LYMPHOEDEMA RESEARCH AND PRACTICE, Vol. 4, No. 1, pp13～24, 2016

Research

Risk Factors for Lymphoedema in Breast Cancer Survivors

Emiko Kimura

Aomori University of Health and Welfare Nursing Department

ABSTRACT

OBJECTIVE：To clarify the risk factors for lymphedema（LE）in postoperative breast cancer patients.

METHODS：This cross-sectional study involved postoperative breast cancer patients（age, ≥20 years）living in Tohoku and Hokkaido, Japan, who were not undergoing adjuvant therapy at the time of the study. Between October 2013 and June 2014, patients with and without LE completed self-administered questionnaires contained patient characteristics, therapeutic regimens, postoperative complications, discharge instructions, concern regarding the affected limb, and the Type A Behavior Pattern Scale.

Descriptive statistics were applied to all variables. After performing univariate analysis with the presence or absence of LE as the dependent variable, significant independent variables were subjected to multiple logistic regression to determine the odds ratios（ORs）.

RESULTS：A total of 318 of the 472 questionnaires were returned. Numbers of patients at each LE stage were as follows：0, n=225（70.8%）；I, n=36（11.3%）；IIa, n=47（14.8%）；IIb, n=9（2.8%）；and III, n=1（0.3%）. Mean LE onset was at postoperative 47.2 months（SD 69.3）. Related ORs determined using forced entry were as follows：Axilla lymph node dissection（ALND）, 12.1（p=0.002）；cellulitis, 7.3（p=0.001）；postoperative difficulty moving arm, 2.3（p=0.031）；changes around the time of swelling onset, 2.1（p=0.035）；and being too busy to worry about the affected limb, 0.5（p=0.030）. The regression coefficient（B value）for being too busy to worry about the affected limb was −0.8, indicating that this was a factor related to prevention rather than onset.

DISCUSSION：The present findings suggest for prevention of LE onset, including：ongoing follow-up even after LE onset, detailed information collection regarding parameters such as physical, mental, and lifestyle changes around the time of swelling onset, and encouraging appropriate movement of the affected limb without excessive worry.

KEY WORDS：lymphoedema, breast cancer, risk factors

Corresponding author：Emiko Kimura
Aomori University of Health and Welfare Nursing Department
58-1, Mase, Hamadate, Aomori city
Manuscript received：21 September 2016
DOI：10.15010/LRAP.2016.9.21.06

Introduction

Lymphoedema [LE] occurs after the treatment of cancer. The incidence of lymphoedema after postoperative breast cancer patients was 10% and 25% in gynecologic cancer[1]. In previous study[2], it was noted onset of lymphoedema within 3 years after the operation. Outpatient LE care reduces limb circumference, many patients still experience exacerbated edema or recurrent inflammation even with ongoing care. It is necessary to identify risk factors for not only LE onset but also progression to stage II. Some LE risk factors were identified by a literature review[3]. There were LE risk factors related to patient characteristics (including body mass index [BMI], age, and airplane travel), treatment (including years of follow-up, medical history, axillary lymph node dissection [ALND], type of surgery, radiotherapy, chemotherapy, and anti-hormone therapy), and postoperative symptoms (including infection, sensory impairment, pain, and limited range of motion [ROM]).

No studies in Japan have investigated risk factors concerning lifestyle and treatment after breast cancer surgery. An interview study of factors related to LE onset in postoperative breast cancer patients in Japan[4] supported the findings regarding patient characteristics and treatment risk factors reported in overseas literature. The patients in this study had varied lifestyle habits and regional cultures, particularly with regard to activity-related factors such as use of the arms and hands, women's roles, assisting with local events, and economic issues, and psychological factors such as the will to not develop LE, type A behavior patterns, and not worrying about the affected limb. The state of LE instruction also varied. However, these findings suggested that risk factors related to regions and lifestyle habits except treatment remained to be clarified for LE in postoperative breast cancer patients in Japan, and no studies to date have investigated exacerbating factors.

The purposes of this study were to examine the risk factor [RF] for developing and deteriorating factors of LE in breast cancer survivors, and to describe the how activity level and developing and deteriorating behavior influence of daily life.

The findings will hopefully enable prediction of lifestyles that may cause LE developing (onset) and thus be useful for preventing onset and exacerbation. The risk factors for LE onset are presented in this report.

Methods

1. Study design

Retrospective, cross-sectional study was used.

2. Subjects

1) Selection criteria

The subjects were female postoperative breast cancer patients (age, ≥20 years) living in Tohoku and Hokkaido, Japan. Inclusion and exclusion criteria were as follows.

Inclusion criteria :

a) Able to communicate, understand questionnaire content, and complete the questionnaire by hand.

b) Able to understand the study objective and significance and voluntarily decide to participate or withdraw.

2) Exclusion criteria :

Undergoing chemotherapy or radiotherapy at the time of the study.

3. Measurement tools

Measurement tools were made based on previous studies[5][6] comprised two questionnaires : 'Stages I-III Questionnaire' for LE patients and 'Stage 0 Questionnaire' for non-LE patients.

