



# Risk, severity and predictors of physical and psychological morbidity after axillary lymph node dissection for breast cancer

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## Abstract

The aim of this study was to investigate the nature and severity of the arm complaints among breast cancer patients after axillary lymph node dissection (ALND) and to study the effects of this treatment-related morbidity on daily life and well-being. 400 women, who underwent ALND as part of breast cancer surgery, filled out a treatment-specific quality of life questionnaire. The mean time since ALND was 4.7 years (range 0.3–28 years). More than 20% of patients reported pain, numbness, or loss of strength and 9% reported severe oedema. None of the complaints appeared to diminish over time. Irradiation of the axilla and supraclavicular irradiation were associated with a 3.57-fold higher risk of oedema (odds ratio (OR) 3.57; 95% confidence interval (CI) 1.66–7.69) causing many patients to give up leisure activities or sport. Women who underwent irradiation of the breast or chest wall more often reported to have a sensitive scar than women who did not receive radiotherapy. Women <45 years of age had an approximately 6 times higher risk of numbness of the arm (OR 6.49; 95% CI 2.58–16.38) compared with those ≥65 years of age; they also encountered more problems doing their household chores. The results of the present study support the introduction of less invasive techniques for the staging of the axilla, sentinel node biopsy being the most promising. © 2001 Elsevier Science Ltd. All rights reserved.

**Keywords:** Breast carcinoma; Axilla; Lymph node dissection; Morbidity; Quality of life

## 1. Introduction

For several decades, axillary lymph node dissection (ALND) has been standard in the surgical treatment of patients with invasive breast cancer. The aim originally was to obtain regional control and it has become a critical element in adjuvant therapy decision-making. However, it has become increasingly apparent that

ALND may also cause severe morbidity, such as oedema, pain, numbness, loss of strength and impaired range of motion of the involved arm.

Although the physical problems due to ALND are well documented [1–13], there are only a few studies in which the psychological morbidity and the effects of arm complaints on everyday life have been studied [14–16]. Tobin and colleagues reported that patients with oedema due to ALND had more psychosocial and adaptational problems than a comparable group of patients without oedema [14]. For instance, women with oedema had less interest in maintaining family relation-

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ships, were less active socially and had fewer goals as far as work and career are concerned. In addition, they reported that finding the right clothing to cover the condition of the arm was often a definite problem. Psychological problems, such as a negative self-esteem and a negative body-image, were also associated with arm complaints. Moreover, patients with lymph oedema reported feeling helpless or losing control. Maunsell and colleagues found that breast cancer patients with severe ALND-related arm complaints showed less interest in their personal appearance and were less active sexually [15].

The present questionnaire-based study focuses on the frequency and severity of physical and psychological complaints and problems in daily life after axillary dissection. In addition, we tried to determine which patient and treatment characteristics were associated with the various levels of complaints. The results of the present study are relevant to the discussion on the introduction of less invasive techniques for staging of the axilla, such as sentinel node biopsy [17–19].

## 2. Patients and methods

### 2.1. Patients

The study was set up and coordinated by the Comprehensive Cancer Centre South in Eindhoven and carried out by the Section of Clinical Health Psychology of Tilburg University. Eight Departments of Surgery, one Department of Radiotherapy and one Department of Internal Medicine of eight community hospitals in the south east of The Netherlands participated in the study. Approval was obtained from the medical ethical committees of the hospitals and the Comprehensive Cancer Centre South.

Between December 1998 and May 1999, specialists approached all eligible breast cancer patients during their scheduled follow-up. All patients had undergone ALND, had finished their treatment at least 3 months before (including radiation and/or adjuvant chemotherapy), and had no clinical signs of locoregional recurrence or distant metastasis. In order to prevent selection bias, specialists were requested to approach all patients consecutively. Informed consent was obtained and the sequence of ALND and primary and adjuvant treatment was indicated on a special form. In addition, swelling of the arm was assessed by measurement of the circumference of the arm 10 cm above and below the olecranon process. All clinical information and the consent form were sent to the Research Department of the Comprehensive Cancer Centre South, from which the patients received a questionnaire in a prepaid envelope. In total, 465 questionnaires were sent and 400 (86%) were returned (Table 1).

