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Research Article

Factors Relevant to Upper Extremity Functions and Health related Quality of Life in Women after Breast Cancer Surgery

Chie Furukawa[1,2]*, Takasi Morimoto[3], Takashi Nomura[3] and Ikuharu Morioka[2]

1Department of Nursing, Yao Municipal Hospital, Japan
2Graduate School of Health and Science, Wakayama Medical University, Japan
3Department of Breast Surgery, Yao Municipal Hospital, Japan

***Corresponding author**
Chie Furukawa, Department of Nursing, Yao Municipal Hospital, 8-89-1107 Hachiman-cho Kishiwada Osaka 596-0023, Japan, Tel: 819059705134; Email: furukawachie@yahoo.co.jp

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Keywords

- Breast cancer
- Health-related quality of life
- Upper extremity function
- Hayashi's qualification theory

Abstract

Purpose: The purpose of this study is to clarify the changes in the Upper Extremity Function (UEF) disabilities and Health-related quality of life (HRQOL), and their relevant factors among women receiving breast cancer surgery.

Methods: The study sample comprised 87 participants who had the breast cancer surgery at a municipal hospital in Osaka, Japan. Data were collected via interview and completed at 6 measuring times; pre-operation, before hospital discharge, 4weeks, 12weeks, 150days and 1year after surgery. The UEF disabilities were evaluated by using Disabilities of the Arm Shoulder and Hand (DASH), the Japanese version. HRQOL was assessed using a Quality of Life Questionnaire for Cancer Patients treated with Anticancer Drugs for Breast Cancer.

Results: The average age was 60.4 years. DASH scores moderately increased after discharge from the hospital, but lower scores were relevant to living with family, axillary lymph nodes dissection and postoperative chemotherapy. While HRQOL scores decreased until 12 weeks after surgery, and their changes were relevant to DASH scores, affected side, and operation method and hormone therapy.

Conclusions: This study shows the points that nurses in outpatient clinics have to pay conscious attention to prevent the UEF disabilities and to increase the HRQOL.

INTRODUCTION

Recently, the number of Japanese women suffering from breast cancer is rising because of their diversified lifestyle [1]. Treatments for breast cancer have been improved remarkably, and have changed to custom-made medicine considering individual quality of life [2]. Breast-conserving surgery is the mainstream of the operative procedure for breast cancer. Axillary lymph nodes (ALNs) are not removed in the case of negative sentinel lymph biopsy [3,4]. Surgery for breast cancer is now conducted in outpatient clinics. It is then important to establish effective system of nursing intervention in the outpatient clinics.

One of the complications of breast cancer surgery is disabilities of upper extremity function (UEF) [5]. Most UEF disabilities after breast cancer surgery are caused by ALNs dissection impairing the brachiointercostal nerve and/or radiation therapy to the ALNs involving normal cells [6,7]. Even if the patient receiving breast cancer surgery suffers from the UEF disabilities, postoperative UEF disabilities themselves are not life-threatening condition, and/or do not need the treatment in a hospital [8]. Medical staffs therefore express a negative attitude for them in many cases [9], although the UEF disabilities may lead to the decreased quality of life [10]. For this reason, there are few reports for nurses in outpatient clinics to aggressively respond to improving the postoperative UEF disabilities. Moreover, there is little information what factors affect the postoperative UEF disabilities [11] and quality of life in such patients.

The aim of this study is to clarify the changes in the UEF

disabilities and quality of life, and their relevant factors among women receiving breast cancer surgery in order to obtain necessary information for daily life instructions and to enable nurses in outpatient clinics to provide better nursing care to such patients.

METHOD

Subjects

The participants were all people who had received the breast cancer surgery at the hospital from June 2010 to September 2011. The subjective hospital was a municipal hospital in Osaka, Japan. This hospital is an acute hospital and roles as a center in the region. The department of breast surgery specializes the cancer treatment.

There were 89 patients and all signed informed consent forms.