1) Questionnaire content

(1) Stages I-III Questionnaire

The Stages I-III questionnaire covered 88 items divided into 9 sections : 1) patient demografics, 2) personality traits, comprising the Type A Behavior Pattern Scale[7]. This 6-point Likert scale (from 1 'does not apply at all' to 6 'applies completely') is divided into three main sections (I. Hostility, II. Perfectionism, and III. Japanese workaholism) and 30 subsections. Scale reliability (Cronbach's α=0.81-0.85) and validity have been confirmed. Permission to use the scale was obtained from the copyright holder, Professor Masahiro Seto of Kanagawa University Faculty of Human Sciences ; 3) therapeutic status, comprising duration of hospital stay, age at LE onset, affected limb, and changes around the time swelling was noticed, type of surgery, so on ; 4) postoperative complications, comprising pain,

Visual Analog Scale（VAS）（score, 0-100）, cellulitis, wound dehiscence, so on；5）discharge instruction, 6）hospital visits, 7）concern regarding the affected limb, comprising prioritizing work over the fear of developing LE and absence of LE for the following reasons, 8）daily activities, and 9）preventive behavior of LE.

（2）Stage 0 Questionnaire

All items were the same as for the Stage I-III Questionnaire except for questions pertaining to changes around the time swelling was noticed.

（3）Face validity

Under the supervision of the LE therapist, questionnaire contents was repeatedly investigated regarding 1）applicability to LE（Stages I-III）and non-LE（Stage 0）postoperative breast cancer patients；2）usage of jargon；and 3）usage of leading or loaded questions.

Next, 1 non-LE and 2 LE postoperative breast cancer patients were asked to complete the survey. The mean time required for completion was 35 min. The patients reported that the questions were "mostly comprehensible" with regard to terminology and difficulty of expressions, "there were no incomprehensible areas" regarding how to answer the questions, and that the font size was "just right".

4. Data collection

1）Procedures and methods

（1）Location

Since post-discharge lifestyle was expected to affect LE onset and exacerbation, data collection was limited to Tohoku and Hokkaido as two regions of Japan with comparable conditions such as seasons and regional customs.

（2）Requests for participation

①Facilities and patients' associations

The directors of nursing and outpatient nursing were firstly explained verbally and in writing details of the study such as the purpose and methods. A written request for study participation was then explained to the hospital director of each facility, and informed consent was obtained.

Where present, the nurse/LE therapist at each facility was asked to act as a research associate and assist with the study by selecting subjects and determining LE stage[8], distributing questionnaires, and responding to patients' concerns and questions regarding aspects such as LE care methods. They were also asked to provide patients who were found through the questionnaire to have LE of stage I or higher with instruction regarding self-care methods and to introduce outpatient LE care services. Therapists were given manuals to ensure that patient selection, study explanations, and questionnaire distribution methods were consistent between facilities.

Author got signature about consent forms of all patients' association representatives for participation after receiving a written explanation of the study aims, methods, and patient explanation process, and seeing a copy of the questionnaires.

Patients were asked to complete the questionnaire at home and then return it by post within 10 days. Consent for participation was implied by return of the questionnaire.

②Determining LE stage

Patients were given the questionnaire that corresponded to their LE stage, determined by the author or nurse/LE therapist as 0 for non-LE patients and I-III for LE patients.

2）Study period

October 2013-June 2014

5. Data analysis

1）Descriptive statistics（all variables）

Frequency, mean, standard deviation（SD）, minimum, maximum, and median values for each variable were tabulated to provide an overview of the data. Free responses were summarized based on content.

2）Univariate analysis

With presence（LE stage, ≥I）and absence（LE stage, 0）of LE as the dependent variables, chi-square test（χ^2 or Fisher's exact test）was performed for independent variables comprising two values（present［1］or absent［0］）or ordinal scales. With regard to Type A Behavior Pattern Scale（6-point scale）scores or continuous variables, normality was confirmed, and independent-samples t-tests or Mann-Whitney U tests were performed for two-group comparison and Kruskal-Wallis or one-way analysis of variance was performed for three-group comparisons.

3）Multivariate analysis

Forced-entry multiple logistic regression analysis was performed with LE stages 0（0）and ≥I（1）as the

dependent variables. Data organization and confirmation in preparation for multiple logistic regression[9] included confirming the sample size and number of independent variables, multicollinearity, and outliers.

Goodness-of-fit was determined using the Hosmer-Lemeshow test and the true rate. Statistical analysis was performed using IBM SPSS ver. 22.0J for Windows. Significance was set at $p<0.05$ (power, 0.80; effect size, 0.40).

6. Ethical considerations

Patient's consent for study participation was implied by return of the self-administered questionnaire. The author and research associates at all facilities were prohibited from using language or attitudes suggesting that participation was mandatory, and questionnaire return was neither confirmed nor encouraged.

Treatment, LE care, and involvement in patients' association activities were wholly unaffected by and no penalty arose from patient refusal to participate or non-return of the questionnaire. This was clearly stated on the study participation request form and explained verbally. The questionnaires were anonymous, preventing individual identification. Approval by the Ethical Review Board of each facility that indicated such approval was necessary was obtained following submission of the necessary documents. Approval was also obtained from the Ethical Review Board of St. Luke's International University (Approval No.13-041).

Results

As stated 7 sections in questionnaire were reported in this results.