Table 1  
Patient and treatment characteristics

Characteristic	n (%)
Age (years) mean (range)	59 (26–88)
< 45	43 (11)
45–54	117 (29)
55–64	126 (32)
65+	114 (29)
Time since axillary lymph node dissection (years) Mean (range)	4.7 (0.3–28)
≤ 1	85 (21)
1.1–3.0	135 (34)
3.1–5.0	80 (20)
> 5.0	99 (25)
Unknown	1 (0.3)
Primary treatment, surgery	
Mastectomy	163 (41)
Breast conservation	237 (59)
Primary treatment, radiotherapy	
No radiotherapy	112 (28)
Irradiation of breast or chest wall, without axillary or supraclavicular field	215 (54)
Axillary or supraclavicular irradiation	68 (17)
Unknown	5 (1)
Primary treatment, chemotherapy	
Yes	68 (17)
No	329 (82)
Unknown	3 (1)
Primary treatment, hormonal therapy	
Yes	84 (21)
No	313 (78)
Unknown	3 (1)
Site of axillary dissection	
Left	201 (50)
Right	186 (47)
Bilateral	13 (3)
Postoperative nodal status	
Negative	262 (66)
Positive	127 (32)
Unknown	11 (3)
Handedness	
Left-handed	32 (8)
Right-handed	360 (90)
Ambidextrous	8 (2)
Comorbidity	
Present	144 (36)
Absent	256 (64)
Civil status	
Married/living together	286 (72)
Single/widowed/divorced	111 (28)
Unknown	2 (1)
Children	
Yes	351 (88)
No	49 (12)
Level of education	
Primary	115 (29)
Secondary or professional	230 (58)
Higher (i.e. polytechnical or university)	50 (13)
Unknown	5 (1)
Occupation	
Employed	103 (26)
Housewife or unpaid work	291 (73)
Unknown	6 (2)
Healthcare insurance	
Public	259 (65)
Private	139 (35)
Unknown	2 (1)

Data on primary and adjuvant treatment, nodal status and field descriptors of radiation were obtained from the medical records and the database of the Eindhoven Cancer Registry. According to regional treatment guidelines [20], the borders of the ALND consisted of the *latissimus dorsi* muscle (dorsal), the thoracic wall below the major and minor pectoral muscles (ventral), and the lower border of the axillary vein (cranial). Aftercare in most hospitals consisted of physical therapy varying from several days to a week, and at discharge patients were instructed by a trained nurse to resume normal use of the arm and to do exercises. Irradiation of the axilla and the supraclavicular region was recommended for patients with inadequate ALND, extracapsular extension of tumour growth or nodal involvement in the apex of the axilla. The radiation dose and dose specification varied with time. The axillary field was usually exposed to 52.5 Gy (25 fractions) and the supraclavicular field to 40 Gy (20 fractions). The dose specification varied from 30 to 50 mm below the surface of the skin.

## 2.2. Questionnaire

To measure the problems of ALND, a treatment-specific questionnaire was developed. For this purpose, a literature study was conducted, medical specialists were interviewed, existing questionnaires were screened and two focus meetings were held with breast cancer patients who had undergone axillary lymph node dissection at 1 year before. The questionnaire was validated in a pilot study of 45 patients, 15 of whom were interviewed afterwards to check on content validity [21]. After validation, 102 items remained in the questionnaire, covering five domains of quality of life: (1) physical functioning; (2) psychological functioning; (3) level of independence; (4) social relationships; and (5) environment. Response format was a four-point Likert scale (ranging from ‘not at all’ to ‘very much’, or from ‘never’ to ‘always’). For this study, 25 items were selected on the basis of clinical relevance. We ensured that all domains were covered adequately by the 25 items.

