



Long-Term Complications Associated with Mastectomy and Axillary Dissection

Mastektomi ve Aksiller Diseksiyon Sonrası Uzun Dönem Komplikasyonlar

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SUMMARY

Long-term arm morbidity and its related factors were evaluated for 299 patients operated for breast carcinoma. Pain was the most prominent complaint. Other complaints were arm swelling, paresthesia and numbness, stiffness of shoulder and loss of strength in order of frequency. At multivariate analysis; the factors related with the pain were age < 50, radiotherapy and arm swelling. Factors related with paresthesia and numbness were age < 50 and breast conserving surgery. Factors related with loss of strength were age < 50, operation on the left breast and arm swelling. While the factors related with stiffness were arm swelling and radiotherapy administration; the factors related with restricted mobility were diabetes and arm swelling. The factor related with increased infection was arm swelling. The factors related with the loss of strength and restricted mobility defined with physical examination were non-preservation of the nerves, axillary metastasis and diabetes, axillary metastasis and arm swelling, respectively.

Key Words: Mastectomy, complications, morbidity.

ÖZET

Bu çalışmada meme kanseri nedeniyle tedavi edilen 299 hastada uzun dönem kol morbiditesi ve ilişkili faktörler incelenmiştir. Ağrı en sık bildirilen şikayet olarak saptanmıştır. Sıklık sırasına göre diğer komplikasyonlar; kolda şişme, parestezi ve uyuşukluk, omuz eklem sertliği ve güç kaybı olarak saptanmıştır. Çok değişkenli analizde ağrı ile ilişkili faktörler; yaşın 50'nin altında olması, radyoterapi uygulanması ve kol şişliği olarak saptandı. Parestezi ve uyuşukluk ile ilgili faktörler; yaşın 50'nin altında olması ve meme koruyucu cerrahi olarak saptandı. Güç kaybı ile ilgili faktörler; yaşın 50'nin altında olması, sol memeye cerrahi girişim uygulanması ve kol şişliği olarak saptandı. Eklem sertliği ile ilgili faktörler kol şişliği ve radyoterapi uygulanması iken; hareket kısıtlılığı ile faktörler diyabet ve kol şişliği olarak saptandı. Kol şişliğinin artmış infeksiyon oranları ile ilişkili olduğu saptandı. Fiziksel muayene ile saptanan güç kaybı ve hareket kısıtlılığı ile ilgili faktörler sırasıyla; sinirlerin korunmaması, aksiller metastaz ve diyabet, aksiller metastaz ve kol şişliği olarak saptandı.

Anahtar Kelimeler: Mastektomi, komplikasyon, morbidite.

INTRODUCTION

The most frequent malignancy for women is the breast cancer. Modified radical mastectomy (MRM) and breast conserving surgery-axillary dissection (BCS-AD) are the most frequently used surgical opti-

ons. But surgery related complications are observed in 2/3 of the patients (1).

Mastectomy related complications are in 2 groups as early (within the first month of surgery) and long-term complications. Early complications are seroma

formation (25%), wound infection (10%), deep vein thrombosis (6%), pulmonary embolism (2%) and myocardial infarction (1%). Long-term complications are lymphedema (11%), atrophy of pectoralis major muscle (7%), restricted arm mobility (8%), neuralgia (5%), wound enduration (5%), hypertrophied scars (2%) and sinus formation (2%) (2).

Chronic pain syndrome, another long-term complication, is seen in 4-22% of patients. Its believed to be related with the damage to the intercostobrachial nerve during surgery (3-6). This damage also restricts arm and shoulder movements. Tasmuth et al. had reported that chronic pain syndrome was more frequently encountered after BCS-AD than MRM (33% vs 17%) (7). In their another study, the incidence was lower in the centers with high volume for breast surgery than the centers with low volume (43% vs 56%) (8).