A total of 472 questionnaires were distributed to six facilities across A Prefecture (n=4), K Prefecture (n=1), and H Prefecture (n=1) and nine patients' associations across A Prefecture (n=6), I Prefecture (n=1), and H Prefecture (n=2). All responses from the 318 returned questionnaires (collection rate, 67.4%) were tabulated and analyzed. LE was present (stages I-III) in 93 (29.2%) patients and absent (stage 0) in 225 (70.8%) patients. The incidence was therefore 29.2%. LE stages were as follows: 0, n=225 (70.8%); I, n=36 (11.3%); IIa, n=47 (14.8%); IIb; n=9 (2.8%); and III, n=1 (0.3%). Mean LE onset was at postoperative 47.2 months (SD 69.3; equivalent to 3 years 9 mon, median 24.0, min 2, max 480). Affected limbs were as follows: left arm, n=46 (50.5%); right arm, n=41 (44.1%); bilateral arms, n=4 (4.3%); and unknown, n=1 (1.1%).

1. Difference between LE and non-LE patients

1) Patient demographics: LE vs. non-LE patients

Mean ages at surgery for LE and non-LE patients were 53.00 y (SD 11.16 y) and 54.72 y (SD 11.62 y), respectively, while BMIs at surgery were 23.07 (SD 3.29) kg/m^2 and 22.96 (SD 3.09) kg/m^2, respectively. BMI at LE onset was 24.11 (SD 4.86) kg/m^2. A total of 77 (82.8%) LE patients and 182 (80.9%) non-LE patients had jobs (including housework). According to their free responses, patients' jobs included administrator, caregiver, hairdresser, *koto* (Japanese harp) teacher, farmer, fisherman, *kimono* seamstress, registered dietician, and yoga instructor so on. Little difference was observed between LE and non-LE patients with regard to mean working hours per day at 416.0 min (SD 169.9 min; approximately 6.8 h and 400.9 min SD 140.2 min; approximately 6.7 h, p=.485 Mann-Whitney U test). Times between hospital discharge and returning to work for LE and non-LE patients were 7.02 mo (SD 11.46 mo) and 6.65 mo (SD 12.53 mo), respectively. LE and non-LE patients gave one or more of the following reasons for returning to work: 'end of sick leave' (9% vs. 10%), 'asked to return' (5% vs. 7.0%), 'wanted to work' (27% vs. 17.6%), 'financial reasons' (16.9% vs. 13.7%), and 'other' (18.2% vs. 11.5%).

2) Personality traits: LE vs. non-LE patients

With regard to personality traits, mean total Type A Behavior Pattern Scale scores (range, 30-180) in LE and non-LE patients were 92.3 (SD 19.9) vs. 91.5 (SD 19.4). Mean subscale scores were as follows: hostility, 22.5 (SD 8.1) vs. 22.3 (SD 8.2); perfectionism, 35.5 (SD 9.4) vs. 35.4 (SD 9.4); and Japanese workaholism, 34.3 (SD 9.8) and 33.9 (SD 9.0).

Cronbach's α reliability coefficient values confirming the internal validity of the Type A Behavior Pattern Scale results were 0.87 for all 30 items and 0.88, 0.88, and 0.83 for hostility, perfectionism, and Japanese workaholism, respectively.

There is no significantly variables between LE and

non-LE patients on demographics and personality traits.

3) Therapeutic regimen

Hospital stay was significantly longer for LE compared to non-LE patients by a mean of 6 days (24.0 days [SD 26.9 days] vs. 18.2 days [SD 18.8 days]; Mann-Whitney U test, p=.005).

Mean LE onset was at postoperative 47.2 mo (SD 69.3 mo; equivalent to 3 y 9 mo; range, 2-480 mo). Significant differences were observed in proportions of LE patients who experienced changes around the time of swelling onset (LE) or to date (non-LE) (45.2% [n=42] vs. 32.9% [n=74]; χ^2=6.092, degrees of freedom [df]=1, p=0.014). Changes around the time of swelling onset in LE patients included weight gain (most common response), mental fatigue, family member requiring care, travel pulling a suitcase, quitting work, and extended working hours. Changes to date in non-LE patients similarly comprised weight gain for many patients, as well as impaired wound healing. All LE patients underwent either lumpectomy (46.2% [n=43]) or mastectomy (51.6% [n=48]). In non-LE patients, lumpectomies were significantly more prevalent than mastectomies (60.0% [n=135] vs. 35.1% [n=79]; χ^2=6.6, df=1, p=0.010). Drain use was significantly more common in LE than non-LE patients (76.3% [n=71] vs. 65.3% [n=147]; χ^2=4.0, df=1, p=0.045). A significant difference was also observed for ALND, with almost all LE patients undergoing ALND (93.5% [n=87] vs. 65.3% [n=147]; χ^2=25.6, df=1, p=0.000). A smaller proportion of LE than non-LE patients underwent sentinel lymph node biopsy [SLNB] (33.3% [n=31] vs. 44.0% [n=99]). The use of adjuvant therapies in LE and non-LE patients was as follows: radiotherapy, 61.3% (n=57) vs. 51.6% (n=116); chemotherapy, 58.1% (n=54) vs. 47.6% (n=107). The use of anti-hormone therapy was more common in non-LE patients (73.8% [n=166] vs. 66.7% [n=62]). The incidence of cancer recurrence in LE and non-LE patients was 3.2% (n=3) vs. 3.6% (n-8). Follow-up durations among LE compared to non-LE patients were as follows: ≥6 y, 44.1% (n=41) vs. 36.9% (n=83); 5.9-5.0 years 15.1% (n=14) vs. 8.4% (n=19), 4.9-4.0 years, 10.8% (n=10) vs. 16.0% (n=36); and 3.9-3.0 years, 3.2% (n=3) vs. 5.3% (n=12). A significant difference was observed between LE and non-LE patients regarding the proportion of patients attending hospital follow-up for 5 years or more (60% vs. 45%; χ^2=8.7, df=1, p=0.046).

