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Factors Affecting Seroma Formation after Mastectomy with Full Axillary Dissection

M. Akinci, B. Cetin**, S. Aslan*, H. Kulacoglu**

*Ankara Diskapi Education and Research Hospital, Department of General Surgery, Ankara Turkey ; **Ankara Oncology Education and Research Hospital, Department of General Surgery, Ankara, Turkey.

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Abstract. *Background and objectives :* Seroma formation is the most common complication after breast cancer surgery, especially when axillary dissection is performed. This clinical research was undertaken to identify factors that predict the development of seroma after modified radical mastectomy for breast cancer.
Methods : 40 patients with primary breast cancer were included. Modified radical mastectomy with full axillary dissection was performed without electrocautery dissection. The seroma was diagnosed clinically by detection of the collection beneath the skin flaps. Drains were retained until the 24 h total output was ≤ 40 ml.
Results : A total of 40 patients with a mean ± age of 53 ± 11 years were included in this study. Nine patients (27.5%) developed seroma after mastectomy. Patients with hypertension were more likely to develop seroma after mastectomy (50% versus 11% in patients without hypertension), but no such difference was found with age, tumour size, total number of lymph nodes or metastatic lymph nodes. When a drain was required for > 7 days, seroma formed more often (36.4%) as compared to when the drain stayed for a shorter time (6%).
Conclusions : It is concluded that hypertension and a drainage flow rate greater than 40 mL/day for more than 7 days predict seroma formation following breast cancer surgery.

Introduction

Seroma formation is the most common complication following mastectomy (1). Seroma formation after mastectomy, which is a sterile collection of serous fluid at the operative site beneath the skin flaps, typically delays recovery and adds to morbidity. There have been various methods for preventing seroma, such as prolonged suction drainage, shoulder immobilisation, suturation of dead place, peri-operative use of tranexamic acid, ocreotide usage, dressing compression, tissue sealers, etc., but these methods for the prevention and treatment of seroma remain varied and inconclusive. Seroma may prolong recovery, length of hospital stay, delay the initiation of adjuvant therapy, predispose to wound infection, delay wound healing and has also been linked to arm lymph oedema and the over-stretching of the health budget.

The main pathophysiology of seroma is not well understood and is still controversial. Although association with morbidity and financial problems are clear, the optimal ways to reduce the incidence of seroma formation are not well known.

This clinical research was undertaken to identify factors that predict the development of seroma in breast cancer patients after modified radical mastectomy with full axillary dissection.

Materials and methods

Forty patients with primary breast cancer were included in the study. The patients were admitted to Ankara Oncology Research and Training Hospital and Ankara Diskapi Research and Training Hospital. Modified radical mastectomy with full axillary dissection was performed in all patients. Electrocautery dissection and postoperative compression dressings were not used. Patients who received neo-adjuvant chemotherapy or had local advanced stage cancer were excluded from the study. Double-sided silicone hemovac drains were used. Drains were retained until the twenty-four hour total output was less than or equal to 40 ml. The diagnosis of seroma was made clinically when a collection was detected beneath the skin flaps. Aspiration under sterile conditions was performed for both diagnostic confirmation and management.

The relationships between the seroma formation and age, presence of diabetes mellitus, hypertension, time to the removal of the drains, total number of lymph nodes sampled, the number of metastatic lymph nodes, the total number of lymph nodes sampled from the apex, the number of metastatic lymph nodes sampled from the apex, and tumor size were investigated. The patients were grouped according to whether the total number of lymph nodes were more or less than 20, whether the total

Table I

Clinical characteristics and seroma formation.
Data is given as n (%). *p < 0.05

	Seroma	
	Absent	Present
Age < 50	19	2
Age ≥ 50	12	7
Diabetes Mellitus absent	27	7
Diabetes Mellitus present	3	3
Hypertension absent	25	3
Hypertension present*	6	6
Tumour size < 2 cm	7	1
Tumour size 2-5 cm	16	5
Tumour size > 5 cm	8	3
Total number of lymph nodes ≤ 20	13	3
Total number of lymph nodes > 20	18	6
0-3 lymph node metastasis	22	5
≥ 4 lymph node metastasis	9	4
≤ 3 level III lymph nodes	14	1
> 3 level III lymph nodes	17	8
No level III metastasis	24	6
≥ 1 level III metastasis	7	3
Drainage time ≤ 7 days	17	1
Drainage time > 7 days*	14	8

number of metastatic lymph nodes were N1 (less than 4, or more than or equal to 4), whether the total number of lymph node samples from the apex was equal to or less than 3, or more than 3, N_{3c} status (whether there are metastatic lymph nodes in the apex), whether the patients were less than 50 years old or not, had hypertension or not, whether the drains were removed after equal to or less than 7 days or not, and according to T1, T2 and T3 (tumour size). The subgroups were compared regarding the incidence of the seroma formation.

Student's t test was used with continuous variables and the chi-square test for categorical situations for subgroup comparisons. Fisher's exact test was applied when small numbers were encountered. A two-tailed test of P<0.05 was considered significant. Univariate analyses were performed to compare the patients who developed seroma with the patients who did not develop seroma regarding age, hypertension, diabetes, tumour size, total number of dissected lymph nodes, number of metastatic lymph nodes, and time to the removal of the drains.