In this study, 2 subjects who had difficulties in answering the questions due to physical or psychological reasons were excluded from the data analysis. Thus, a total of 87 participants were studied (effective response 97.8%).

Ethical considerations

The target population comprised persons with breast cancer who had agreed to have a surgery at the hospital and whose operation day had been scheduled. First, author in this paper clearly stated the aims and methods of the study, protection of the personal information and answers, which participation was voluntary, that there was no disadvantage in not participating, data usage limits of the survey, and absolute confidentiality of the individual. The participants who agreed with our survey gave the informed consent until the surgery. Study procedures were approved by the Ethics Committee of Yao Municipal Hospital.

Methods

The participants were interviewed to make the database of this study. Data were completed at 6 measuring times. They were: (1) the previous day of surgery (Pre), (2) on the discharge day (D), (3) 4 weeks after surgery (4W), (4) 12 weeks after surgery (12W), (5) 150 days (±7days) after surgery (150D) and (6) 1 year (±1 month) after surgery (1Y). Each interview was usually no more than 30 munities. Data collection occurred from July 2010 to October 2012.

The questionnaires basically included questions about gender, age (initial measuring time), job status, height and body weight (initial measuring time), living conditions, Tumor Nodes Metastases (TNM) stage for breast cancer, operation method, whether or not the ALNs dissection was performed during surgery, whether or not the affected side is same as the dominant arm, whether or not radiotherapy, chemotherapy and hormone therapy were received, the UEF disabilities, HRQOL etc.

The UEF disabilities were evaluated by using Disabilities of the Arm, Shoulder and Hand (DASH), the Japanese (JSSH) version [12,13]. DASH consists of 30 questions and is often used to evaluate the UEF disabilities. Higher scores indicate worse UEFs.

The quality of life was estimated as Health-related quality of life (HRQOL) in this study. Quality of Life Questionnaire for Cancer Patients treated with Anticancer Drugs for Breast Cancer (QOL-ACD-B, Version 1.0) [14,15] was used in the interview to assess HRQOL. This has 21 question items. Higher scores indicate better HRQOL. The results of DASH were converted into scores according to the scoring instruction [12]. Personal scores of the DASH were then subtracted from 100 so that high scores show the better UEFs. The results of HRQOL were also converted into scores following the scoring instruction [14].

Statistical analysis

The body mass index (BMI) was calculated from height and weight at initial measuring time.

Analysis of variance was used to compare the averages at 6 measuring times for the purpose of evaluating the temporal changes in data. To identify factors relevant to DASH and HRQOL scores, we adopted Hayashi's qualification theory as a technique [16-18]. We used multiple linear regression analysis (stepwise method) to predict the relationship between a response value (DASH and HRQOL) and categorical value (items). The stepwise method selects the variables statistically significant associated with the dependent variable. The score is used to assess the weight of the variable for the dependent variable. We assigned the changes in the scores of the DASH and the QOL-ACD-B to dependent variables, and items for demographic and clinical characteristics of participants to independent variables. Age: less than 60, employed, BMI: over 25, living with family, TNM Stage: IIA and over, breast conserving surgery, ALNs dissection, the affect side same as the dominant arm, pre-operative radiotherapy (RTD), postoperative radiotherapy (RT4W: radiotherapy after surgery until 4 weeks; RT12W: radiotherapy between 4 weeks and 12 weeks after surgery; RT150D: radiotherapy between 12 weeks and 150 days after surgery; RT1Y: radiotherapy between 150 days and 1 year after surgery), pre-operative chemotherapy (CTD), postoperative chemotherapy (CT4W: chemotherapy after surgery until 4 weeks; CT12W: chemotherapy between 4 weeks and 12 weeks after surgery; CT150D: chemotherapy between 12 weeks and 150 days after surgery; CT1Y: chemotherapy between 150 days and 1 year after surgery), or hormone therapy (HTD: pre-operative hormone therapy; HT4W: hormone therapy after surgery until 4weeks; HT12W: hormone therapy between 4 weeks and 12 weeks after surgery; HT150D: hormone therapy between 12 weeks and 150 days after surgery; HT1Y: hormone therapy between 150 days and 1 year after surgery), were allocated one point. The other conditions were set 0 point. When we assigned the changes in the scores of the QOL-ACD-B to the dependent variable, the change in the scores of the DASH from the pre-operation (at D: DASH(Pre-D), at 4W: DASH(Pre-4W), at 12W: DASH(Pre-12W), at 150D: DASH(Pre-150D) and at 1Y: DASH(Pre-1Y)) was included as the independent variable to clarify the relationship between the changes in the scores of the DASH and the QOL-ACD-B. Table 1 show the independent variables used for multiple linear regression analysis to select the variables statistically significant associated with the dependent variable.

