, in which radical mastectomy and modified radical mastectomy are common surgical methods clinically [2]. However, these would cause scar tissue, wound and contracture of soft tissue after breast and axillary surgery, which then affect the blood circulation, lymphatic circulation and muscle activity of the limbs on the operative side. Patients will have varying degrees of upper limb dysfunction postoperatively, including shoulder stiffness, muscle atrophy, and lymphedema [3, 4]. Lymphedema is a common complication after breast cancer surgery. Relevant data showed that the incidence of

postoperative lymphedema in patients with breast cancer is about 10-30%, and there is a self-aggravating vicious cycle in its pathogenesis, which will lead to 3 grade disability in severe cases [5, 6]. Studies suggested that the injury of upper limb lymphalgia is not the only cause of postoperative upper limb edema in patients, but also other important influencing factors, such as insufficient functional exercise of affected limbs, etc. Therefore, it has become the focus of scholars' attention all over the world to effectively prevent upper limb lymphedema after breast cancer surgery [7]. Based on science and the clinical condition of patients, the evidence-based nursing plan works out the best individualized nursing plan by referring to literature and pathology, and is one of the new models in the field of nursing at present [8]. This study explored and analyzed the effect of evidence-based nursing program of progressive limb functional exercise of affected limbs on lymphedema after breast cancer surgery, aiming to further strengthen the functional exercise of patients and reduce the occurrence of lymphedema postoperatively.

Materials and methods

Clinical materials

A total of 78 patients with breast cancer who underwent surgery in our hospital from January to December 2018 were recruited as the control group, and 83 patients with the same condition from January to December 2019 were chosen as the observation group. The study was approved by the ethics committee of our hospital.

Inclusive criteria: (1) all patients underwent surgical treatment of breast cancer and were diagnosed by pathological examination after surgery; (2) patients without mental illness or family history of mental illness; (3) patients who could communicate normally and complete the questionnaire on their own; and (4) patients who voluntarily signed the informed consent forms.

Exclusive criteria: (1) patients with a medical history of upper limb surgery; (2) patients who had upper limb edema preoperatively; (3) patients combined with medical complications, such as diabetes, hypertension or severe cardiopulmonary insufficiency; and (4) patients who were to undergo breast-conserving surgery.

Methods

The patients in the control group were given routine nursing measures after operation, including negative pressure drainage tube nursing, wound nursing, postural nursing and upper limb edema nursing, and instructed to perform routine upper limb functional exercises.

The patients in the observation group were cared by evidence-based nursing program for progressive functional exercise of the affected limbs postoperatively. The details are as follows: (1) Descriptions: identify the best evidence of the starting time, form of education and exercise objectives of early postoperative functional exercise for breast cancer patients after surgery; (2) Summary of the literature search and evidence: the systematic search on published guidelines and systematic reviews in both Chinese and English were conducted. The literature was screened and evaluated by 2 members with systematic training in evidence-based nursing, and graded according to the evidence classification and recommendation of strength standards by the Oxford University Evidence-based Nursing Center. (3) Suggestions: make the conclusions according to the level of evidence, and form the recommendations that combined the clinical professional experience of nursing staff on recommended intensity of evidence as well as the requirements and wishes of patients: ① The early functional exercise should be conducted gradually after surgery, and the intensity of the exercise should not cause pain. ② The exercise should be carried out under the guidance of professional nursing staff. ③ Patients who cannot carry out the active and effective functional exercise on the day of surgery and the first postoperative day should take passive exercises 3-5 minutes/time and 3 times/day under the help of the nurse in charge. ④ Patients were advised to use pillows under the armpit of the affected limb provided that the affected limb could not be well immobilized on the day of surgery. ⑤ The shoulder lifting exercise can be delayed if there was still much effusion in the armpit 3-5 d after surgery. ⑥ Patients could start the active or passive shoulder joint stretching exercise 7-10 d after surgery, and gradually increase the intensity of exercise. ⑦