4) Postoperative complications

Pain was experienced by 55.9% (n=52) LE and 55.1% (n=124) non-LE patients. Pain intensity was higher for LE patients (mean VAS scores), 21.8 [SD 25.4] vs. 14.91 [SD 18.4]). The incidence of cellulitis was around 5 times higher in LE than non-LE patients, a significant difference (25.8% [n=24] vs. 5.8% [n=13]; χ^2=23.9, df=1, p=0.000). The incidence of wound dehiscence was 7.5% (n=7) in LE and 4.0% (n=9) in non-LE patients, while periwound swelling was 17.2% (n=16) and 18.7% (n=42). The incidence of periwound induration was lower in LE than in non-LE patients (39.8% [n=37] vs. 44.9% [n=101]). A higher proportion of LE than non-LE patients experienced periwound hypoesthesia (60.2% [n=56] vs. 56.9% [n=128]), while a significantly higher proportion of LE patients experienced postoperative difficulty moving arm(s) (63.4% [n=59] vs. 49.8% [n=112]; χ^2=4.5, df=1, p=0.035).

5) Discharge instructions

No significant difference was observed for discharge instructions, which was received by 71.0% (n=66) LE and 70.7% (n=159) non-LE patients. LE and non-LE patients received discharge instructions from one or more of the following people: nurse, n=22 vs. 50; doctor, n=11 vs. 28; physical therapist, n=5 vs. 10; and others, n=5 vs. 14.

Discharge instructions covering one or more of the following aspects of LE was received by LE and non-LE patients as follows: development process, n=15 vs. 30; symptoms, n=26 vs. 53; treatment methods, n=17 vs. 25; importance of self-care, n=18 vs. 34; prevention and improvement methods, n=28 vs. 54; precautions during daily life, n=35 vs. 63; methods of managing infection, n=8 vs. 10; and 'other' content, n=4 vs. 0. The most common instruction for both LE and non-LE patients related to precautions during daily life. Discharge instructions for LE and non-LE patients was delivered verbally (n=27 vs. 57), using pamphlets (n=34 vs. 54), by video (n=6 vs. 11), and by 'other' methods (n=2 vs. 3). No significant difference was observed in instruction methods between LE and

non-LE patients. A significantly higher proportion of LE than non-LE patients received post-discharge outpatient instructions (29.0% [n=27] vs. 10.7% [n=24]; χ^2=4.0, df=1, p=0.045).

6) The time required to hospital

The time required to hospital for LE and non-LE patients were as follows: ≤30 min, 61.3% (n=57) vs. 60.9% (n=137); 31-60 min, 19.4% (n=18) vs. 24.9% (n=56); 61-90 min, 11.8% (n=11) vs. 7.6% (n=17); and ≥91 min, 5.4% (n=5) vs. 4.0% (n=9). Around 80% of both LE and non-LE patients had the time required to hospital of ≤60 min.

7) Concern regarding affected limb

A significantly higher proportion of non-LE than LE patients responded that they were too busy to worry about the affected limb (56.5% [n=127] vs. 44.1% [n=41]; χ^2=6.5, df=1, p=0.011), demonstrating that around half of non-LE patients were unconcerned about the affected limb. Frequency of unconcerned about the affected limb in LE and non-LE patients was as follows: always, 41.5% (n=17) vs. 23.6% (n=27); sometimes, 36.6% (n=15) vs. 53.5% (n=68); and occasionally, 21.9% (n=9) vs. 25.2% (n=32). Lack of awareness regarding right or left was reported by 41 (44.1%) LE and 117 (52.0%) non-LE patients. Frequency of not favoring right or left arm in LE and non-LE patients was as follows: always, 26.0% (n=11) vs. 17.9% (n=21); sometimes, 39.1% (n=16) vs. 47.0% (n=55); and occasionally, 34.1% (n=14) vs. 35.1% (n=41). LE and non-LE patients believed they would not develop LE because they were not taking anti-cancer drugs or undergoing radiotherapy (2.2% [n=2] vs. 1.8% [n=4]; undergoing regular checkups (19.4% [n=18] vs. 15.1% [n=34]); and only working (studying, engaging in hobbies) a little (14.0% [n=13] vs. 11.6% [n=26]). Among the 259 employed patients, 36.3% (n=28) LE and 21.4% (n=39) non-LE patients prioritized work over the fear of developing LE.

2. Odds ratio of Risk factors for LE

Forced-entry multiple logistic regression analysis performed on the variables that showed significance (**Table 2**) generated the following odds ratios (ORs): ALND, 12.1 (p=0,002); cellulitis, 7.3 (p=0.001); postoperative difficulty moving arm(s), 2.3 (p=0.031); changes around time of swelling, 2.1 (p=0.035); and being too busy to worry about the affected limb, 0.5 (p=0.030). The regression coefficient (B value) for being too busy to worry about the affected limb was -0.8, indicating that this was a factor for LE prevention rather than onset (**Table 3**).