The software Statistical Package for the Statistical Package for the Social Sciences (SPSS) 19.0 (SPSS Japan) was used for

Table 1: Independent variables used for multiple linear regression analysis to select the variables statistically significant associated with the dependent variable.

	Changes between				
Variables	**Pre-D**	**Pre-4W**	**Pre-12W**	**Pre-150D**	**Pre-1Y**
Age (<60)	○	○	○	○	○
Employed	○	○	○	○	○
BMI (>25)	○	○	○	○	○
Living with family	○	○	○	○	○
TNM Stage (IIA+)	○	○	○	○	○
ALNs dissection	○	○	○	○	○
Operation Method	○	○	○	○	○
Affected side same as dominant arm	○	○	○	○	○
RTD*	-	-	-	-	-
RT4W*		-	-	-	-
RT12W			○	○	○
RT150D				○	○
RT1Y					○
CTD	○	○	○	○	○
CT4W*		-	-	-	-
CT12W			○	○	○
CT150D				○	○
CT1Y					○
HTD*	-	-	-	-	-
HT4W*		-	-	-	-
HT12W			○	○	○
HT150D				○	○
HT1Y					○
DASH(Pre-D)**	○	○	○	○	○
DASH(Pre-4W)**		○	○	○	○
DASH(Pre-12W)**			○	○	○
DASH(Pre-150D)**				○	○
DASH(Pre-1Y)**					○

*This variable was not used because no subject was treated.
**This variable was used only as the variable for estimating the relationship to HRQOL.
Abbreviation: RT: Radio Therapy, CT: Chemo Therapy, HT: Hormone Therapy, DASH: Disabilities of the Arm, Shoulder and Hand.

statistical analyses. P-values less than 0.05 were considered statistically significant.

RESULTS

Table 2 summarizes demographic and clinical characteristics of participants. All participants were females. The average age of the initial measuring time was 60.4 years. The proportion of participants was highest in their 60's. Ones at less than 60 were 42.6%. As regards their job status, 26.4% of the participants were employed. Participants with BMI over 25 were 34.4%. Eighty-four percent of participants were living with family. For the TNM stage, 17.2% of the participants were at advanced stages; stage IIB, IIIA, IIIB and over. For the operation method, 70.1 % of the participants received the breast-conserving surgery and 19.5 % of them received ALNs dissection. That the affected side was same as the dominant arm was 51.7 %.

Participants who received radiotherapy were 60.9%. Many of them received it between 4 weeks and 150 days after surgery. Those who received chemotherapy were 44.8%. Many of them received it between 4 weeks and 150 days after surgery. Those who received hormone therapy were 80.5%. Many of them received it between 12 weeks and 1 year after surgery.

The changes in the scores of DASH and QOL-ACD-B were shown in Figure 1. The DASH scores significantly decreased at D, and then increased at 4W. The scores at 1Y recovered to 87.9% of the initial score at Pre. The scores were significantly lower at the each measuring time (D, 4W, 12W and 150D) compared with the one at Pre. The one at 1Y was significantly higher than the one at D.

Table 2: Demographic and clinical characteristics of participants.

