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*Published in:*  
British Journal of Surgery

*Publication date:*  
2003

*Document Version*  
Publisher's PDF, also known as Version of record

[Link to publication in Tilburg University Research Portal](#)

*Citation for published version (APA):*

Voogd, A. C., Ververs, J. M., Vingerhoets, A. J. J. M., Roumen, R. M. H., Coebergh, J. W. W., & Crommelin, M. A. (2003). Lymphoedema and reduced shoulder function as indicators of quality of life after axillary lymph node dissection for invasive breast cancer. *British Journal of Surgery*, 90(1), 76-81.

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# Lymphoedema and reduced shoulder function as indicators of quality of life after axillary lymph node dissection for invasive breast cancer

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**Background:** The aim was to explore measurements of arm circumference and shoulder abduction as indicators of quality of life after axillary lymph node dissection for invasive breast cancer.

**Methods:** Differences in arm circumference and shoulder abduction were measured in 465 consecutive women who underwent axillary lymph node dissection. These women received a treatment-specific questionnaire on the severity of physical disability and the effects on their daily life and well-being.

**Results:** The questionnaire was returned by 400 women (86 per cent). Of these 400, only the 332 women who did not receive axillary radiotherapy were included in the analysis. Their mean time since axillary lymph node dissection was 4.2 (range 0.3–28) years. For 86 patients (26 per cent) there was a difference in arm circumference of 2 cm or more, or a difference in abduction of 20° or more. These patients found it more difficult to do household chores, were more likely to have given up hobbies, felt more disabled and were more likely to be treated by a physiotherapist. However, complaints also occurred among the women with smaller differences in arm circumference and shoulder abduction, although the frequency and severity of their complaints were similar to those in women without swelling of the arm or without restricted shoulder abduction.

**Conclusion:** Measuring arm circumference and shoulder abduction during control visits identifies only some of the women whose daily life and well-being is affected by the side-effects of axillary lymph node dissection.

Paper accepted 8 August 2002

Published online in Wiley InterScience (www.bjs.co.uk). DOI: 10.1002/bjs.4010

## Introduction

Axillary lymph node dissection (ALND) may cause severe, long-term morbidity in patients with breast cancer, such as lymphoedema, pain, numbness, loss of strength and impaired range of arm motion<sup>1–5</sup>. Of these complaints, most attention has been focused on lymphoedema<sup>6–8</sup>.

Comparison of the results of the various studies on morbidity after ALND is hampered by the use of different methods of measuring and defining physical complaints. Moreover, most studies are based on physical measurements only and no attempt was made to ask the patients whether they experienced any physical complaints

and how these complaints affected their daily life, e.g. performance of professional work, household chores, sports or hobbies. The opinion of the patient, however, has become increasingly important in the evaluation of cosmetic and functional results of cancer treatment<sup>9</sup>.

In a previous study the authors reported on the frequency and severity of subjective physical and psychological complaints, and problems in daily life up to more than 5 years after ALND<sup>10</sup>. The current study focuses on the association between measurements of arm circumference and shoulder function, and self-reported morbidity to determine whether objective measurements can be used to detect the patients affected by the side-effects of ALND.

In addition, the role of various patient- and treatment-related factors in the development of lymphoedema and restriction of arm movement has been analysed.

## Patients and methods

Between December 1998 and May 1999 surgeons, radiotherapists and oncologists in eight community hospitals in Southeast Netherlands approached all eligible women with invasive breast cancer during their scheduled follow-up. All women had undergone ALND, had finished treatment at least 3 months before (including radiation and/or adjuvant chemotherapy), and had no clinical signs of locoregional recurrence or distant metastasis. 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.