Discussion

The present risk factors, including changes around the time of swelling (weight gain), duration of hospital stay, type of surgery, drain use, ALND, duration of follow-up, cellulitis, and postoperative difficulty moving arm(s), have also been reported in previous studies overseas. This indicates that LE risk factors in patients outside Japan are similar to those in patients in Hokkaido and 3 prefectures in Tohoku.

The main change at the time of swelling onset was weight gain (OR ×2.1). However, non-physical changes relating to family and working life, such as a family member requiring care, mental fatigue, and quitting work, were also reported in the free response section. We must consider their family as well as their own lifestyle needs. These findings show that prevention methods need to consider and respond appropriately to not only weight gain but also anything else that is troubling the patient. Weight gain may be due to increased subcutaneous fat or the LE-related lymph congestion itself. Mean BMIs at surgery were within the normal range (18.5-25.0 kg/m^2) at around 23 kg/m^2 for both LE and non-LE patients. Many breast cancer patients undergo pre- and/or postoperative chemotherapy. Increased capillary permeability and subsequent edema have been reported with taxane[10)11)], while persistent edema following swelling due to anti-cancer drugs has also been experienced in clinical practice. Many literature reviews have presented the risk of LE onset with chemotherapy[12-18)]. Postoperative anti-hormone therapy also causes weight gain, triggering LE[19-22)].

Theoretically, with increased capillary permeability arising from drug side effects, excessive tissue fluid builds up in the tissues and, through osmosis, either returns to the veins or enters the lymph capillaries where it is transported as lymph fluid to the venous angle and enters the venous blood system. Thus, swelling does not arise. However, in postoperative

Table 1　Demographics and personality traits of patients

Characteristics	LE (n=93)		non-LE (n=225)		p value
Age at surgery, mean (SD)	53.0	(11.2)	54.7	(11.6)	.226
BMI (kg/m^2) at surgery, mean (SD)	23.1	(3.3)	23.0	(3.1)	.888
BMI (kg/m^2) at LE onset, mean (SD)	24.1	(4.9)			
Jobs (including housework), N (%)	77	(82.8)	182	(80.9)	.616
Working hours per day, mean (SD)	416.0	(169.9)	400.9	(140.2)	.485
Times between hospital and returning to work ; month, mean (SD)	7.0	(11.5)	6.7	(12.6)	.452
Reasons for returning to work (multiple replies allowed), N (%) §					
End of sick leave	7	(9.0)	18	(9.9)	.451
Asked for return	4	(5.2)	13	(7.1)	.223
Wanted to work	21	(27.2)	32	(17.6)	.292
Financial reasons	13	(16.9)	25	(13.7)	.976
others	14	(18.2)	21	(11.5)	.411
Marital statuses, N (%)					.229
Married	73	(78.5)	169	(75.1)	
Unmarried	12	(12.9)	22	(9.8)	
In a relationship	2	(2.2)	3	(1.3)	
Others	3	(3.2)	16	(7.1)	
unknown	3	(3.2)	15	(6.7)	
Highest education level, N (%)					.197
Elementary school	0	−	4	(1.8)	
Junior high school	12	(12.9)	19	(8.4)	
High school	57	(61.2)	127	(56.5)	
University/postguraduate	14	(15.1)	47	(20.9)	
unknown	10	(10.8)	28	(12.4)	
Household income, N (%)					.194
5.01 million yen/y	21	(22.6)	50	(22.2)	
301-500 million yen/y	9	(9.7)	39	(17.3)	
151-300 million yen/y	51	(54.8)	97	(43.2)	
150 million yen/y	11	(11.8)	32	(14.2)	
unknown	1	(1.1)	7	(3.1)	
Concurrent disearses (multiple replies allowed), N (%)	48	(51.6)	127	(56.4)	.431
Hypertension	23	−	45	−	.349
Orthopedic disorder	15	−	30	−	.515
Cardiovascular disease	8	−	10	−	.144
Diabetes mellitus	3	−	20	−	.056
Gynecological disorders	3	−	11	−	.375
Cranial nerve disease	2	−	11	−	.214
Respiratory disease	1	−	6	−	.343
Others	12	−	49	−	.067
Type A Behavior Pattern Scale ; range, 30-180, mean (SD)					
Total : 30 items	92.3	(19.9)	91.5	(19.4)	.417
Hostility : 10 items	22.5	(8.1)	22.3	(8.2)	.825
Perfectionism : 10 items	35.5	(9.4)	35.4	(9.4)	.864
Japanese workaholism : 10 itmes	34.3	(9.8)	33.8	(9.0)	.680

note : § N of Jobs (LE=77, non-LE=182). LE ; Lymphoedema, SD ; standard deviation, Body mass index ; BMI,
: Chi-square test, Fisher's exact test, Mann- Whitney test, Student's t-test