Characteristics		N(%) (n=87)
Gender	Females	87(100 %)
Age, year	Average ± standard deviation	60.4 ± 12.4
	30-39 40-49 50-59 60-69 70-79 80 or over	3(3.4 %) 17(19.6 %) 17(19.6%) 31 (35.6 %) 14(16.1%) 5(5.7%)
Job status	Not employed Part-time job Full-time job	64(73.6 %) 10(11.5 %) 13(14.9 %)
BMI, kg/m^2	<22 22-25 >25	31(35.6 %) 26(29.9 %) 30(34.4 %)
Living conditions	Living with family Living alone	73(83.9 %) 14(16.1%)
TNM stage	0 I IIA IIB IIIA IIIB and over	2(2.3%) 49(56.3 %) 21(24.1%) 3(3.4 %) 8(9.2 %) 4(4.6 %)
Operation Method	Breast-conserving surgery Mastectomy	61(70.1 %) 26(29.9%)
ALNs dissection	Yes No	17(19.5 %) 70(80.5 %)
Affected side	Dominant arm side Opposite arm side	45(51.7 %) 42(48.3 %)
Radiotherapy	Yes (received ratio)	53(60.9 %)
	D 4W 12W 150D 1Y	0 0 26(29.9 %) 38(43.7 %) 18(20.7 %)
Chemotherapy	Yes (received ratio)	39(44.8%)
	D 4W 12W 150D 1Y	9(10.3 %) 0 27(31.0 %) 34(39.1 %) 19(21.8 %)
Hormone therapy	Yes (received ratio)	70(80.5%)
	D 4W 12W 150D 1Y	0 0 58(66.7 %) 69(79.3 %) 70(80.5 %)

The changes in the scores of QOL-ACD-B were different from ones in the scores of DASH (Figure 1). The QOL-ACD-B scores continued to decrease until 12W, but moderately recovered after that. The scores were significantly lower at the each measuring time (D, 4W, 12W, 150D and 1Y) compared with the one at Pre.

We therefore intend to clarify the factors related to the change in the scores from the one at Pre. The values subtracting the scores at Pre from the ones at each measuring time (D, 4W, 12W, 150D and 1Y) were assigned to the dependent variables in the multiple linear regression analysis. (Table 3) shows the results. As to the change in scores of DASH at D, the living with family was the variable statistically significant associated with the change. The weight of the variable (Estimate) was negative. This means that the persons living with family had the more decreased values. In respect of the change in scores of DASH at 4W, the administration of ALNs dissection was the variable significantly associated with the change. In regard to the change in scores of DASH at 12W and 150D, chemotherapy between 4 weeks and 12 weeks after surgery was the variable significantly associated with the change. There is no significantly associated variable at the 1Y.

As to the change in scores of QOL-ACD-B at D, the change in DASH score at D, namely DASH Pre-D was the variable statistically significant associated with the change. The weight of the variable (Estimate) was positive. This means that the persons whose score of DASH was higher had the more increased values. In respect of the change in scores of QOL-ACD-B at 4W, it was the variable significantly associated with the change that the affected side was same as the dominant arm. In regard to the change in scores of QOL-ACD-B at 12W, breast conserving surgery was significantly associated with the change. In the case of the change in scores of QOL-ACD-B at 150W, DASH (Pre-12W) was the variable significantly associated with the change. In regard to the change in scores of QOL-ACD-B at the 1Y, DASH (Pre-1Y) and hormone therapy between 150 days and 1 year after surgery were significantly associated with the change.