Swelling of the arm was assessed by measurement of the circumference of the arm 10 cm above and below the olecranon process; arm movement was assessed by measurement of the difference in the extent of abduction between the two arms. All clinical information and the consent forms were sent to the Research Department of the Comprehensive Cancer Centre South, which sent the patients a questionnaire in a prepaid envelope. In total 465 questionnaires were mailed, 400 (86 per cent) of which were returned. Further details on the hospitals participating in the study and the study design can be found elsewhere<sup>10</sup>. Because axillary radiation added to ALND is known to substantially increase the risk of physical morbidity, the current study was restricted to the patients who did not receive axillary radiation; after exclusion of 68 patients with axillary radiation, 332 patients remained available for the analyses.

Data on primary and adjuvant therapy, lymph node 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, 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 physiotherapy varying from several days to a week; at discharge patients were instructed by a trained nurse to resume normal use of the arm and to do exercises.

To measure ALND-related problems, a treatment-specific questionnaire was developed. Further details on the development and validation of the questionnaire have been published before<sup>10</sup>. 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, ten items were selected on the basis of clinical relevance.

## Statistical analysis

The study examined whether the differences in arm circumference and abduction were associated with the complaints of the patients. For this purpose, the original four-point Likert scale responses were dichotomized, which means that patients who answered 'much' or 'very much' were compared with patients who answered 'no' or 'little'. The  $\chi^2$  test was used to analyse the distribution of complaints according to the difference in abduction and circumference between the two arms.

## Results

### General characteristics

The mean age of the 332 women at the time of the study was 59 (range 26–88) years. The mean time since the completion of the treatment was 4.2 (range 0.3–28) years. In 62 women (19 per cent) tumour involvement of one or more axillary lymph nodes was confirmed by histological examination; 260 women were node negative and for ten no information on axillary node status was available. Of all women, 213 (64 per cent) underwent breast-conserving surgery and 118 underwent mastectomy, whereas type of surgery was unknown for one woman. Radiotherapy of the breast or chest wall was given to 211 women (64 per cent), chemotherapy to 45 (14 per cent) and hormonal therapy to 59 (18 per cent). Information on chemotherapy and hormonal therapy was complete, whereas information on radiotherapy was lacking for eight women.

### Physical measurements

Of the 332 patients, 46 (14 per cent) had a difference of 2 cm or more in the circumference between the right and left upper arm and 36 (11 per cent) had a difference of 2 cm or more between the forearms. A difference in the shoulder abduction of more than 20° between the two arms was found in 33 women (10 per cent). In 86 women (26 per cent) there was a difference in upper or lower arm circumference of 2 cm or more, or a difference in abduction of 20° or more.

In 116 patients (35 per cent) no differences were measured in circumference and abduction between the two arms.

### Association between physical measurement and complaints

'Much' or 'very much' lymphoedema was reported by 33 per cent of the patients with a difference in circumference of 2 cm or more between the forearms (*Table 1*). In the group with a difference in arm circumference of 2 cm or more between the upper arms this proportion was 20 per cent (*Table 2*). Pain was reported mainly by patients with a difference in abduction between the two arms of 20° or more (*Table 3*). These patients also had to give up hobbies more often and reported loss of strength, impaired shoulder movement and sleeping problems more frequently, compared with those without a difference in

abduction or a difference of less than 20° (*Table 3*). Loss of energy and the feeling of being handicapped owing to ALND-related morbidity were more pronounced among patients with a difference in circumference of the forearms of more than 2 cm as well as those with a difference in abduction of more than 20° (*Tables 1 and 3*). The proportion of patients visiting a physiotherapist and having problems with household chores was higher among those with a difference in arm circumference of 2 cm or more, or a difference in abduction of 20° or more, compared with those with no difference or with a smaller difference in arm circumference and abduction (*Tables 1–3*).

