RESEARCH ARTICLE

Expanding scope about factors influencing seroma formation after breast cancer surgery

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Abstract

Objectives: To determine the incidence of seroma formation after breast cancer surgery, and its association with common risk factors.

Method: The correlational study was conducted at the General Surgery department of Kafrelsheikh University Hospital, Egypt, from March 2020 to March 2022 and comprised patients having breast cancer stage I, II or III, as per the Tumour-Node-Metastasis classification, who were scheduled to undergo modified radical mastectomy, breast conserving surgery or reconstructive surgery. Baseline, intraoperative and postoperative data was collected on a proforma. Data was analysed using SPSS 22.

Results: Of the 50 female patients with mean age 45±5.20 (range: 20-70 years), 30(60%) were in the elderly group aged >45 years, while 20(40%) were aged <45years. Overall, 12(24%) cases developed seroma; 9(30%) in the elderly group. There were 24(48%) cases of modified radical mastectomy, and 8(33.3%) had seroma. Electrocautery was used for breast dissection in 30(60%) cases, and, among them, seroma developed in 10(33.3%) patients.

Conclusion: Age, body weight, afflicted breast side, site, and size of breast mass were not found to be significant predictors of seroma formation following breast cancer surgery.

Keywords: Seroma, Breast neoplasms, Neoadjuvant therapy, Electrocoagulation, Wound healing, Lymph nodes, Obesity. **DOI: 10.47391/JPMA.EGY-S4-55**

Introduction

A seroma is an accumulation of serous fluid that originates during a mastectomy or in the dead space within the axilla following axillary dissection. The incidence of seroma formation after breast surgery ranges from 2.5% to 51%.[1] Furthermore, breast carcinoma (BC) is the most common malignancy among women, and the most commonly performed BC surgery is modified radical mastectomy (MRM), with seroma development and upper limb lymphoedema being the most common consequences following mastectomy, which continue to be substantial concerns in the postoperative phase.[2] Seroma is significant because it can cause pain and discomfort to the patient, and a negative psychological outcome is possible in stromatous patients due to frequent aspirations and a higher risk of wound infection and flap issues.[3] Several factors, including the patient's age and body mass index (BMI), effect of neoadjuvant chemotherapy (NAC), energy source type employed in dissection, removal of the pectoral fascia, postoperative shoulder joint exercise, duration of wound drainage, types of suction drain used, postoperative use of platelet-rich plasma or pressure garment, and the time of breast reconstruction after mammoplasty, have been reported as risk factors for seroma formation.[4]

The current study was planned to determine the incidence of seroma formation after breast cancer surgery, and to look into its association with several common risk factors.

Patients and Methods

The correlational study was conducted at the General Surgery department of Kafrelsheikh University Hospital, Egypt, from March 2020 to March 2022. After approval from the institutional ethics review committee, the sample was raised using convenience sampling technique. Those included were patients having breast cancer stage I, II or III, as per the Tumour-Node-Metastasis (TNM) classification[5], who were scheduled to undergo MRM, breast conserving surgery (BCS) or reconstructive surgery. Those excluded were patients with stage IV disease having metastatic connective tissue beyond surgical intervention, steroid use, anticoagulation, dangerous systemic infection, and history of connective tissue disease. All participants signed an informed consent after explaining the objectives of the study.

Patients were subjected to detailed history, including

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surgical and medical history, chemotherapy and past radiation therapy, and associated co-morbidities, like smoking, diabetes and renal insufficiency. Routine clinical examination was performed inclusive of preoperative body weight, laboratory tests, radiological tests, including breast ultrasound, mammography and magnetic resonance imaging (MRI) ,if indicated, along with fine needle aspiration cytology (FNAC), or trucut biopsy, and metastatic workup. Intraoperative data collected included the procedure, total number of axillary lymph nodes (LNs) removed, tumour size, and the use of electro-coagulation and other methods.

Postoperative data included duration of hospital stay, drain removal day, complications, like infection, flap necrosis, haematoma and open wound, incidence of seroma, volume of seroma aspirate, and the number of postoperative visits. After surgery, all patients were discharged with drains, and they were followed up in the outpatient clinic (OPC) until the drains were removed, with instructions to return to the clinic early if the drain bottle touched its capacity. The drain was removed when its output decreased to <50ml in 24 hours. Seroma was considered if the residual serous fluid accumulated in the breast after drain removal.