DISCUSSION

The DASH scores declined at D in our study. The living with

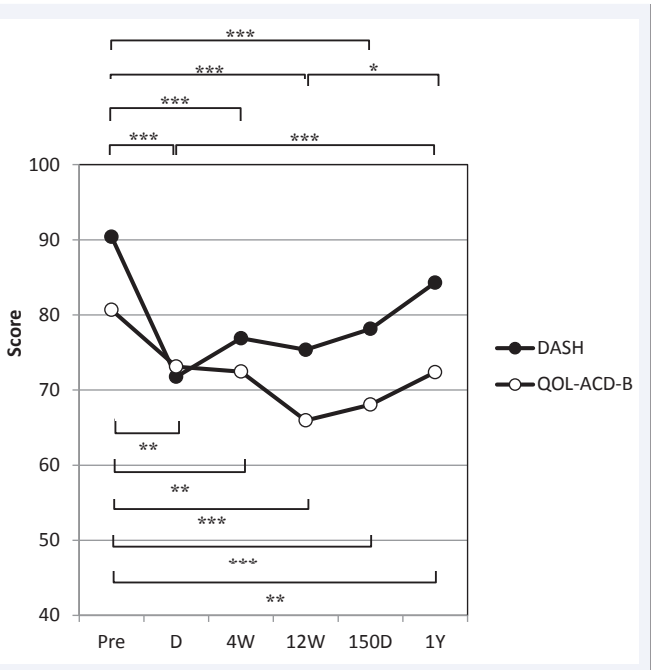

Figure 1 Scores of DASH and QOL-ACD-B HRQOL of subjects
Abbreviation: DASH: Disabilities of the Arm, Shoulder and Hand, QOL-ACD-B: Quality of Life Questionnaire for Cancer Patients treated with Anticancer Drugs for Breast Cancer.
Pre, before the previous day of surgery; D, on the discharge day; 4W, 4weeks; 12W, 12weeks; 150D, 150days and 1Y, 1 year after surgery.
* p<0.05,** p<0.01,*** p<0.001

Table 3: Results of the multiple regression analysis.

DASH					
Changes between	**Variables**	**Estimate**	**95%CI**	**T**	**P**
Pre-D	Living with family	-13.830	(-22.264,-5.397)	-3.261	0.002
Pre-4W	ALNs dissection	-12.907	(-20.151,-5.663)	-3.543	0.001
Pre-12W	CT12W	-9.694	(-16.596,-2.791)	-2.792	0.006
Pre-150D	CT12W	-9.305	(-17.487,-1.123)	-2.261	0.026
Pre-1Y	-	-	-	-	-
QOL					
Changes between	Variables	Estimate	95%CI	T	P
Pre-D	DASH(Pre-D)	0.189	(0.017,0.362)	2.182	0.032
Pre-4W	Affected side same as dominant arm	7.576	(1.026,14.126)	2.300	0.024
Pre-12W	Breast-conserving surgery	-11.592	(-21.007,-2.177)	2.448	0.016
Pre-150D	DASH(Pre-12W)	0.320	(0.084,0.556)	2.698	0.008
Pre-1Y	DASH(Pre-1Y) HT1Y	0.439 11.080	(0.189,0.689) (1.746,20.414)	3.496 2.361	0.001 0.021

Abbreviation: Pre, before the previous day of surgery; D, on the discharge day; 4W, 4-week; 12W, 12-week; 150D, 150-day (±7-day); and 1Y, 1 year (±1-month) after surgery.
CT: Chemotherapy, HT: Hormone Therapy, DASH: Disabilities of the Arm, Shoulder and Hand, CI: Confidence Interval.
t and p are for testing the null hypothesis that the parameter is zero.

family was significantly associated with the change of DASH scores at D. It's negative estimate value shows the effect to decrease the DASH scores at D.Women living with family show less muscle strength compared with those living alone, and appears negative attitude about postoperative rehabilitation for affected arm [19] because they do not have to deal with daily life by themselves at home. Corresponding these facts, the living with family may cause the lower DASH scores at D. When patients suffering from breast cancer have the ALN's dissection at our hospital, they are necessary to receive rehabilitation. Some of such patients get coaching from physical therapists about exercising the arm at the same side as the operation. Since the coaching is focused on the issues concerning exercise training at the hospital, the patients are not instructed about daily life after discharge mainly due to shortening of hospital staying [20]. Although the DASH scores increased at 4W, patients who had the ALN's dissection seemed to have the lower DASH scores at 4W in this study, because the ALN's dissection was significantly and negatively associated with the change in DASH scores at 4W. This may be resulted from that they have to start self-rehabilitation in their daily life after going back to their home.