### Risk factors

The proportion of women with a difference in abduction of 20° or more between arms increased from 6 per cent in

**Table 1** Association between the difference in arm circumference between the right and left forearm and complaints of patients as reported in the questionnaire ( $n = 332$ )

Question	Answer	Difference in circumference, forearm			P*
		No	< 2 cm	≥ 2 cm	
Do you have pain in your arm or shoulder?	much/very much	19	21	28	0.46
Do you have swelling or oedema in your arm?	much/very much	3	6	33	< 0.001
Do you have less strength in your hand or arm?	much/very much	26	27	31	0.84
Do you have difficulties moving your arm or shoulder?	much/very much	14	13	17	0.87
Do you have difficulties doing household chores?	much/very much	11	9	33	< 0.001
Have you given up hobbies or sports?	yes	34	33	50	0.16
Does pain in your arm awaken you during the night?	often/always	10	9	17	0.43
Has your energy diminished?	much/very much	13	11	28	0.035
Do you feel handicapped?	much/very much	9	7	25	0.007
Are you currently going to a physiotherapist?	yes	12	8	39	< 0.001

Values are percentage of women. \* $\chi^2$  test.

**Table 2** Association between the difference in arm circumference between the right and left upper arm and complaints of patients as reported in the questionnaire ( $n = 332$ )

Question	Answer	Difference in circumference, upper arm			P*
		No	< 2 cm	≥ 2 cm	
Do you have pain in your arm or shoulder?	much/very much	16	28	22	0.054
Do you have swelling or oedema in your arm?	much/very much	3	9	20	< 0.001
Do you have less strength in your hand or arm?	much/very much	24	33	24	0.26
Do you have difficulties moving your arm or shoulder?	much/very much	13	14	15	0.92
Do you have difficulties doing household chores?	much/very much	10	12	26	0.016
Have you given up hobbies or sports?	yes	34	38	39	0.68
Does pain in your arm awaken you during the night?	often/always	8	14	13	0.32
Has your energy diminished?	much/very much	12	15	17	0.56
Do you feel handicapped?	much/very much	8	12	17	0.13
Are you currently going to a physiotherapist?	yes	11	14	26	0.03

Values are percentage of women. \* $\chi^2$  test.

**Table 3** Association between the difference in abduction between both arms and complaints of patients as reported in the questionnaire ( $n = 332$ )

Question	Answer	Difference in abduction			<i>P</i> *
		No	< 20°	≥ 20°	
Do you have pain in your arm or shoulder?	much/very much	15	24	55	< 0.001
Do you have swelling or oedema in your arm?	much/very much	5	11	15	0.054
Do you have less strength in your hand or arm?	much/very much	23	26	61	< 0.001
Do you have difficulties moving your arm or shoulder?	much/very much	9	15	49	< 0.001
Do you have difficulties doing household chores?	much/very much	10	17	33	< 0.001
Have you given up hobbies or sports?	yes	32	37	61	0.005
Does pain in your arm awaken you during the night?	often/always	7	11	36	< 0.001
Has your energy diminished?	much/very much	10	20	39	< 0.001
Do you feel handicapped?	much/very much	6	13	36	< 0.001
Are you currently going to a physiotherapist?	yes	10	22	33	< 0.001

Values are percentage of women. \* $\chi^2$  test.

patients aged less than 55 years, to 12 per cent in those aged 55–69 years and 15 per cent in women aged 70 years or more ( $P = 0.04$ ,  $\chi^2$  test for trend). The proportions were 14 and 7 per cent respectively after mastectomy and breast-conserving treatment for women of all ages ( $P = 0.03$ ). Women who had irradiation of the breast or chest wall were at a significantly higher risk of having a difference in circumference of 2 cm or more between the forearms ( $P = 0.005$ ). Left- or right-handedness had an effect on the frequency of oedema in the upper arm; women who underwent ALND on the side of their dominant arm were more likely to have a difference in circumference of 2 cm or more. Differences in shoulder abduction and arm circumference did not differ significantly between patients who completed treatment more or less than 5 years previously. Axillary node status and the use of chemotherapy had no significant association with differences in arm circumference or shoulder abduction. However, among patients who used or had used hormone therapy, arm abduction was significantly reduced ( $P = 0.01$ ). This reduction could be explained to a large extent by the greater age of tamoxifen users and the higher proportion of older women who underwent mastectomy.