Results

A total of 40 patients with a mean ± age of 53 ± 11 years were included in this study (Table I). Nine patients (27.5%) developed seroma after mastectomy. Two out of 21 patients less than 50 years of age developed seroma (9.5%) with an incidence statistically similar to older patients (36.8%).

Patients with hypertension (12 patients) were more likely to develop seroma after mastectomy compared to patients without hypertension (50% versus 11% respectively, p = 0.03), but no such difference was found in patients with diabetes mellitus.

There were no differences in the incidence of seroma formation between the patients with a tumour size of less than 5 cm (T1 + T2, 29 patients) and those with a tumour of more than 5 cm (T3, 11 patients). The total number of lymph nodes sampled from the patients was 23 ± 8. No differences in the incidence of seroma formation were found between the patients with 20 lymph nodes or less taken out (16 patients) and where more lymph nodes were sampled (24 patients). Twenty-one (52.5%) patients had metastatic lymph nodes. The median (range) number of metastatic lymph nodes in these patients was 4 (1-42). There were no differences in the incidence of seroma formation between the patients with either no metastasis or up to 3 metastatic lymph nodes ($N_0 + N_1$, 27 patients) and the patients with 4 or more metastatic lymph nodes (13 patients). The mean ± SD number of lymph nodes from level III dissections was 5 ± 3. No differences in the incidence of seroma formation were found between the patients with less than 3 lymph nodes taken out from level III dissection (15 patients) and where more lymph nodes were sampled (25 patients). The incidence of seroma formation was similar in patients without metastasis in level III dissection (30 patients) to the incidence in patients with at least one metastasis (N_{3c}, 10 patients).

The drains were removed on the mean ± SD 9 ± 3 postoperative day. When a drain was required for > 7 days, seroma formed more often (36.4%) as compared to when the drain stayed for a shorter time (5.6%) (P = 0.011).

Discussion

The 27.5% incidence of seroma formation in this report is acceptable, as it varies widely between 15 and 81% in the literature . It is known that high volume seroma forms especially when axillary dissection is performed, such as in our patients (2). Our patients were standardised patients with the full axillary dissection and modified radical mastectomy. Indeed, for further standardisation electrocautery dissection (2) and compression dressing (3) were not used in order to avoid the thermal or compression trauma that augment the seroma formation.

Although it was previously shown that the most important factors in the causation of seroma were the number and extent of axillary lymph node involvement (4), in this research neither the number nor the involvement of the axillary lymph nodes affected the seroma formation. Peculiar to this study, we investigated the effects of the number of dissected level III lymph nodes and level III metastasis lymph nodes on seroma formation. We found that the number of dissected level III lymph nodes and whether lymph nodes of level III had metastasis or not, did not have any role in seroma formation.

It has been reported that the only statistically significant factor influencing the incidence of seroma formation is the type of surgery (5, 6). The incidence of seroma is lower if conservative breast surgery is performed due to the limited dead space. Therefore there is no need for extra research or for a control group. Similarly, employing immediate breast reconstruction with prostheses reduces postoperative seroma formation (7). The tension in the breast pocket could balance between fluid absorption and excessive production and additionally, it appears that immediate reconstruction may reduce the incidence of postoperative seromas, presumably by filling the dead space in the chest wall (7, 8).

Retention of the drain in-situ for a longer period seems to be a logical measure, as formed seroma usually subsides with aspiration (9). A drain retained in-situ for longer than eight days due to a persistently high output is probably a direct reflection of an underlying tendency to excessive fluid production (10). We also found that the drain retained for more than seven days due to high flow was an alert for seroma. Although some may advocate removal of the drain as early as possible, we suggest waiting until the drainage is 40 mL/day or less, supporting Dalberg *et al.* (11) who reported that early removal of axillary drain shortened the length of hospital stay but with a significantly higher incidence of seroma.

We have identified hypertension as a risk factor for seroma, very much like Loo and Chow (10) but we identified that the patient's age was not associated with seroma formation, unlike them. Similar findings have also been reported by Kumar *et al.* (12) who postulated that a higher tendency to continuous exudation at the operative site is responsible for the association between hypertension and seroma formation. Hypertension contributes to seroma formation, probably by way of prolonged oozing from the large mastectomy wound (12). In a further study, it would be interesting to investigate if the volume or duration of seroma formation correlated with the degree of hypertension.

Diabetes was not significantly associated with seroma formation in our study. Similarly, no individual study found a significant association with diabetes and seroma formation (12-14).

Lumachi *et al.* (15) identified tumour size as a factor affecting seroma development. However, our results are comparable with those of Gonzalez *et al.* (16) and Hashemi *et al.* (6) all of which suggest that size of tumour, patient's age, positive axillary lymph nodes, or number of lymph nodes dissected are not associated with seroma development.

Conclusions

We concluded that hypertension and a drainage flow rate greater than 40 mL/day for more than 7 days predict seroma formation following breast cancer surgery. As it is estimated that approximately 85,000 women will develop wound seroma annually after breast cancer surgery in the USA alone, new techniques and strategies have to be sought in order to decrease the incidence of seroma formation.

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M. Akinci, M.D.
1468.Sokak. Lale apt No : 4/14 06520
Cukurambar Ankara, Turkey
Tel. : 0090 505 6253175
Fax : 90 312 3454979
E-mail : melihakinci@yahoo.com