One extra question was added to assess the presence of comorbidity (e.g. complaints or diseases which were not located in the arm or shoulder). Comorbidity was reported by 144 of the 400 patients (36%). This included: (1) back problems, symptoms of rheumatoid arthritis, arthrosis, hernia nuclei pulposi ( $n=83$ ); (2) gastro-intestinal symptoms ( $n=7$ ); (3) headaches or migraine ( $n=2$ ); (4) myalgic encephalomyopathy (ME) or encephalomyelitis ( $n=2$ ); (5) a mixed category, e.g. multiple sclerosis, cardiovascular disease, hot flushes, toothaches and varicose veins ( $n=6$ ); and (6) burning sensation or pain in the treated breast and ribs ( $n=44$ ).

## 2.3. Statistics

A multivariate logistic regression analysis was applied to assess the association between patient and treatment characteristics and the risk of complaints. For this purpose, the original four-point Likert-scale responses were dichotomised. Response categories 2 (i.e. ‘often’ or ‘much’) and 3 (i.e. ‘always’ or ‘very much’) were recoded into 1, which means that the complaint was present. Values 0 (i.e. ‘never’ or ‘not at all’) and 1 (i.e. ‘sometimes’ or ‘a little’) were reclassified into 0, meaning that the complaint was absent. We calculated odds ratios (ORs) and 95% confidence intervals (95% CIs) for the risk of complaints. The following covariates were included in the regression analysis:

- age: younger than 45, or 45–54, or 55–64 years of age versus 65 years or older;
- time since diagnosis: 1.1–1.3, or 3.1–5.0 or > 5 years ago versus  $\leq 1.0$  year ago;
- type of surgical treatment: breast-conserving treatment versus mastectomy;
- radiation therapy: axillary or supraclavicular irradiation versus no axillary irradiation and breast or chest wall irradiation versus no irradiation;
- adjuvant chemotherapy: yes versus no;
- adjuvant hormonal therapy: yes versus no;
- ALND ipsilateral to handedness: axillary dissection on the side of hand preference versus axillary dissection not on the side of hand preference (i.e. contralateral);
- civil status: living with a partner (i.e. either married or unmarried) versus living without a partner (i.e. single, widowed or divorced);
- children: having children versus having no children;
- educational level: secondary or higher education versus primary education;
- occupation: being employed (i.e. paid work) versus non-paid work or housewives;
- health care insurance: private versus public health care insurance;
- co-morbidity: present versus absent.

All  $P$  values were two-sided and only variables with a value  $<0.05$  were considered to be statistically significant and were kept in the model after a stepwise backward selection procedure.

## 3. Results

### 3.1. Frequency and severity of arm problems and arm-related complaints

The frequency and severity of arm complaints and arm-related complaints are presented in Table 2. Frequently reported (i.e.  $\geq 20\%$ ) physical complaints were:

Table 2

Frequency and severity of complaints after axillary lymph node dissection according to the self-rating questionnaire ( $n=400$ )

Domain	Never/ not at all (%)	Sometimes/ a little (%)	Often/ much (%)	Always/ very much (%)	Missing (%)
<b>Physical functioning</b>					
Do you have pain in your arm or shoulder?	36	43	17	4	1
Do you have swelling or oedema?	58	32	6	3	1
Do you have a numb feeling in your arm or shoulder?	34	44	16	6	1
Do you have a sensitive scar?	26	47	31	4	2
Do you have less strength in arm or shoulder?	21	41	23	5	1
Do you have shoulder, neck or back complaints?	52	26	16	4	3
Did your complaints diminish after some time?	28	23	19	15	17
<b>Level of independence</b>					
Do you take moments of rest to relieve your complaints?	33	45	18	3	2
Do you use a pillow for arm support when resting?	69	17	10	3	1
Do you do things with the other hand?	43	30	17	5	5
Do you have problems lifting heavy things?	22	41	24	11	3
Are you still able to do household chores as before?	7	18	33	40	2
Do you exercise your arm?	40	33	16	8	4
<b>Mental functioning</b>					
Are you afraid of oedema?	40	40	9	9	3
Are you bothered that others have to do your chores?	39	23	16	11	12
Do you avoid wearing clothing which might reveal scars?	46	22	12	15	5
Is it a nuisance to have to be careful of your arm?	31	40	13	8	9
Do you think that you should not use your arm too much?	35	41	17	6	2
<b>Social Support</b>					
Do you get sympathy from others for your arm complaints?	11	19	27	15	29
Are you able to talk about your arm complaints at home?	7	15	25	24	30
Is your partner supportive?	3	5	14	39	40
<b>Environment</b>					
Are your complaints taken seriously by your physician?	3	12	22	36	28
Is your physician willing to discuss your complaints with you?	2	17	26	30	25
Does your arm cause problems when you ride a bike?	47	26	11	3	14
Have you given up hobbies or sport?	No: 58	Yes: 37			5