## Discussion

A difference in arm circumference of 2 cm or more and a limitation of shoulder abduction of 20° or more were strong indicators for the presence of severe physical complaints, limitations in everyday life and psychosocial problems in women who underwent ALND for breast cancer. Complaints also occurred, but to a lesser extent, in patients with a difference in arm circumference of less than 2 cm, or with a difference in abduction of less than 20°;

however, the frequency and severity of their complaints were in general similar to those in women without swelling of the arm or restricted shoulder abduction.

The complaints reported in the questionnaire were most pronounced in patients with a difference in arm abduction of 20° or more, especially pain, loss of strength, impaired movement of the arm and shoulder, and sleeping problems. Remarkably, more than 15 per cent of the patients without a difference in arm circumference or abduction suffered moderate or severe pain in the arm or shoulder. Pain in the arm or shoulder after axillary dissection has been attributed to the transection of one or more of the branches of the intercostobrachial nerve<sup>11</sup>. Sensory innervation of quite a large part of the arm and axillary region can be disturbed afterwards. Randomized trials, however, have shown that preservation of the intercostobrachial nerve is difficult and time-consuming and only leads to a modest reduction in sensory deficit<sup>12,13</sup>.

Lymphoedema of the forearm appeared to be more troublesome than oedema of the upper arm. However, little or no swelling of the arm was reported by two-thirds of the patients who had a difference in arm circumference of 2 cm or more. This lack of association between the objective measurement of the arm circumference or arm volume has also been reported in other studies<sup>1,9</sup>.

Patients who underwent axillary or supraclavicular irradiation in addition to ALND were not included in this analysis. It is well known that this subgroup runs a significantly higher risk of developing lymphoedema of the arm and impairment of shoulder function<sup>1,2,14</sup>.

In the current study, information was obtained at only one point in time after ALND, which makes it difficult to draw any firm conclusions about the natural course of lymphoedema and restricted shoulder

function. The proportion of women with a difference in shoulder abduction of 20° or more, or a difference in circumference between the forearms or the upper arms of more than 2 cm, did not decrease with time after ALND. This suggests that ALND-related morbidity tends to become chronic. This conclusion is also supported by the fact that, at the time of the study, many patients with oedema and restricted shoulder function were being treated by a physiotherapist. There is, however, little evidence for the effectiveness of current treatments for oedema and other shoulder dysfunction. Massage and exercise are often prescribed as part of a multidisciplinary treatment programme. The most effective policy seems to consist of early diagnosis of swelling, and treatment with manual lymphatic drainage by specially trained therapists, together with the use of elastic compression bandages or compression pumps<sup>15–17</sup>. Warfarin was shown not to improve lymphoedema of the arm<sup>18</sup>.

In the present study, physical complaints related to ALND were shown to have a negative impact on the psychosocial well-being of women with breast cancer. Women with severe oedema of the forearm and limited shoulder movement particularly often had the feeling of being handicapped, had less energy and encountered problems when doing household chores. In addition, patients with limited shoulder function had to give up leisure activities more often. Only a few studies have addressed the effects of ALND-related complaints on everyday life and psychosocial well-being<sup>19–24</sup>, and their results are in agreement with the current findings.

More limited procedures for staging of the axilla, such as the four-node sampling technique or sentinel node biopsy, cause fewer physical complaints<sup>25,26</sup>. However, 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 psychosocial side-effects. The effectiveness of radiotherapy as an alternative to full ALND among patients with a positive sentinel node remains to be investigated in randomized controlled trials.

### Acknowledgements

The authors thank all clinicians who contributed to the design of the study and recruitment of the patients. Their names have been given in a previous paper<sup>10</sup>. This study was supported by a grant from the Scientific Fund of the Catharina Hospital Eindhoven.

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