The neuropraxia affecting brachial plexus was thought to be related with the etiopathology of paresthesia and numbness. Ivens et al. had reported numbness (70%), pain (33%), motor weakness (25%), swelling of the extremity (24%) and stiffness (15%) in patients with axillary dissection (AD) and the daily activities were affected in 39% of the cases.(9)

In another study, numbness and paresthesia was seen in 76.5% of the patients and complaints were decreased and even disappeared in 82% of patients with follow-up (10). In some other studies, brachial plexopathy was observed in 0.6-9% of the patients with peripheral lymphatic irradiation and more than 200 cGy per day was not recommended (7,8,11).

Restricted mobility of the shoulder was reported in 0-10% of the cases (6,7). Extensive surgery, late onset shoulder and arm physiotherapy, radiotherapy (RT) to axilla and the presence of lymphedema were responsible for its occurrence.

In this study, long term arm morbidity and its related factors have been evaluated in breast cancer patients operated with MRM and BCS-AD.

MATERIALS and METHODS

Two hundred ninety nine patients that had been operated with MRM and BCS-AD have been enrolled in this study. All the cases had been operated by the 4th Department of Surgery in Ankara Oncology Hospital and completed their adjuvant treatments at least 6 months prior to enrollment. The patients with loco-regional or distant recurrence and bilateral breast cancer were not included. N. thorasicus longus, n.

thoracodorsalis and medial and lateral pectoral nerves were tried to be preserved and n. intercostobrachialis was routinely transected during surgery. Shoulder movements were not allowed during post-operative first week and physiotherapy programme was started at the 7th post-operative day.

Demographic features, complaints and physical examination findings were evaluated. Age, educational status, occupation, body mass index (BMI), concurrent systemic and rheumatological diseases, smoking habits, surgery, adjuvant treatments, metastatic and total number of dissected lymph nodes and preserved nerves during surgery have been evaluated. The complaints have been questioned under the headings of pain, loss of strenght, restricted mobility, numbness, stiffness, arm swelling and infection.

The mobility and muscle strenght of the arm was evaluated with physical examination in comparison to the non-operated side. The loss of strenght in adduction, abduction, extension, flexion, inner rotation, and outer rotation was recorded.

SPSS 10.00 programme was used, the comparisons between groups was made with chi-square testing and p values less than 0.05% was recorded as significant. Forward Logistic Regression analysis was used for multivariate analysis.

RESULTS

The mean age of the patients was 50.6 (28-78) and the mean follow-up was 40.3 (10-276) months. The demographic features of the patients are summarized in Table 1.

The distribution of the complaints are shown in Table 2. The most frequent complaint was the pain, but the visual analog scale (VAS) score was ≤ 5 in 92.1% of the patients.

The physical examination findings are summarized in Table 3.

Pain was seen in 90 (56.6%) of 159 patients aged under 50 and 50 (35.7%) of 140 patients aged over 50. The pain was seen in 64 (37.6%) of 170 patients that had not been given RT. But it was seen in 27 (64.2%) of the 42 patients that had been given RT to the chest wall and 49 (56.3%) of 87 patients that had been given RT to axilla. While the pain was seen in 75 (44%) of the 135 patients with arm swelling, it was seen in 65 (38.4%) of the 169 patients without arm swelling. The factors related with the pain were age

Table 1. Demographic features of study population.

		n	%
Age	< 50	159	53.2
	> 50	140	46.8
Education	None	73	24.4
	Primary-high	166	55.5
	University	60	20.1
Occupation	Housewife	222	74.2
	Worker	77	25.8
BMI*	Thin-normal	81	27.0
	Fat	218	73.0
Dominant hand	Right	293	97.9
	Left	6	2.1
Rheumatoid disease	No	269	89.9
	Yes	30	10.1
Hypertension	No	231	77.2
	Yes	68	22.8
Diabetes mellitus	No	267	89.2
	Yes	32	10.8
Smoking	Non-smoker	257	86.0
	Smoker	42	14.0
Surgery	MRM**	271	90.6
	BCS-AD***	28	9.4
Operated side	Right	153	51.2
	Left	146	48.8
Nerves	Non-protected	206	68.8
	Protected	93	31.2
Total number of LNs	> 20	161	53.8
	10-20	120	40.1
	< 10	18	6.1
Metastatic LNs	Yes	142	47.4
	No	157	52.6
Chemotherapy	Given	236	78.9
	Not given	63	21.1
Hormonotherapy	Given	218	72.9
	Not given	81	27.1
Radiotherapy	Not given	170	56.8
	To the chest wall	42	14
	To the axilla	87	29.2