All surgeries were performed by a single expert breast team with more than 10 years of experience using a harmonic scalpel and electrocautery. The procedures included MRM[6] (Figure 1), BCS, which included tumerectomy or lumpectomy [7] or quadrantectomy (segmental resection)[8] (Figure 2). If indicated, skin sparing mastectomy (SSM)[9] was performed (Figure 3).

Data was analysed using SPSS 22. Qualitative data was expressed as frequencies and percentages. After determining data normality using the Shapiro-Wilk test, quantitative non-parametric data was expressed as median with interquartile range (IQR)) and quantitative parametric data as mean and standard deviation. P<0.05 was considered statistically significant.

Results

Of the 50 female patients with mean age 45±5.20 (range: 20-70 years), MRM was used in 24(48%) cases, BCS 10(20%), SSM with latissimus dorsi (LD) flap 10(20%) and SSM with implant 6(12%) (Table 1). There were 30(60%) patients in the elderly group aged >45 years, while 20(40%) were aged <45 years (Table 2).

Overall, 12(24%) cases developed seroma; 9(30%) in the elderly group. Among the 24(48%) MRM cases, 8(33.3%) had seroma. Electrocautery was used for breast dissection in 30(60%) cases, and, among them, seroma developed in 10(33.3%) patients.

Early active shoulder exercises were started in 20(40%) cases, and, of them, 12(60%) developed seroma (Table 3). Postoperatively, drain removal day, use of pressure garment and cautery, significantly affected seroma formation (Table 4).

Table-1: Complications of breast cancer surgeries.

Parameters	Modified Radical Mastectomy (n= 24) n (%)	Breast Conserving Surgery (n=10) n (%)	SSM + LD flap (n= 10) n (%)	SSM + implant (n= 6) n (%)	*p-value*
Sub-epidermal nipple necrosis	0 (0)	1 (10)	2 (20)	1 (16.66)	0.725
Total nipple necrosis	0 (0)	0 (0)	1 (10)	0 (0)	0.347
Haematoma	0 (0)	0 (0)	0 (0)	1 (16.66)	0.347
Seroma	8 (33.33)	1 (10)	2 (20)	1 (16.66)	0.144
Infection	0 (0)	1 (10)	0 (0)	1 (16.66)	0.347
Fat necrosis	0 (0)	0 (0)	0 (0)	0 (0)	-
Shoulder pain	2 (6.66)	0 (0)	0 (0)	1 (16.66)	0.301
		Late			
Capsular contracture	0 (0)	0 (0)	0 (0)	1 (16.66)	0.570
Hypertrophied scar	1 (3.33)	0 (0)	2 (20)	0 (0)	0.570

SSM: Skin sparing mastectomy, LD: Latissimus dorsi.

Table-2: Incidence of seroma formation in the study age groups.

	Total number	No seroma (n=38) n (%)	Seroma (n=12) n (%)	Test of significance
Age >45y	30	21 (70%)	9 (30%)	$\chi 2 = 0.469$
Age <45y	20	17 (85%)	3 (15%)	P = 0.494

SSM: Skin sparing mastectomy, LD: Latissimus dorsi.

Table-3: Factors that contributed to either prevention or development of seroma.

	Total number	No seroma (n=16) n (%)	Seroma (n=4) n (%)	Test of significance
Drains removed 3-7 days postoperative	12	3 (25%)	9 (75%)	$\chi 2 = 3.467$ P = 1.287
Drain removed later	38	35 (92.1%)	3 (7.9%)	
Pressure garment	35	33 (94.3%)	2 (5.7%)	
No pressure garment	15	5 (33.33%)	10 (66.66%)	
Delayed active shoulder exercise	30	26 (86.66%)	4 (13.33%)	
Early active shoulder exercise	20	12 (60%)	8 (40%)	

Table-4: Univariate logistic regression of factors affecting seroma occurrence.

Factors affecting seroma	Odds ratio	(95% confidence interval)	*p-value*
Age >45y vs. age<45	0.429	0.036 - 5.063	0.494
Cautery/ vs. no Cautery	1.444	0.109 – 19.216	0.001*
Ordinary vs. no ordinary scalpel	0.692	0.052 – 9.210	0.780
Harmonic vs. No harmonic scalpel	Can't be calculated as all seroma occurs in those with no harmonic Scalpel		0.090
Pressure vs. No Pressure garment	21.0	1.404 – 31.4	0.010*
Delayed vs active shoulder exercise 5-10 days	3.857	0.326 – 45.570	0.264
Drain removed early vs later	2.45	1.43 -4.98	0.003*

