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Early and Late Morbidity Associated With Axillary Levels I–III Dissection in Breast Cancer

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Background and Objectives: Axillary dissection may cause substatial morbidity in breast cancer patients. The purpose of this study was to investigate the value of a registration method of morbidity of the arm and shoulder, which is frequently used by surgeons and which includes the measurement of range of movement, strength, and pain.
Methods: We surveyed 148 patients who had received an axillary dissection as part of breast cancer surgery. Of these patients, 77 had undergone axillary dissection 6–12 months ago and 71 patients more than 5 years ago. In all patients, an objective measurement of shoulder movement and a subjective measurement of pain and arm strength was performed.
Results: A difference of more than 20 degrees in abduction, ventral elevation, or dorsal elevation occurred in 12% of the patients. Pain or loss of strength were measured in half of the patients. Shoulder movement, pain, and arm strength were not significantly different between the patients who underwent mastectomy or breast conserving surgery. Also, no significant difference could be found in shoulder movement, pain, and arm strength between the patients who underwent axillary dissection 6–12 months ago and those who underwent it more than 5 years ago.
Conclusions: Pain, loss of arm strength, and limitation of shoulder movement are frequent complaints after axillary dissection for breast cancer and appear to be independent of the length of follow-up and the type of surgery (i.e., breast-conservation or mastectomy).
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KEY WORDS: carcinoma; breast; axilla; lymph node; arm; pain

INTRODUCTION

Although more selective and less invasive approaches toward the axilla are currently coming into use, axillary lymph node dissection is still part of the surgical treatment of many breast cancer patients. Size and number of axillary metastases are an essential issue in adjuvant treatment planning and important parameters for prognosis [1]. Effective surgical treatment of tumor-containing axillary lymph nodes not only results in adequate local tumor control in most cases, but may also cure some patients [2,3]. The discussion on arm morbidity after axillary dissection tends to concentrate on lymph edema [4–14], but it is obvious that long-lasting postoperative pain and limitation in range of movement are at least as frequent and disabling complications [15–29]. It is difficult to compare results of studies concerning this problem, as uniform definitions of arm and shoulder dysfunction are lacking and follow-up times often differ.

We investigated the value of a registration method of morbidity of the arm and shoulder that is frequently used by trauma surgeons to evaluate the results of revalidation of trauma patients, and includes measurement of range of

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movement, strength, and degree of pain. The method was applied to two groups of breast cancer patients who had axillary dissection; one with a short follow-up period of less than 1 year and the other with a long follow-up period of more than 5 years. The measurements of morbidity in both groups were compared. Moreover, a comparison of morbidity was also made according to the type of surgery (i.e., breast-conservation or mastectomy).

PATIENTS AND METHODS

Patients

In 1999, two groups of breast cancer patients received an invitation to participate in the study. The first group consisted of 77 consecutive patients analyzed for 6–12 months after surgery and the second group of 71 consecutive patients analyzed for more than 5 years after surgery. Non-responders received a further letter or telephone call, so that ultimately all patients participated. Only patients known to be free of local or systemic disease and who had undergone axillary dissection in the St. Elisabeth Hospital in Tilburg were considered eligible for this study.

Treatment Protocols

There were no differences in treatment protocols between the two groups. Mean age was 55 years (range 30–77 years). Patient, treatment, and tumor characteristics are listed in Table I, according to the type of surgery (i.e., breast-conservation or mastectomy). Breast-conserving therapy was performed in 42 patients (28%), and modified radical mastectomy in 106 patients (72%). Axillary dissection consisted of removal of the lymph nodes at level I, II, and III: lateral border of the latissimus dorsi muscle, medial border of the chest wall with the serratus anterior muscle, and upper border of the axillary vein (as this complete axillary dissection is the regional standard practice in The Netherlands). The pectoralis minor muscle was not divided. Vascular and nerve structures running into the axillary fat on the anteroinferior aspect of the axillary vein were ligated, the long thoracic nerve and the thoracodorsal nerve were spared, but the intercostobrachial nerve usually was cut. In all surgical specimens, at least 10 lymph nodes had been examined; range was 10–32 and 10–34 after BCT and mastectomy, respectively. In 90 patients (61%), the lymph nodes were negative at pathological examination; in 58 patients (39%), they contained tumor. After axillary dissection, there was no immobilization of the shoulder; the suction drain was removed on the seventh day after surgery or earlier if the 24-hour fluid production was 50 cc or less. Patients were stimulated to participate in a standardized exercise program, including active and passive physical therapy supervised by a physical therapist. Radiotherapy to the breast was a standard procedure after breast-conserving surgery. Radiotherapy to the chest wall after mastectomy and to the supra and infraclavicular region after breast-conservation or mastectomy was given to patients with extracapsular extension of tumor growth or more than three involved lymph nodes. Radiotherapy fields never included the axilla.