* BMI: Body mass index.
** MRM: Modified radical mastectomy.
*** BCS-AD: Breast conserving surgery-axillary dissection.

under 50 [$p=0.001$, relative risk (RR): 2.4], RT to the chest wall and axilla ($p=0.033$, RR: 2.8 and $p=0.006$, RR: 1.7 respectively) and arm swelling ($p=0.003$, RR: 2.1) (Table 4).

Numbness was seen in 44% of the patients aged under 50 years and 26.4% of the patients aged over 50 years. Numbness was also seen in 89 (32.8%) of

Table 2. The distribution of complaints.

	n	%
Pain	140	46.9
Numbness	107	35.7
Loss of strenght	70	23.4
Stiffness	74	24.7
Swelling of the arm	130	43.4
Loss of motion		
Non-minimal loss	274	91.6
Moderate-extreme loss	25	8.4
Infection in the arm	16	5.3

Table 3. The distribution of physical examination findings.

	n	%
Loss of strenght	53	17.3
Restricted mobility	89	29.7

271 patients that had been operated with mastectomy and 18 (64.2%) of 28 patients that had been operated with BCS-AD. The factors related with numbness were age under 50 ($p=0.002$, RR: 2.1) and the BCS-AD ($p=0.002$, RR: 3.6) (Table 4).

Loss of strength was seen in 27.6% of the patients aged under 50 years and in 18.5% of the patients aged over 50 years. While the loss of strength was seen in 42 (28.7%) of 146 patients that been operated on the left breast, it was seen only in 28 (18.3%) of the 153 patients that had been operated on the right breast. Loss of strength was seen in 35.3% of the patients with arm swelling and 14.2% of the patients without swelling. The factors related with loss of strength were age under 50 ($p=0.048$, RR: 1.7), surgery to the left breast ($p=0.025$, RR: 1.9) and the presence of the arm swelling ($p=0.001$, RR: 3.6) (Table 4).

Stiffness was seen in 25 (14.7%) of 170 patients that had not been given RT. But it was seen in 18 (42.8%) of 42 patients that had been given RT to chest wall and 31(35.6%) of 87 patients that had been given RT to axilla. While it was seen in 40% of the patients with arm swelling, the incidence was only 13% for the patients without arm swelling. The factors related with stiffness were the presence of arm swelling ($p=0.001$, RR: 4.1) and RT to the chest wall and axilla ($p=0.006$, RR: 2.4 and $p=0.001$, RR: 4 respectively) (Table 4).

Table 4. Factors related with complaints (multivariate analysis).

		p	Relative risk	%95 Confidence interval	
				Min	Max
Pain	Age < 50	0.001	2.493	1.532	4.058
	RT* (chest wall)	0.006	2.801	1.341	3.821
	RT(axilla)	0.033	1.721	0.991	3.011
	Arm swelling	0.003	2.149	1.308	3.529
Numbness	Age < 50	0.002	2.164	1.316	3.559
	BCS-AD**	0.002	3.611	1.578	8.259
Loss of strenght	Age < 50	0.048	1.790	1.004	3.190
	Side (left)	0.025	1.923	1.084	3.406
	Arm swelling	0.001	3.678	2.061	6.561
Stiffness	Arm swelling	0.001	4.123	2.275	7.472
	RT (chest wall)	0.006	2.460	1.290	4.466
	RT (axilla)	0.001	4.039	2.231	7.311
Restricted mobility	Diabetes mellitus	0.022	3.403	1.191	9.725
	Arm swelling	0.001	4.907	1.876	12.837
Infection	Arm swelling	0.003	21.827	2.854	166.926

* RT: Radiotherapy.
** BCS-AD: Breast conserving surgery-axillary dissection.