Table 1. Comparison of clinical data between the two groups

Clinical Data	The Control Group (n = 78)	The Observation Group (n = 83)	t/χ^2	*P*
Age (Years, $\bar{x} \pm sd$)	51.84±8.23	51.05±7.94	0.620	0.536
Education Degree				
High School or Below	37	40	0.009	0.924
College and Above	41	43		
Tumor Location				
Left Side	35	42	0.529	0.467
Right Side	43	41		
Operative Type				
Mastectomy + Biopsy of Sentinel Lymph Node	49	46	0.910	0.340
Modified Radical Mastectomy	29	37		
Additional Treatment				
Chemotherapy	59	65	0.162	0.687
Radiotherapy	52	49	1.002	0.317
Endocrine Therapy	26	31	0.284	0.594
Targeted Therapy	19	24	0.427	0.514

Table 2. Comparison of upper limb lymphedema between the two groups [n (%)]

Group	Number of Cases	No lymphedema	Mild lymphedema	Moderate lymphedema	Severe lymphedema
The Control Group	78	45	18	12	3
The Observation Group	83	65	11	7	0
Z	-		-2.875		
P	-		0.004		

Patients should undergo strictly evaluation before starting shoulder lifting exercises. ⑧ Patients started with 3 min of the functional exercises, and gradually extended to 5-10 min each time. Extended the duration to 20-30 min each time and 2-3 times a day for performing the large joints exercises. ⑨ Since early postoperative functional exercise may increase the volume and time of drainage, the exercise intensity should be adjusted accordingly to the patients' conditions.

The functional exercise program for breast cancer patients after surgery was formulated in combination based on above recommendations. The specific contents are as follows: ① Patients who cannot carry out the active and effective functional exercise on the day of surgery and the first postoperative day should take passive exercises 3-5 min/time and 3 times/day through the nurse in charge. ② For patients whose limbs cannot be properly immobilized on the day of surgery, when returning to the ward, pillows should be placed under armpits to make the elbow joints higher than the shoulders to facilitate blood circulation and reduce local swelling of the affected limbs. ③ If the patient has more axillary effusion or the drainage volume exceeds 60 ml/24 h 3-5 d postoperatively, the shoulder lifting exercise should be postponed, and the activity of flexion and extension should be reduced. ④ 7 d after the surgery and before shoulder lifting exercise, the degree of skin traction during shoulder movement should be measured, and the incision should be evaluated at the same time to determine that the patient's physical condition conforms to his individualized exercise plan. ⑤ If the patient has a dehiscence of skin flap before performing shoulder abduction exercise, the exercise needs to be suspended. In addition, during exercising, the patient's shoulder joint should be braked, and the patient should be informed to perform gradual exercise. ⑥ If the patient is unable to retain well during the interval of shoulder lifting and abduction, a sling should

Table 3. Comparison of limb lifting function between the two groups [n (%)]

Group	Number of Cases	Good	General	Poor
The Control Group	78	60	15	3
The Observation Group	83	75	8	0
Z	-		-2.368	
P	-		0.018	

Table 4. Comparison of limb abduction function between the two groups [n (%)]

Group	Number of Cases	Good	General	Poor
The Control Group	78	50	21	7
The Observation Group	83	71	11	1
Z	-		-3.242	
P	-		0.001	

Table 5. Comparison of limb rotatory function between the two groups [n (%)]

Group	Number of Cases	Good	General	Poor
The Control Group	78	53	19	6
The Observation Group	83	68	13	2
Z	-		-2.122	
P	-		0.034	

be used to support the affected limb. When assisting the patient, only the healthy side can be assisted to prevent the sliding of the axillary flap from affecting wound healing. ⑦ From 9 d after surgery, patients can gradually start shoulder relaxation exercises, upper arm exercises, neck exercises, body rotation exercises, and shoulder lifting exercises according to their recovery situation.

Observation of Indexes

Evaluation of lymphedema 4 weeks postoperatively in both groups. Mild lymphedema: the circumference of the affected upper limb was less than 3 cm thicker than that of the healthy side, with most of which limited to the upper arm; Moderate lymphedema: the circumference of the affected upper limb was 3-6 cm thicker than that of the healthy side, which affected the patient's whole upper limb, including the forearm and the back of the hand. Severe lymphedema: the circumference of the affected upper limb was 6 cm thicker than the healthy side, and the skin was hard and tough. The edema affected the entire upper limbs including the fingers, and the patient's whole upper arm and shoulder joints were severely restricted.