pain (21%), numbness (22%), loss of strength (28%), sensitive scar (35%) and shoulder, neck or back complaints (20%). Severe oedema was reported by approximately 9% of respondents. Measurement of forearm and upper arm girth showed a difference of 2 cm or more between the right and the left arm in 25 of the 35 patients (71%) reporting much or very much oedema, whereas of the 365 patients reporting no or only a little lymph oedema, a difference of 2 cm or more between the forearms or upper arms was measured in only 63 (17%).

Of all 400 patients, 63% had at least one physical complaint and 37% were free of complaints. 51% of the patients indicated that there had been very little improvement in their complaints over the course of time.

25–35% of the patients reported that they also had problems performing daily activities, such as household chores or lifting heavy objects. 21% said that they frequently needed to rest the arm, 24% exercised the affected arm and 22% had learned to do things with the other arm.

As far as mental functioning was concerned, 18% of patients feared the development of oedema and 21% found it a nuisance to be careful of your arm. 27% of the women avoided wearing revealing clothing.

30% of respondents felt that they had received little sympathy from others for their complaints and 7% said that they could not discuss their problems at home. 15–19% of patients of this study reported that they were somewhat dissatisfied with the attention they received from their physician and 14% of respondents had problems with transportation. 37% of the women reported that they had to give up a hobby or sport due to ALND-related morbidity.

### 3.2. Risk factors

In Tables 3 to 7, ORs which resulted from the multi-variable logistic regression analysis are presented for the domain-specific ALND-related complaints.

After adjustment for confounders, the patients with axillary or supraclavicular irradiation were found to have a 3.57-fold higher risk to develop lymph oedema compared with those who had not been irradiated (95% CI 1.66–7.69) (Table 3). The presence of comorbidity significantly increased the risk of pain, oedema, numbness, loss of strength in the arm or shoulder, shoulder, back or neck complaints (Table 3). None of the physical complaints seemed to diminish over time (Table 3). The

Table 3  
Odds ratios for complaints in the physical functioning domain<sup>a</sup>

Complaint	Odds ratio (95% CI)
Having pain in arm or shoulder Comorbidity versus no comorbidity	3.38 (2.03–5.64)
Having swelling or oedema Axillary or supraclavicular irradiation versus no irradiation Co-morbidity versus no comorbidity	3.57 (1.66–7.69) 3.08 (1.49–6.38)
Having a numb feeling in the arm or shoulder. Age <45 years versus 65+ years Age 45–54 years versus 65+ years Age 55–64 years versus 65+ years Having children versus having no children Private versus public health care insurance Comorbidity versus no comorbidity	6.49 (2.58–16.34) 2.83 (1.26–6.35) 2.67 (1.22–5.83) 0.45 (0.21–0.94) 0.38 (0.21–0.70) 2.33 (1.36–3.97)
Having a sensitive scar Irradiation of breast or chest wall versus no irradiation	1.79 (1.10–2.91)
Having less strength in arm or shoulder ALND <sup>b</sup> 3.1–5.0 years ago versus ≤1.0 year ago Comorbidity versus no comorbidity	1.91 (1.11–3.30) 1.80 (1.12–2.85)
Having shoulder, neck or back complaints Co-morbidity versus no comorbidity	2.72 (1.62–4.59)

95% CI, 95% confidence interval.