Registration Methods of Arm Morbidity

All patients were seen and all measurements were taken and recorded at the outpatient clinic by two of the investigators (WB and JAR). Differences in abduction, dorsal elevation, ventral elevation, endorotation, and

TABLE I. Patient, Disease, and Treatment Characteristics According to Primary Surgical Treatment

	Mastectomy (n = 102)		Breast-conservation (n = 46)		
Characteristics	n	(%)	n	(%)	*P*-value*
Mean age (range)	56	(22–77)	52	(30–72)	n.s.
Lymphnodes removed					
Range	10–32		10–34		
Mean	15		16		
Nodal status, pN					
pN+	47	(46)	11	(24)	< 0.05
pN−	55	(54)	35	(76)	
Tumor size, pT					
≤ 2.0 cm	56	(55)	39	(85)	< 0.001
> 2.0 cm	46	(45)	7	(15)	
Follow-up (months)					
6–12	49	(48)	24	(52)	n.s.
> 60	53	(52)	22	(48)	

*Chi-square test, except for age (Student *t*-test).

exorotation of the arm between the ipsilateral and contralateral side were measured using a synthetic quadrant scale. Shoulder pain and loss of arm strength were documented by asking the patient to use a linear analogue scale from 0 to 10 (i.e., 0 = no pain, 10 = normal arm strength).

Upper and lower arm circumferences were measured 10 cm proximal and distal from the elbow joint in both arms. A difference of more than 2 cm between the ipsilateral and contralateral lower or upper arm was considered to be lymphedema.

Statistical Analysis

Student *t*-test was used to compare age between the patients undergoing breast-conservation or mastectomy and the chi-square test was used to compare the frequency distributions of disease and treatment characteristics and arm-complaints according to type of surgery and length of follow-up. The significance level was set at 0.05.

RESULTS

Differences in range of motion of the arm at the dissected side vs. the contralateral side for the total patient group are listed in Table II. A difference of more than 20 degrees in abduction, ventral elevation, or dorsal elevation occurred in 12% of the patients. It appeared that differences in ventral and dorsal elevation never occurred without a difference in abduction. So, in the following analyses on range of movement, we only used abduction.

Table III shows differences in abduction, arm strength, and shoulder pain after breast-conservation and mastectomy. Although the difference in abduction seemed to be larger after mastectomy than after breast-conservation, this was not statistically significant. Loss of arm strength and shoulder pain were also similar after breast-conservation and mastectomy.

Between the group with short follow-up (6–12 months) and the group with a follow-up of at least 5 years, there was no significant difference in shoulder pain, abduction, and arm strength (Table IV). The same lack of difference existed between patients with positive vs. negative lymphnodes.

Lymphedema of the arm was measured in nine patients (6%): three patients in the BCT group (3 of 46 = 6%) and six patients in the mastectomy group (6 of 102 = 6%); four patients after short and five patients after long follow-up. Only one of the three BCT patients with lymphedema did receive radiotherapy to the supra and infraclavicular region, while on the contrary only one of the six mastectomy patients with lymphedema did not receive radiotherapy. As expected, most of the patients with lymphedema did suffer from upper extremity dysfunction; seven patients had abduction differences, but loss of arm strength and pain were documented in only two in this small group of nine patients.