Evaluation of patient's upper limb function recovery through shoulder joint mobility 4 weeks after surgery. Two nurses were assigned to measure the angles of the patients' shoulder joint flexion, extension, adduction, abduction, internal rotation, and external rotation by the same goniometer. The patients did not feel discomfort or pain during the measurement. Excellent: the shoulder joint could resist certain resistance, but lower than that of healthy people; Good: able to resist body weight, and the joints could actively move to the normal range, but failed to move against resistance; Poor: after excluding the weight of limbs, the joints could be actively moved by muscle contraction.

Evaluation of life quality by measurement scale in both groups 4 weeks after surgery. The scale, which contained 36 items and 5 dimensions including physiological status, emotional status, functional status, social/family status and additional attention, was designed for measuring the quality of life of patients with breast cancer. The higher score indicated the better life quality of the patient.

Comparison of nursing satisfaction by self-designed nursing satisfaction questionnaire 4 weeks after surgery. The questionnaire consisted of 20 questions including nursing profession, nursing staff attitude, functional exercise satisfaction, postoperative recovery satisfaction, etc. The questionnaire was scored by 0-5 points with a total score of 100 points, and the higher scores indicated the higher the nursing satisfaction. Those with a total score of 90-100 were very satisfied, the total score of 80-89 were satisfied, and the total score of less than 80 were dissatisfied. The satisfaction rate = (very satisfied + satisfied)/the total number of cases in the group ×100%.

Statistical analysis

Data statistics and analysis were conducted using SPSS25.0. The measurement was expressed by the mean ± standard deviation (x

Table 6. Comparison of the quality of life between the two groups (score, $\bar{x}$ ± sd)

Group	Number of Cases	Physiological Status	Emotional Status	Functional Status	Social/family Status	Additional Concerns
The Control Group	78	16.95±4.17	17.42±2.86	19.80±2.65	23.18±2.37	18.32±2.56
The Observation Group	83	25.46±3.97	24.74±3.11	25.48±1.69	23.75±3.31	24.51±4.12
t	-	13.265	15.516	16.315	1.249	11.365
P	-	0.000	0.000	0.000	0.213	0.000

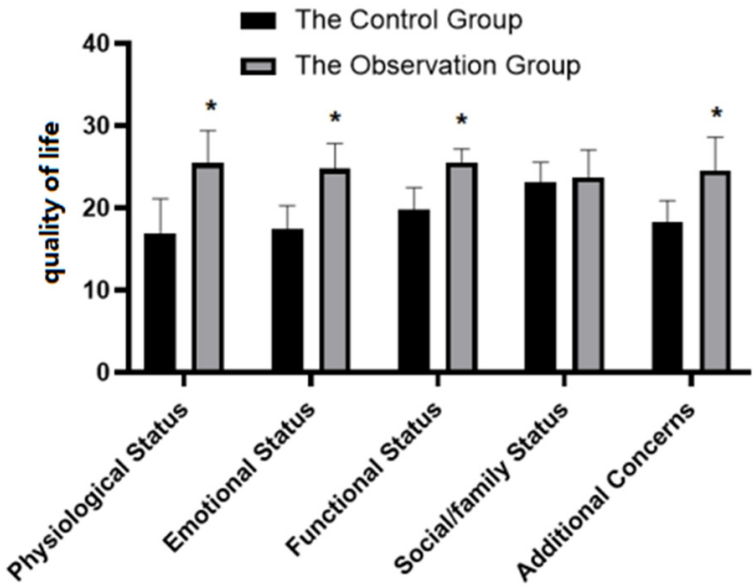

Figure 1. Comparison of quality of life between the two groups.

± sd), and compared by X^2 test; the enumeration data were expressed by percentage and compared by X^2 test. Statistical significance was accepted by P<0.05.

Results

Comparison of clinical data

The difference in clinical data between the two groups was statistically insignificant (P>0.05), as shown in **Table 1**.

Comparison of upper limb lymphedema

The degree of upper limb lymphedema in the observation group was significantly milder than that in the control group 4 weeks after operation (P<0.05), as shown in **Table 2**.

Comparison of upper limb function between the two groups

The lifting function, abduction function and rotatory function of the affected limb in the observation group were significantly better than those in the control group (P<0.05), as shown in **Tables 3**-**5**.

Comparison of quality of life between the two groups

The scores of physiological status, emotional status, functional status and additional concerns in the observation group were significantly higher than those in the control group 4 weeks after operation (25.46±3.97 vs. 16.95±4.17; 24.74±3.11 vs. 17.42±2.86; 25.48±1.69 vs. 25.48±1.69; 24.51±4.12 vs. 18.32±2.56) (P<0.05). There was no significant difference in social/family status scores between the two groups (P>0.05), as shown in **Table 6** and **Figure 1**.