The period between 12W and 1Y is the time to undergo additional therapy, such as radiotherapy, chemotherapy and hormone therapy. In this period the DASH scores continued to increase in this study. Nihei [21] reported that the UEF disabilities of arm at the affected side would recover to the acceptable degree of the daily life regardless of the operation method after one year. The DASH scores in this study recovered to 87.9% after 1Y. This corresponded to the Nihei's report. Our study showed that the DASH scores at 12W and 150D seemed to be lower when the patient underwent chemotherapy, because CT 12W was significantly and negatively associated with the change of DASH scores at 12W and 150D. These lower scores may result from adverse effects of treatment such as foot hand syndrome, and vacuities related to chemotherapy [22].

The HRQOL scores declined at D in our study. The change in the HRQOL score at D was solely and positively associated with the change in DASH scores at D. This implies that HRQOL at D is affected mainly by UEF disabilities: when the UEF disabilities would be little, the decrease of HRQOL would little. This corresponded to the earlier report [23].

The HRQOL scores did not increase at 4W in this study. The affected side same as the dominant hand was significantly and associated with the change in HRQOL scores at 4W. We assumed that HRQOL was decreased more if the affected side was same as the dominant hand, but increased contrary to our assumption. At 4 weeks after surgery, using the dominant hand in the daily life may become the rehabilitation of the affected arm [24] and then makes the HRQOL higher.

The HRQOL scores continued to decrease until 12W in this study. At this time, breast-conserving surgery was the significantly and negatively associated variable. In the period between 4W and 12W, most participants who had breast-conserving surgery experience breast scarring around the surgical wound and their breast begins to change its shape [25]. Those who had an experience of these events would have lower HRQOL in this period.

The HRQOL scores moderately recovered after 12W, but did not reach to the scores at Pre even at 1Y in this study. According to Sato's study [26], HRQOL for women with breast cancer was holistically lower until one year after surgery. The results in this study corresponded to his results. The changes in the HRQOL score at 150D were significantly and positively associated with the change in DASH (Pre-12W) and the ones at 1Y were significantly and positively associated with the change in DASH

(Pre-1Y). The recovered UEF disability may enable the subjects have their daily life more easily, and then their HRQOL will increase in this period.

Hormone therapy is often used for the subjects who have finished the radiotherapy and/or chemotherapy, is seldom used for them under such therapies. This may show that this therapy was done with the subjects relatively in good condition. This fact may result in that this therapy had the positive association with the HRQOL scores at 1Y.

The results in our study clinically implicate the points that nurses in outpatient clinics have to pay conscious attention to. In order to prevent UEF disabilities, nurses should make a carefully question about participant's family member, when they are admitted to a hospital. Nurses should encourage the rehabilitation of UEFs especially, when the patient received ALN's dissection. Nurses need to pay heed to the side effects of chemotherapy after 4 weeks after surgery. Meanwhile, nurses need to devote undivided attention to UEFs, because they are one of strong contributors to HRQOL after surgery. Specially, nurses need to consider the affected side and operation method at the discharge from the hospital to prevent decreasing the HRQOL.

LIMITATION AND CONCLUSION

In this study, the causality is not sufficiently estimated, although we took the occurrence time of the events into consideration. Our samples comprised 87 participants from a single hospital; therefore, we cannot conclude that the sample represent all patients who had received breast cancer surgery. In addition, participants were limited to persons who sought services from an outpatient clinic.

In conclusions, we evaluated DASH scores and HRQOL scores with 87 participants who had breast cancer surgery until one year after surgery. DASH scores moderately increased after discharge from the hospital, but lower scores were relevant to living with family, ALNs dissension and postoperative chemotherapy. HRQOL scores decreased until 12 weeks after surgery. Their changes were relevant to DASH scores, affected side, operation method, and hormone therapy. Nurses at outpatient clinics have to consider these points to prevent the UEF disabilities and to increase the HRQOL.

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