TABLE II. Differences in Range of Arm-Motion Between the Treated and the Not-Treated Side (n = 148)

Difference between right and left arm (degrees)	Abduction		Ventral elevation[a]		Dorsal elevation[b]	
	n	(%)	n	(%)	n	(%)
0	106	(72)	100	(78)	99	(78)
1–20	24	(16)	13	(10)	13	(10)
> 20	18	(12)	16	(12)	15	(12)

[a]Information missing for 19 patients.
[b]Information missing for 21 patients.

TABLE III. Differences in Abduction and Strength of the Arm and Shoulder Pain After Axillary Dissection for Breast Cancer According to Primary Surgical Treatment

Measurement	Mastectomy (n = 102)		Breast-conservation (n = 46)		*P*-value*
	n	(%)	n	(%)	
Difference in abduction of upper limbs (degrees)					
0	71	(70)	35	(76)	n.s.
1–20	16	(15)	8	(17)	
> 20	15	(15)	3	(7)	
Arm strength score					
10	49	(48)	22	(48)	n.s.
9–6	39	(38)	20	(42)	
< 6	14	(14)	4	(9)	
Pain score					
0	51	(50)	22	(51)	n.s.
1–3	28	(27)	9	(21)	
> 3	27	(27)	11	(24)	

*Chi-square test.

DISCUSSION

Traditionally, the debate on management of the axilla in breast cancer has focused on the quality of prognostic

TABLE IV. Arm Morbidity After Axillary Dissection for Breast Cancer According to the Length of Follow-Up

Measurement	Follow-up 6–12 months (n = 77)		Follow-up > 60 months (n = 71)		*P*-value*
	n	(%)	n	(%)	
Pain score > 3	19	(25)	19	(26)	n.s.
Abduction difference > 20 degrees	11	(14)	7	(10)	n.s.
Arm strength score < 6	12	(15)	6	(8)	n.s.

*Chi-square test.

information and local tumor control, but hardly on arm morbidity. With the introduction of less invasive procedures like sentinel node biopsy [30,31] and the ongoing debate concerning the need for axillary dissection in elderly patients, patients with serious concomitant disease or very small tumors [32–41], adequate registration methods, and definitions concerning arm morbidity have become essential in the decision making. Most authors have studied a wide range of complaints. Some, however, have concentrated on specific complaints like arm edema [4–14], postoperative pain [21], or psychological distress [18,20]. The majority of the studies made use of subjective as well as objective measurements. In the study presented here, we used objective registration of shoulder movement and subjective registration of pain and arm strength in two groups: one with a short follow-up period of less than 1 year and the other with a long follow-up period of more than 5 years. Although both groups consisted of consecutive series of patients, this was a nonrandomized retrospective study with its restrictions. It is obvious, however, that measuring shoulder abduction alone gives adequate information about shoulder function after axillary dissection and that ventral or dorsal elevation add little to it. Aitken et al. [16] stated that assessment of shoulder joint movement in a single direction is of limited value as almost all arm movements involve the whole shoulder girdle. In our experience, abnormalities in dorsal or ventral elevation never occurred without impairment of abduction, so it seems adequate to use abduction as an integral parameter of shoulder joint movement in general practice.

There was no difference in shoulder abduction between the breast-conservation and the mastectomy group as a whole, but severe abduction impairment tended to occur more often in the mastectomy group. Gutman et al. [42] could only demonstrate a slightly better range of flexion immediately after operation in their breast-conservation-group, while all patients had regained their preoperative range of flexion after 3 months. Gerber et al. [25] mentioned a slower return to preoperative range of motion after mastectomy than after breast-conserving therapy.

Although the incidence of lymphedema in this study was only 6%, morbidity in this group was substantial, as stated by other authors [4,5,8,12–14], loss of abduction capacity being a bigger problem than loss of arm strength or pain in our patients.

The results of the current study further suggest that none of the complaints diminished in course of time. Five years or more after primary treatment, shoulder pain remains a major complaint in 26% of patients in this series, while impairment of range of motion and arm strength effects the quality of daily life in about 10%. Not many studies have described results after 5 years or more, but of the ones that have, the majority has demonstrated that the morbidity of axillary dissection remains substantial [18,26].

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 realized, however, that those patients with a positive sentinel node will still need to undergo treatment of the axilla either by axillary dissection with or without radiotherapy or by radiotherapy alone and will thus remain at risk for the physical side effects.

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