* Significant P < 0.05

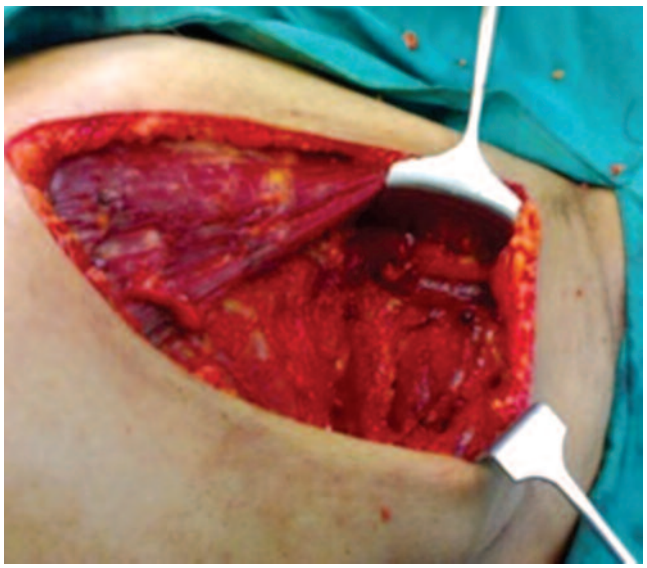

Figure 1: Modified radical mastectomy (MRM).

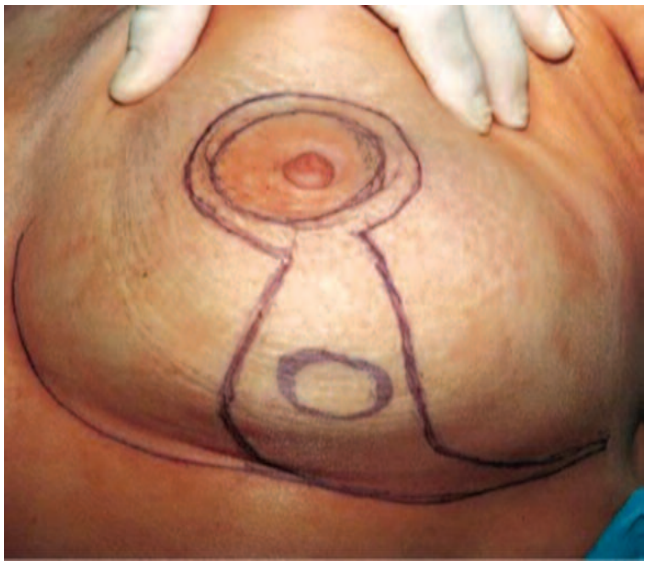

Figure 2: Radial elliptical incision in the lower quadrant for breast-conserving surgery (BCS).

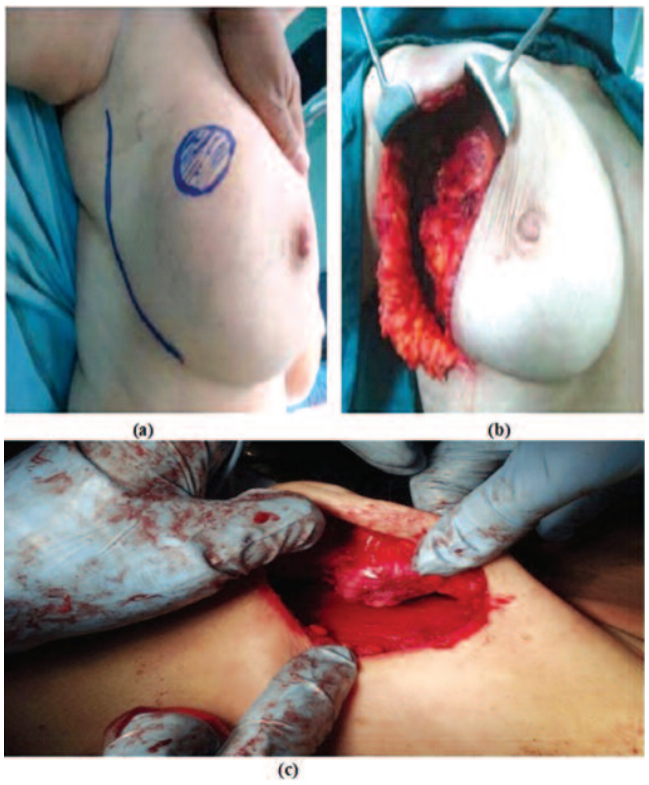

Figure 3: (a-c) Technique of skin-sparing mastectomy (SSM).