<sup>a</sup> Results should be interpreted as follows: e.g. patients with axillary or supraclavicular irradiation showed a 3.57 times higher risk of having swelling or oedema.

<sup>b</sup> ALND, axillary lymph node dissection.

Table 4  
Odds ratios for complaints in the level of independence domain

Complaint	Odds ratio (95% CI)
Taking moments of rest to relieve complaints Comorbidity versus no comorbidity	1.94 (1.17–3.21)
Using a pillow for arm support when resting Age 55–64 years versus 65+ years	2.09 (1.15–3.81)
Doing things with the other hand Age 45–54 years versus 65+ years Age 55–64 years versus 65+ years Secondary education versus primary education Axillary or supraclavicular irradiation versus no irradiation ALND on the side of hand preference versus contralateral Comorbidity versus no comorbidity	2.10 (1.04–4.24) 2.33 (1.21–4.49) 0.56 (0.33–0.96) 3.67 (1.94–6.93) 0.58 (0.34–0.98) 2.54 (1.49–4.34)
Having problems lifting heavy things Comorbidity versus no comorbidity	1.88 (1.21–2.93)
Still being able to do household chores as before Age <45 years versus 65+ years Private versus public health care insurance Breast conservation versus mastectomy Comorbidity versus no comorbidity	0.44 (0.21–0.91) 1.91 (1.10–3.32) 0.57 (0.34–0.97) 0.35 (0.21–0.59)
Doing arm exercises Age 55–64 versus 65+ years ALND 1.0–3.0 years ago versus ≤1.0 year ago ALND 3.0–5.0 years ago versus ≤1.0 year ago ALND > 5.0 years ago versus ≤1.0 year ago Higher education versus primary education	2.50 (1.47–4.25) 0.50 (0.27–0.93) 0.30 (0.14–0.65) 0.17 (0.07–0.37) 2.06 (1.04–4.07)

95% CI, 95% confidence interval; ALND, axillary lymph node dissection.

Table 5  
Odds ratios for complaints in the mental functioning domain

Complaint	Odds ratio (95% CI)
Being afraid of oedema	
Comorbidity versus no comorbidity	1.92 (1.13–3.27)
Being bothered that others have to take over chores	
Working professionally versus housewife	0.46 (0.25–0.84)
ALND 1.0–3.0 years ago versus ≤1.0 year ago	0.56 (0.33–0.94)
Comorbidity versus no comorbidity	2.01 (1.24–3.27)
Avoiding clothing which might reveal scars	
Age 55–64 years versus 65+ years	1.70 (1.01–2.84)
ALND > 5.0 years ago versus ≤1.0 year ago	2.19 (1.27–3.77)
Private versus public healthcare insurance	1.79 (1.08–2.97)
Breast conservation versus mastectomy	0.39 (0.24–0.64)
Hormonal therapy versus none	2.17 (1.24–3.60)
Finding it a nuisance to be careful with the arm	
Chemotherapy versus none	2.23 (1.20–4.13)
Comorbidity versus none	1.97 (1.17–3.31)
Thinking that the arm should not be used too much	
Secondary education versus primary	0.51 (0.31–0.83)
Chemotherapy versus none	2.13 (1.14–4.00)
Without partner versus with partner	1.73 (1.02–2.95)
Comorbidity versus no comorbidity	1.93 (1.16–3.19)

95% CI, 95% confidence interval; ALND, axillary lymph node dissection.

risk of numbness in the arm appeared to be 6.49 times higher for women <45 years than for women of 65 years or older (95% CI 2.58–16.34) (Table 3).

Patients who received axillary or supraclavicular irradiation were 3.67 times more likely to relieve the affected arm by doing things with the other arm (95% CI 1.94–6.93) (Table 4). Younger patients, patients who underwent breast conservation and those with public healthcare insurance experienced more problems doing household chores after ALND (Table 4). Patients with a higher education were more likely to do arm exercises. The presence of comorbidity significantly diminished the level of independence (Table 4). Mental functioning appeared to be worse among patients with comorbidity (Table 5).