Restricted mobility was seen in 19 (7.1%) of 267 non-diabetic patients and 6 (18.7%) of 32 diabetic patients. It was seen in 3.5% of the patients without arm swelling and 14.2% of the patients with arm swelling. Factors related with restricted mobility were the presence of diabetes mellitus (p= 0.022, RR: 3.4) and arm swelling (p= 0.001, RR: 4.9) (Table 4).

The infection in the arm was seen in 15 (11.5%) of the patients with arm swelling, but it was seen only in 1(0.5%) patient without arm swelling. The arm swelling was related with the infection in the arm (p= 0.003, RR: 21.8) (Table 4).

Loss of strength at physical examination was seen in 31 (15%) patients with preserved nerves and in 22 (23.6%) of the patients without preserved nerves. Loss of strenght was seen in 39 (27.4%) patients with axillary metastasis and 14 (8.9%) patients without axillary metastasis. Factors related with loss of

strength were damage to the nerves (p= 0.034, RR: 2) and presence of axillary metastasis (p= 0.001, RR: 4.1) (Table 5).

Restricted mobility at physical examination was seen in 17 (53.12%) diabetic patients and in 72 (26.9%) non-diabetic patients. It was seen in 60 (42.2%) patients with axillary metastasis and 29 (18.4%) patients without axillary metastasis. While it was seen in 60 (46.1%) patients with arm swelling, the rate was decreasing to 29 (17.1%) patients without swelling. Factors related with restricted mobility were the presence of diabetes mellitus (p= 0.002, RR: 3.7), axillary metastasis (p= 0.001, RR: 2.9) and arm swelling (p= 0.001, RR: 4.1) (Table 5).

The distribution of the restricted mobility at physical examination is outlined in Table 6. Both abduction and adduction of the arm were the most frequently altered movements.

Table 5. Factors related with physical examination findings (multivariate analysis).

		p	Relative risk	%95 Confidence interval	
				Min	Max
Loss of strenght	Lymph node metastasis	0.001	4.122	2.107	8.064
	Not preserved nerves	0.034	2.002	1.055	3.799
Restricted mobility	Diabetes mellitus	0.002	3.784	1.649	8.680
	Lymph node metastasis	0.001	2.966	1.700	5.175
	Arm swelling	0.001	4.182	2.387	7.327

Table 6. The distribution of the restricted mobility at physical examination (n= 89).

Movements	Study population		Physical examination findings	
	(n= 299)	(%)	(n= 89)	(%)
Abduction	85	28.5	85	95.5
Adduction	73	24.4	73	82.0
Internal rotation	31	10.3	31	34.8
External rotation	28	9.3	28	31.4
Extention	49	16.3	49	55.2
Flexion	42	14.0	42	47.1

DISCUSSION

Standardized criteria to define arm morbidity after mastectomy and axillary dissection are lacking at the present and therefore the incidences are quite different between series.

The incidence of pain after axillary dissection was between 12-51% (12). In a series by Peter et al. the incidence was 45% but the VAS scores were < 5 for most of the patients (13). Similarly, Roses et al. reported that only 2.3% of their patients with pain were using analgesics (10). Our study findings were in accordance with these high incidence and low need for analgesics figures. In a study with 368 patients, Liljegren has reported the incidence as 49.2% for patients aged under 65 and 28.2% for patients aged over 65 and the possible explanation for this was the more frequent use of the arm in the younger age group (14). In a study with 222 patients, Hack et al. has also reported a significant correlation between the pain and the young age, the number of dissected lymph nodes and chemotherapy (15). The chronic pain described on the chest wall after RT might be related with the periosteal inflammation of the ribs (16,17). In our series, pain was also the most frequent complaint of the patients with RT to the chest wall. The decrease in the incidence of pain with fractionated 50 cGy RT has also been reported (18). The incidence of pain in a group of patients treated for lymphedema was 30% and lymphedema was found to be one of the factors associated with increased incidence (9).