Discussion

The incidence of seroma was 24% in the current study. Woodworth et al. reported 25.5% seroma incidence rate in a sample of 252 patients, with dissection performed by cautery in 159 and by the knife in 93.[10] Porter et al. reported seroma incidence of 26% among 80 patients; 50 were dissected using cautery and 30 using a scalpel.[11] The current study found that using electrocautery during dissection increased the frequency of seroma formation postoperatively by 33.3% and was a significant factor. The wound consequences are more visible with electrocautery dissection because of increased thrombosis of subdermal arteries with subsequent ischaemia of the flaps and the heat effects of cautery on the subcutaneous fat (lipolysis).[12] Archana et al. investigated 240 patients and compared electrocautery with harmonic scalpel use, reporting that electrocautery was used in 120 patients, with a higher rate (34.5%) of seroma formation than the harmonic scalpel group.[12] Doughty et al. conducted a study on 40 patients and reported that electrocautery was associated with a higher rate of seroma formation.[13] Jeffery et al. conducted a study on 46 mastectomy patients and reported similar findings.[14] In contrast, Faisal et al. reported no significant difference between the two groups, which could be attributed to the study's small sample size.[15]

The current study found that using a conventional scalpel was associated with a lower incidence of seroma formation than using electrocautery. This lower rate. The finding is in agreement with Doughty et al. who preferred the use of scalpel over electrocautery due to decreased occurrence of seroma.[13] Harmonic scalpel is an essential element in preventing seroma formation during breast cancer surgery because it ensures that lymphatic and blood vessels are perfectly sealed and that there is less heat harm.[13] According to Jeffrey et al., electrocautery has a higher rate of seroma formation than harmonic dissection.[14] Compared to standard electrocautery, harmonic dissection is a better procedure with no sutures and lesser blood loss, postoperative problems, and seroma formation.[15]

The current study found that early drain removal was a significant factor in the development of postoperative seroma. This is required for drainage of lymphatic reconstitution.[16] Gupta et al. showed that 5-day drainage had a higher frequency of seroma formation than 8-day drainage following MRM.[17] In another study, when the drain was withdrawn on the 5th postoperative day, there were 17 cases of seroma out of 120 (29%), and 3 cases of seroma (5%) when the daily drainage was <30ml/day.[18] On the other hand, Parikh et al. randomly assigned 100 MRM patients to have their postoperative drains removed on day 3 or day 6. There was no significant difference in the mean number of seroma formation between the groups (2.9 versus 2.2).[19] A study on the influence of early drain removal and hospital stays time following breast cancer surgery reported that 3(6%) patients developed seroma in the long-stay group, whereas 5(10%) patients got seroma in the short-stay group.[20] There was no significant difference between early and late drain removal, but late drain removal may increase the risk of infection, is more expensive, and inflicts psychological damage.

The current study found that wearing a pressure garment reduced the likelihood of seroma formation. Chen et al. reported that the incidence rate of seroma and other problems was 15.7 in the pressure garment group and 29% in the non-pressure garment group.[21] This could be owing to the pressure garment's early obliteration of the dead space.

The current study found that delayed active shoulder exercise 5-10 days after surgery greatly reduced the occurrence of breast seroma. It can be explained by skin flap adhesion after dissection and the obliteration of dead space generated by vigorous shoulder action. In a study, delaying active shoulder activity and shoulder immobilisation, especially till the end of the first postoperative week, was found to lower the incidence of breast seroma while having no change in shoulder joint stiffness compared to the other group.[22]

The current study has limitations as the sample size was not calculated which may have influenced the power of the study. Besides, the sample was raised using convenience sampling technique due to geographical proximity, availability at a given time, or willingness to participate in the research.

Conclusion

The use of scalpels and harmonics, as well as the avoidance of electrocautery were found to help prevent seroma formation after breast cancer surgery. Delaying the removal of wound drains till their daily output is <50cc, using a pressure garment early post-surgery, and delaying active shoulder exercises 5-10 days after the surgery were found to be effective in preventing seroma formation. Age, body weight, afflicted breast side, site, and size of breast mass were not found to be significantly associated with seroma formation after breast cancer surgery.

Disclaimer: An abstract of the idea of this study was presented by the corresponding author (descriptive abstract) in the international conference on breast surgery held in Dubai, March 2020. Abstract Number 2, Page 3, in the Abstract Book entitled 'Breast Cancer Dubai 2020'.

Conflict of Interest: None.

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