Higher educational level and private healthcare insurance were associated with the social support domain and the environment domain (Tables 6 and 7). Patients with a higher or secondary educational level appeared to receive more support and sympathy from others than patients who had only a primary education (Table 6), and they also appeared to be more mobile (Table 7). The risk of having to give up hobbies or sports was 1.89 times higher for patients with axillary or supraclavicular irradiation (95% CI 1.05–3.40) (Table 7). Women with private healthcare insurance, however, experienced fewer problems continuing leisure activities (Table 7). Patients with comorbidity had more problems with social support, continuing leisure activities and transportation. They also appeared to be less

Table 6  
Odds ratios for complaints in the social support domain

Complaint	Odds ratio (95% CI)
Getting sympathy from others for the arm complaints	
Secondary education versus primary education	2.25 (1.30–3.91)
Higher education versus primary education	3.72 (1.56–8.85)
Comorbidity versus no comorbidity	0.59 (0.36–0.98)
Being able to talk about the arm complaints at home	
Chemotherapy versus no chemotherapy	3.73 (1.49–9.37)
Without partner versus with partner	0.26 (0.14–0.46)
Having a partner who is supportive <sup>a</sup>	
Comorbidity versus no comorbidity	0.21 (0.08–0.58)

95% CI, 95% confidence interval.

Table 7  
Odds ratios for complaints in the environment domain

Complaint	Odds ratio (95% CI)
Complaints are taken seriously by the physician Co-morbidity versus no co-morbidity	0.35 (0.19–0.64)
Being given enough time to discuss problems with the physician Co-morbidity versus no co-morbidity	0.56 (0.33–0.97)
Having to give up hobbies or sports Private versus public health care insurance	0.56 (0.34–0.90)
Axillary or supraclavicular irradiation versus no irradiation	1.89 (1.05–3.40)
Comorbidity versus no comorbidity	3.01 (1.90–4.76)
Arm complaints causing problems when riding a bike Higher education versus primary education	0.18 (0.04–0.78)
Comorbidity versus no comorbidity	2.74 (1.49–5.05)

satisfied with the attention that was paid to their problems by their treating physician (Table 7).

#### 4. Discussion

The purpose of this study was not only to assess the nature and severity of the morbidity after ALND, but also to determine whether complaints interfere with daily life and psychosocial functioning of the patient. To gain insight into the nature and severity of the complaints related to ALND, a newly designed treatment-specific questionnaire was used since existing questionnaires failed to cover the full range of the problems which confront patients after ALND. Our study demonstrated that almost two-thirds of the patients experienced at least one of the following physical problems: pain, numbness, a sensitive scar, loss of strength, swelling or oedema, and shoulder, neck or back complaints. More limited approaches to the axilla, like axillary node sampling or sentinel node biopsy, appear to cause less physical complaints [22,23]. We are aware that our questionnaire-based study is not suited for investigating the hypothesis whether these procedures will also lead to improved psychological well-being and that only a randomised trial can give a valid answer to this question. Less invasive procedures, however, will enable earlier discharge, which in itself has been shown to have positive psychosocial effects [24].

9% of the women in this study reported to have much or very much lymph oedema. In other studies, the incidence of oedema varied between 5 and 30%, depending on the definition that was used. In most cases, oedema has been defined as the absolute difference in arm circumference between the treated and untreated sides and was not based on a patient's self-report. One study, in which self-rating and objective measurement of oedema were compared, showed that self-rating resulted in a lower incidence of oedema than objective measurement

[16]. In most studies, severe disabling swelling or oedema was diagnosed in less than 10% of the patient population [6,7].

The highly elevated risk of severe arm oedema for patients who underwent axillary or supraclavicular irradiation in addition to dissection, which has been reported previously [1–3,8,12,13], is probably associated with disturbances in arterial and venous lymph flow. The risk and severity of oedema were also suggested to be associated with the extent of the dissection [1], obesity [4,10] and hypertension [5]. However, we did not include these variables in the present study. The disabling effect of lymph oedema is reflected by the fact that when the treated axilla had been irradiated, the women were more inclined to do things with their other hand and more often had to give up hobbies or sports.