Numbness is one of the most frequent complaints and frequently observed on the chest wall and inner aspect of the upper arm. The incidence was between 20-80% (7,14). In a series with 200 patients, Roses et al. reported that numbness was seen in 76.5% of the patients with level I-II axillary dissection during the first year of follow-up and it was completely disap-

peared in 22% of the cases and found to be stable in 18% of the cases (10). Ververs et al. reported that the risk for numbness was 6.79 fold higher for the patients younger than 45, compared with the patients over 65 and the young age was found to be the most important risk factor (19). One possible explanation for this may be the more extended dissection to increase cure chance of the younger patients. Tasmuth et al. had compared the incidence between radical and conservative surgery groups and reported the same incidence as 75% for both groups (8). But in our study, the incidence was 64.2% and 32.8% in BCS-AD and MRM group respectively. The explanation of this may be the anatomy of the nerves at the surgical area. Cutaneous branches of brachial plexus and their anastomosis are located both in the axillary fossa and medial aspect of the upper arm. When intercostabrachial nerve is damaged, fascicules originating from T1 and T3 innervates this area. Separate axillary incision used in our BCS-AD may damage these branches.

In a series by Kwan et al. the incidence for the loss of strength was between 17-33% (20). Tasmuth et al. also reported that the incidence was higher when the surgery performed on the dominant hand side (8). But in our series the incidence was 28.7% for the left breast and 18.3% for the right breast. One possible explanation for this might be the more frequent use of dominant arm.

Kwan et al. reported that in the presence of lymphedema, stiffness of the arm and shoulder increases from 2% to 7.1% and 5.9% to 14.2% respectively (20). The removal of lymphatic tissue with axillary dissection decreases inflammatory response in the arm. Besides, interstitial fluid, rich for proteins and lipids, is a suitable environment for bacterial growth. Infection may also contribute to the pathogenesis of lymphedema (10).

Restricted mobility was seen in 2-51% of the patients with mastectomy and as in the case in our study, the most frequently affected movement was abduction (12). More than 50% restriction is described as "heavy loss of mobility". Gutman and Molinaro had explained the reasons as; post-operative pain, scapular tissues, loss of skin, damage to nerves (the medial and lateral pectoral nerves, n. thoracicus longus and n. toracodorsalis) and hyperabduction of the arm during the operation resulting with the brachial plexus damage (21,22). Gerber et al. had reported that there was no difference between BCS-AD and MRM with respect to the arm mobility, but the recovery period after BCS-AD was shorter than MRM (17). Christensen et al. reported that, restricted mobility was more prominent for patients that RT given to the chest wall and axilla (23). Keramopoulos et al. also reported that, mobility problems were much more prominent for the patients with more than 9 metastatic axillary lymph nodes and possible explanation was more extensive dissection and damage to the nerves for patients with macroscopically involved axillary lymph nodes (24). However, Kuehn et al. reported that, axillary metastasis had no impact on arm mobility (25). In our study, axillary lymph node metastasis had a negative influence on arm mobility (42.2% vs 18.4%, $p=0.001$). Diabetes mellitus was also one of the factors affecting arm mobility. Neuropathy and vasculopathy caused by diabetes, poor wound healing and increased tendency for wound infections may contribute to this situation.

CONCLUSION

Axillary lymph node metastasis was not observed in about half of our study population. In general, arm morbidity is observed in 50% of patients with axillary lymph node dissection. This rate increases to 70% with radiotherapy. Unnecessary lymph node dissection should be avoided to decrease arm morbidity. Its imperative that axillary lymph node dissection should be performed in accordance with the results of sentinel lymph node biopsy.

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