Table 2 Variables with a significant difference between LE and non-LE patients

	LE (n=93)		Non-LE (n=225)		p value	Pearson's χ^2
Duration of hospital stay (days), mean (SD)	24.0 (27.0)		18.2 (18.8)		.005*	
Changes around time of swelling onset (LE)/changes to date (non-LE), N (%)					.014*	6.1
Yes	42	(45.2)	74	(32.9)		
No	37	(39.8)	126	(56.0)		
Type of surgery, N (%)					.010*	6.6
Mastectomy	48	(51.6)	79	(35.1)		
Lumpectomy	43	(46.2)	135	(60.0)		
Drain use, N (%)					.045*	4.0
Yes	71	(76.3)	147	(65.3)		
No	14	(15.1)	56	(24.9)		
Axillary lymph node dissection, N (%)					.000*	25.8
Yes	87	(93.5)	147	(65.3)		
No	2	(2.2)	57	(25.3)		
Duration of follow-up (years), N (%)					.046*	8.6
None	0	−	1	(0.4)		
≤1 year	6	(6.5)	29	(12.9)		
1.0-1.9 years	7	(7.5)	18	(8.0)		
2.0-2.9 years	10	(10.8)	20	(8.9)		
3.0-3.9 years	3	(3.2)	12	(5.3)		
4.0-4.9 years	10	(10.8)	36	(16.0)		
5.0-5.9 years	14	(15.1)	19	(8.4)		
≥6 years	41	(44.1)	83	(36.9)		
Cellulitis, N (%)					.000*	23.9
Yes	24	(25.8)	13	(5.8)		
No	66	(71.0)	194	(86.2)		
Postoperative difficulty moving arm(s), N (%)					.035*	4.5
Yes	59	(63.4)	112	(49.8)		
No	30	(32.3)	99	(44.0)		
Provision of post-discharge outpatient instructions, N (%)					.045*	4.0
Yes	27	(29.0)	24	(10.7)		
No	57	(61.3)	97	(43.1)		
Concern regarding affected limb : too busy to worry about the affected arm(s), N (%)					.011*	6.5
Yes	41	(44.1)	127	(56.5)		
No	44	(47.3)	70	(31.1)		

note : Chi-square test, Fisher's exact test, Mann- Whitney test
*$p<0.05$

patients, normal lymphatic flow via the lymph vessels is disrupted and lymph congestion occurs. Swelling is avoided if the lymph fluid is rerouted at the lymph capillary level, but if the transport capacity of the lymph vessels is exceeded, LE will develop.

While studies in Europe and America have reported BMI ≥30 kg/m^2 as a risk factor for LE onset[23)24)], a study in Hong Kong and South Korea by Park et al[25)] found the cutoff to be 23-25 kg/m^2. Meanwhile, although Aonuma et al.[26)] reported no significant difference between the mean BMI of LE (23 kg/m^2 ; n=27) and non-LE patients (24 kg/m^2 ; n=16), a significant difference was found in another study (24 [SD 3.8] kg/m^2, n=16 vs. 22.6 [SD 3.0] kg/m^2, n=31 ; $p<0.05$)[27)]. These find-

Table 3 Risk factor odds ratios for LE onset

Variable	B	P-value	Exp (B)	Exp(B) 95% CI	
				Lower limit	Upper limit
Axillary lymph node dissection	2.5	.002*	12.1	2.5	59.2
Drain use	−0.5	.325	0.6	0.3	1.6
Cellulitis	2.0	.000*	7.3	2.3	22.5
Postoperative difficulty moving arm(s)	0.8	.031*	2.3	1.1	4.7
Changes around time of swelling onset	0.7	.035*	2.1	1.1	4.1
Too busy to worry about the affected limb	−0.8	.030*	0.5	0.2	0.9
Constant	−3.2	.000	0.0		
Omnibus test of model coefficient: p value	.000				
Hosmer-Lemeshow test	.830				
True rate	73.0				

B=regression coefficient, Exp(B)=odds ratio, CI=Confidence Interval
*$p<0.05$

ings reaffirm the importance of not simply including BMI in discharge instruction based on values stated in previous literature, but considering the origin and characteristics of the patients from whom these values were obtained.

In addition to measuring weight (BMI), other screening is necessary to identify potential risk factors in postoperative patients. Creating an observation chart containing screening items related to LE onset such as duration of hospital stay (≥24 days), duration of follow-up (4-5 years), type of surgery, SLNB, ALND (OR ×12.1), drain use, postoperative difficulty moving arm(s) (OR ×2.3), and cellulitis (OR ×7.3) to be used pre- and post-discharge would enable any health worker to assess patient status.

With regard to postoperative difficulty moving arm(s) and cellulitis, it is necessary to go beyond simply confirming their presence or absence and understand the details of the situation. The present study only asked whether patients had postoperative difficulty moving arm(s) and did not generate details such as differences in symptom duration and range and types of motion. When assessing ROM of affected arm, it is necessary to confirm : the ranges of abduction, flexion, and extension with the shoulder as the pivot ; which motions are difficult and to what degree ; and if any other motions triggers twitches, as well as assessing any associated pain. Similarly, with regard to cellulitis, recurrent inflammation causes increased arm circumference, high fever, and exacerbated fibrosis. Therefore, it is important to clarify what the patient was doing before onset in addition to simply checking for inflammation in order to avoid repeating the action that induced the inflammation. The OR ×7.3 for cellulitis suggests that patients should be particularly warned about behaviors linked to infection.

LE patients were three times more likely than non-LE patients to receive post-discharge outpatient instruction (29.0% [n=27] vs. 10.7% [n=24] ; $p<0.05$). However, no differences were observed between the two groups with regard to instruction content or products used during instruction. Although the present results found no difference in instruction content, the difference in frequency between the two groups calls into question the effectiveness of the instruction received by patients who went on to develop LE, and further investigation is urgently required.