Comparison of nursing satisfaction between the two groups

The satisfaction with nursing care of patients in the observation group was significantly higher than that in the control group (P<0.05), as shown in **Table 7**.

Discussion

Emphasizing on personal experience, the traditional nursing is based on theory and guidance of clinical experience. Evidence-based nursing, however, is a new comprehensive nursing mode focusing on scientific theoretical basis and combining clinical nursing experience with individual needs of patients to achieve the desired nursing effect [9, 10]. Different from the traditional methods that only focus on treating and nursing of patients' diseases, the evidence-based nursing adopts nursing care that follows the evidence and standards, and fully applies

Table 7. Comparison of nursing satisfaction between the two groups [n (%)]

Group	Number of Cases	Very Satisfied	Satisfied	Dissatisfied	Satisfaction Rate (%)
The Control Group	78	47 (60.26)	19 (24.36)	12 (15.38)	84.46
The Observation Group	83	67 (80.72)	13 (15.66)	4 (4.82)	95.18
χ^2	-	-	-	-	5.015
P	-	-	-	-	0.025

human cares to the whole process to effectively avoid the blind and subjective nursing work [11, 12].

Lymphedema is a serious complication after breast cancer surgery. The postoperative limb lymphedema and pain will seriously affect the normal life of the patients and their quality of life [13, 14]. The main cause of lymphedema after breast cancer surgery is the ligation of axillary vein, which affects the backflow of blood. In addition, the surgical lymph node dissection leads to unsmooth lymphatic channels, coupled with poor blood and lymphatic return, eventually causing the concentration of tissue fluid in the interstitial space and lymphedema [15, 16]. At the same time, it should be noted that the surgical methods, postoperative infection and radiotherapy, the breast tumor location, axillary effusion, and the age and weight of patient can also be the factors that cause lymphedema [17, 18].

Adopting evidence-based nursing program of progressive exercise in patients with breast cancer-related lymphoedema, this study established the evidence-based nursing team, acquired evidence-based support for postoperative complications of breast cancer, formulated caring plan and implemented interventions to effectively improve the clinical effect and survival quality of patients [19, 20]. In clinical practice, nursing staff can effectively improve the theoretical skills and accumulate clinical nursing experience by discovering, proposing, analyzing and consulting materials and literature and formulating specific measures [21, 22].

According to the results of this study, the degree of upper limb lymphedema in the observation group was significantly lower than that of the control group 4 weeks after surgery; the lifting function, abduction function and rotatory function of the affected limb of the observation group were significantly better than those of the control group; the postoperative physiological, emotional, functional, and additional attention scores of the observation group were significantly higher than those of the control group; and the satisfaction of patients to nursing in the observation group was significantly higher than that in the control group. Similar to the results reported by other scholars [23, 24], the evidence-based nursing program of progressive limb functional exercise, compared with the traditional nursing mode, can effectively reduce the postoperative lymphedema of upper limbs, and improve upper limb functions, thus contributing to the improvement of patients' quality of life and nursing satisfaction. Compared with the traditional experiential nursing rehabilitation, the evidence-based nursing mode is more scientific by consulting literature, clarifying the notices that patients need to pay attention to during postoperative exercise, and the corresponding solutions to better help them with bodily rehabilitation and prevention of postoperative lymphedema. After further analysis to the mechanism of evidence-based nursing program of progressive limb function exercise on patients, we consider that it is related to standardized and scientific exercise that promoted the return of lymphatic tissue fluid. In addition, the progressive and gradual exercise based on patient's individual condition improves the upper limb function, which is correlated with the promotion of clinical prognosis.

However, it is necessary to further expand the sample size in the follow-up studies due to the small sample size and the absence of long-term follow-up studies included in this study. Meanwhile, long-term rehabilitation exercise should be followed up to analyze the influence of evidence-based nursing program of progressive limb function exercise on long-term rehabilitation of breast cancer patients.

In conclusion, the evidence-based nursing program of progressive limb function exercise can effectively reduce lymphedema in patients with

breast cancer after surgery, improve their upper limb function, and increase the quality of life and nursing satisfaction, which is worthy of clinical promotion.

Disclosure of conflict of interest

None.

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