Approximately 20% of the women suffered pain or a great deal of pain in the operated arm or shoulder, which is comparable to other studies. For instance, Van Dam and colleagues diagnosed pain in 23 of 71 (32%) of examined and interviewed patients and pain was moderate to severe in 12% of all cases [7]. In a study by Ivens and coworkers, 33% of the sample suffered pain [6]. In a recent study by Hack and colleagues, of 222 breast cancer patients who had undergone ALND, pain, numbness or weakness of arm and shoulder was listed by 72% of all women; 73% had a limited range of motion [9]. They reported that pain was mild to moderate in most cases, was experienced more frequently by younger women and also appeared to be associated with chemotherapy and the number of lymph nodes removed. Tasmuth and colleagues also found that most complaints of pain were mentioned by younger women and the group of patients that had received chemotherapy in addition to irradiation [11]. However, the results of these studies are difficult to compare with ours as we did not use a standardised pain score. Pain in the arm or shoulder after axillary dissection is likely to be due to transection of one or more of the branches of the

intercostobrachial nerve by the surgeon. Sensoric innervation of quite a large part of the arm and axillary region can be disturbed afterwards [25,26]. In the present study, none of the treatment variables was associated with pain in the arm or shoulder.

In addition to pain in the arm or shoulder, a substantial number of patients (11%) mentioned that they felt a burning pain in the breast or ribs that was more bothersome than the side-effects of ALND. This complaint was reported more often after breast conservation and has also been reported in other studies [11,27]. Adjuvant irradiation of the breast seems to play an important role in the development of these complaints. In a study by Carpenter, almost one-third of the patients had severe postoperative pain in the treated breast [27]. The present study revealed an association between the risk of developing a sensitive scar and radiation.

The results of the current study further suggested that none of the complaints diminished over time. On the contrary, the risk of loss of strength was even higher for the group that had been treated more than 3 years ago than for the more recently treated groups. Hack and coworkers also found that the pain was fairly permanent since it was not inversely related to the number of years that had passed since initial diagnosis [19]. Only a few patients practised and exercised the arms regularly more than 5 years after treatment. Little is known, however, about the effectiveness of these exercises.

A number of problems were clearly associated with age. The much higher risk of numbness for younger women can perhaps be explained by the fact that some older patients underwent less extensive dissection on account of their poor physical health. A more aggressive approach to the axilla might have been chosen for younger patients to optimise their chances of cure, probably resulting in a higher risk of tissue damage. This hypothesis is supported by the results of another study in the south east of The Netherlands among 6663 breast cancer patients, in which the mean number of nodes examined appeared to decrease with age from 11.1 for patients <40 years of age to 9.3 for those of 80 years or older [28]. Younger women also encountered more problems doing their household chores, which may be explained by the fact that younger women often combine a job, taking care of children and running the household; as a result they may be under greater physical strain so that the problems with the arm or shoulder are intensified.

Higher educational level predicted fewer problems in the social support and environment domain. This may imply that women with a higher education are more likely to ask for support, can cope with problems in these domains more easily or have more resources to do so.

Many ALND-related problems in our study were associated with comorbidity or pain in the breast or ribs. The explanation for this finding could be that the

questionnaire might have given the opportunity for at least some of these patients to express (health) problems which are not related to ALND. Comorbidity also affected satisfaction with healthcare providers. Nearly half of this patient group were not satisfied with the time available to discuss their problems during follow-up visits or felt that their complaints were not taken seriously by their treating physician.

Our questionnaire survey among breast cancer survivors demonstrates that ALND is associated with a wide range of problems. These problems pertain not only to physical or mental health but also social support, daily activities such as household chores, transportation, recreation and sports. Our findings support the further technical development and implementation of less invasive techniques for staging of the axilla, sentinel node biopsy being the most promising. It should be realised, however, that those patients with a positive sentinel node will still need to undergo treatment of the axilla either by ALND with or without radiotherapy or by radiotherapy alone and will thus remain at risk for the physical and psycho-social side-effects.

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