Concern regarding affected limb (being too busy to worry about the affected limb) had an OR ×0.5 and a regression coefficient (B value) of −0.8. This variable was based on risk factor categories identified by Kimura[28] of "working without awareness regarding the affected arm" and "prioritizing work over concerns regarding swelling". Working hard without concern for

the risk of developing LE was expected to place a burden on the arm on the operated-on side. However, the negative coefficient resulting from multiple logistic regression analysis indicated that this is a preventive factor rather than an onset risk factor. While postoperative difficulty moving arm(s) and limited ROM were found to be onset risk factors, worrying about and not moving the arm(s) similarly appeared to be actually linked to onset. The collecting lymphatic vessel walls contain smooth muscle ; however, subepithelial lymph capillaries are not capable of peristaltic contraction. Moving the arms and trunk entails movement of the muscles and diaphragm, and blood vessel pulsation, thereby stimulating flow of congested lymph fluid. Appropriate physical movement is therefore linked to LE prevention.

LE and non-LE patients were compared using the Type A Behavior Pattern Scale to investigate whether this typically Japanese attitude and serious-mindedness may be risk factors for onset ; however, no differences were observed. Mean scores for hostility, perfectionism, and Japanese workaholism in different subject groups at scale development[29] were as follows : ischemic heart disease patients (n=13) 30.62 (SD 5.12), 42.62 (SD 5.80), and 38.92 (SD 5.63), respectively ; general managers (n=148) 29.91 (SD 7.32), 41.73 (SD 6.59), and 40.10 (SD 6.56), respectively ; and healthy women (n=296) 28.14 (SD 7.49), 38.31 (SD 6.76), and 35.63 (SD 7.73). The mean scores in the present study were lower than all scores at scale development apart from Japanese workaholism in healthy women. These findings indicate that the subjects in the present study (n=318) tended toward hostile behavior less than the average for healthy women and were neither perfectionists nor prone to Japanese workaholism.

These findings indicate that, in addition to giving specific instructions such as "limit activities to this level, avoid being bitten by insects to prevent infection, and rest if tired", in most cases, encouraging patients to feel that it is better not to constantly worry about the affected limb may contribute to LE prevention. Many postoperative patients avoid moving due to pain and worry that they will never be cancer-free. Pain relief, gradual rehabilitation, and not being overly nervous may help to prevent onset.

Conclusion

The present questionnaire surveyed 472 postoperative breast cancer patients. Responses were obtained from 318 patients. Univariate analysis with the presence or absence of LE as the dependent variable identified 10 variables with significant differences : type of surgery, duration of hospitalization (≥24 days), ALND, drain use, cellulitis, postoperative difficulty moving arm(s), post-discharge outpatient instruction, duration of follow-up, changes at the time of swelling, and being too busy to worry about the affected limb. Forced-entry multiple logistic regression on these variables generated the following OR : ALND, 12.1 (p=0.002) ; cellulitis, 7.3 (p=0.001) ; postoperative difficulty moving arm(s), 2.3 (p=0.031) ; changes at the time of swelling, 2.1 (p=0.035) ; and being too busy to worry about the affected limb, 0.5 (p=0.030). The regression coefficient (B value) value for being too busy to worry about the affected limb was -0.8, indicating that this is a factor related to prevention rather than onset.

Limitations

Participants in this study were not all breast cancer survivors after operation in the Hokkaido and Tohoku area. So, the RFs of LE are a part of them. Next step would be carried out prospective research using RFs of this study.

References

1) Katou I, Matsuo H : Rinpafushu sinryou no jissai genjou to tenbou, Bunkoudou, 31, 2003. (in Japanese)
2) Petrek JA, Senie RT, Peters M, et al. : Lymphoedema in a cohort of Breast Carcinoma Survivors 20 Years after Diagnosis, Cancer, 92 (6), 1368-1377, 2001.
3) Kimura E : Rinpafushu no risukufakuta ni kansuru bunkenrebyu , LYMPHOEDEMA RESEARCH AND PRACTICE, International Lymphoedema Framework of Japan, 1 (1), 5-24, 2013. (in Japanese) http://www.ilfj.jp/kaishi/pdf3/toukou-2.pdf [10.20.2014] ISSN 2188-1375
4) Emiko K : Qualitative research for risk factors of

lymphoedema among nine breast cancer survivors, LYMPHOEDEMA RESEARCH AND PRACTICE, International Lymphoedema Framework of Japan, 2（1）, 10–17, 2014. http://www.ilfj.jp/kaishi/pdf3/toukou-2-1.pdf［11.27.2014］ISSN 2188-1375
5）above 3）
6）above 4）
7）Seto M, Hasegawa N, Sakano Y, et al.：Nihonteki taipuA koudou hyoutei syakudo（CTS）no kokoromi, Kaunseringu Kenkyu, 5（30）, 199–206, 1997.（in Japnaese）
8）Takahasi Y：Gankanja ya chiryou ni kanrenshita rinpafushu；Masujima M. Byouto・Gairai kara hajimeru rinpafushu yobousidou（shohan）, Igakushoin, 48, Tokyo-to, 2012.（in Japnese）
9）Tsushima E：SPSS de manabu iryoukeitahenryoude-takaiseki, Tokyoutosho kabushikigaisya. 109, Tokyo-to, 2009.（in Japnaese）
10）Arioka J：Gan no kagakuryouhou Saishin chiryou konsensasu Yakuzai kihon jouhou Takisan-kei yakuzai pakuritakisetu to dosetakiseru, Igaku no ayumi, 215（5）, 366–371, 2005.（in Japnese）
11）Arai Y, Maki M, Horikoshi M, et al.：Takisan-kei kagakuryouhou ni yoru ryoukasi fushukanja ni taisuru fukugouteki rigakuryouhou no kouka, Nihon gan kangogakkaishi, 24（Suppl）, 261, 2010.（in Japanese）
12）Park JH, Lee WH, Chung HS：Incidence and risk factors of breast cancer lymphoedema, Journal of Clinical Nursing, 17（11）, 1450–1459, 2008.
13）Paskett ED, Naughton MJ, McCoy TP, et al.：The epidemiology of arm and hand swelling in premenopausal breast cancer survivors, Cancer Epidemiol Biomarkers Prev, 16（4）, 775–782, 2007.
14）Hayes SB, Freedman GM, Li T, et al.：Does axillary boost increase lymphedema compared with supraclavicular radiation alone after breast conservation, Int J Radiat Oncol Biol Phys, 72（5）, 1449–1455, 2008a.
15）Swenson KK, Nissen MJ, Leach JW, et al.：Case-control study to evaluate predictors of lymphedema after breast cancer surgery, Oncology Nursing Forum, 36（2）, 185–193, 2009.
16）Shih YC, Xu Y, Cormier JN, et al.：Incidence, treatment costs, and complications of lymphedema after breast cancer among women of working age, a 2-year follow-up study, Journal of Clinical Oncology, 27（12）, 2007–2014, 2009.
17）Yen TW, Fan X, Sparapani R, et al.：A contemporary, population-based study of lymphedema risk factors in older women with breast cancer, Ann Surg Oncol, 16（4）, 979–988, 2009.
18）Norman SA, Localio AR, Kallan MJ, et al.：Risk factors for lymphedema after breast cancer treatment, Cancer Epidemiol Biomarkers Prev, 19（11）, 2734–2746, 2010.
19）Vignes S, Arrault M, Dupuy A：Factors associated with increased breast cancer-related lymphedema volume, Acta Oncologica, 46（8）, 1138–1142, 2010.
20）Paskett ED, Naughton MJ, McCoy TP, et al.：The epidemiology of arm and hand swelling in premenopausal breast cancer survivors, Cancer Epidemiol Biomarkers Prev, 16（4）, 775–782, 2007.
21）Hayes S, Janda M, Cornish B, et al.：Lymphedema secondary to breast cancer. how choice of measure influences diagnosis, prevalence, and identifiable risk factors, Lymphology, 41（1）, 18–28, 2008b.
22）above 14）
23）Foeldi M, Foeldi E, Kubik S：Textbook of Lymphology（First edition）, URBAN & FISHER, 396, München, 2003.
24）Mak SS, Yeo W, Lee YM, et al.：Predictors of lymphedema in patients with breast cancer undergoing axillary lymph node dissection in Hong Kong, Nursing Research, 57（6）, 416–425, 2008.
25）above 12）
26）Aomo R, Hori K, Wakui S, et al.：Nyugan jutugo norinpafuu shutugen ni kansuru jittaichousa, Dai 33 kai Naganoken kango kenkyugakkai, 1–3, 2012.（in Japanese）
27）Sugano A：Nyugan kanja no rinpafushuhasshou to yobou koudou no jittai, Iwate kango gakkaishi, 1（1）, 48–54, 2008.（in Japanese）
28）above 4）
29）above 7）

乳がん術後患者のリンパ浮腫のリスクファクターに関する研究

木村恵美子

青森県立保健大学看護学科

要　旨

目的：乳がん術後患者のリンパ浮腫（以下 LE）発症に関与するリスクファクター（以下 RF）を明らかにする。

研究方法：研究デザインは自記式質問紙を用いた横断調査である。研究対象は東北・北海道に居住する 20 歳以上で，補助療法中でない乳がん術後患者とした。調査期間は平成 25 年 10 月～平成 26 年 6 月。質問紙は，属性・治療内容・術後合併症・退院指導・患肢への関心・タイプ A 行動パターン尺度を含む。分析は全変数の記述統計を行い，LE の有無を従属変数とし単変量解析後，有意であった変数を用いて多重ロジスティック回帰分析を行いオッズ比を求めた。

結果：施設は 6 施設，患者会は 9 団体で，配布総数 472 件のうち，回収は 318（67.4%）件だった。病期は，0 期 225 人（70.8%），Ⅰ期 36 人（11.3%），Ⅱa 期 47 人（14.8%），Ⅱb 期 9 人（2.8%），Ⅲ期 1 人（0.3%）で，LE の発症は術後平均 47.2ヶ月（SD 69.3）だった。

単変量解析後，オッズ比（強制投入）を求めると，腋窩リンパ節郭清（odds：12.1 p=.002），術後蜂窩織炎（odds：7.3 p=.001），患肢の動きにくさ（odds：2.3 p=.031），むくんだ頃の変化（odds：2.1 p=.035），多忙で患肢を気にしない（odds：0.5 p=.030　回帰係数－ 0.8）だった。多忙で患肢を気にしないは，係数がマイナスということから，発症ではなく予防に向いていた。

考察：結果から，術後から継続的なフォローアップをする，むくんだ頃の心身や生活の変化等の詳細な情報収集をする，患肢をあまり気にせず適度に動く等の LE 発症予防に関する示唆を得た。

キーワード：リンパ浮腫，乳がん，リスクファクター