

## **Incidence of Seroma Formation after using Flap Fixation Technique in Modified Radical Mastectomy**

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### **ABSTRACT**

**Background:** Breast cancer is the most common female cancer and the second leading cause of cancer death among women. Seroma is a pocket of clear serous fluid that develops in the body after surgery. Seroma is thought to be caused by the fact that the mastectomy operation leaves a lot of an empty space which can ooze serous fluid causing it to gather up in the space beneath the wound. This study aimed to evaluate the mechanical closure effect of the dead space by suture fixation of the mastectomy flaps to the underlying chest wall on the seroma formation after mastectomy.

**Patients and methods:** A clinical trial study involved 54 patients with breast carcinoma admitted for modified radical mastectomy at the oncosurgery unit, general surgery department, faculty of medicine, Zagazig University Hospitals. Patients were divided equally into: (a) study group and (b) control group. The postoperative results have been compared between the two groups and the effect of flap fixation on the amount and duration of fluid drainage and formation of seroma was concluded.

**Results:** The present study showed a statistically non-significant difference between the studied groups regarding age. There is statistically non-significant difference between the studied groups regarding side of lesion or presence of skin changes. There is statistically non-significant difference between the studied groups regarding pathological type. IDC was the commonest type in each group. There is significant difference between the studied groups regarding days till drain removal which was significantly higher in classic technique group. Regarding postoperative complications, there was 85.2% of flap fixation group had no postoperative complications compared to 59.3% of the classic group.

**Conclusion:** The flap fixation technique is proving its validity in decreasing the incidence of seroma formation and its subsequent complications, so that it can be introduced as a step in the mastectomy operation.

**Keywords:** Mastectomy; Seroma Formation; Flap Fixation Technique

### **INTRODUCTION**

Breast cancer is the commonest female malignancy worldwide. Surgical treatment in the form of either breast conserving surgery or modified radical mastectomy (MRM) with axillary clearance remains the standard treatment for operable breast cancers (1).

Ideal wound closure should minimize lymph spillage and serumoozing, provide a means of holding skin flaps securely to the chest wall structures, obliterate dead space, and allow rapid removal of fluid as it forms. For this, several techniques of flap fixation or wound drainage, as well as limitation of post operative shoulder movement and injecting different chemical substances as thrombin, tranexamic acid and fibrin

glue have been proven to improve primary healing and minimize seroma formation, also new research project is exploring an injection of steroid after surgery may help prevent seroma formation (2).

Seroma formation after axillary dissection for breast cancer is difficult to be avoided, but it can be minimized by mechanical closure of the dead space. Flap fixation compared to closed suction drainage showed no difference in seroma rates, but patients without drains were discharged earlier (3).

Several postoperative complications were reported such as necrosis of skin flaps, wound dehiscence, hematoma, seroma formation, and surgical site infection. Among them, seroma, a clinically evident subcutaneous collection of serous fluid within a surgical cavity, is the most frequent post-operative complication after breast cancer surgery, developing in approximately 30% of cases. Although seroma is not life threatening, it can lead to significant morbidity as flap necrosis, wound dehiscence, predispose to sepsis, prolonged recovery period, multiple physician visits, and may delay adjuvant therapy (4). Sometimes repeated skin punctures used to drain the seroma, can lead to local infection. Rarely if infection develops, a seroma can lead to a delay in starting chemotherapy (5).

This study aimed to evaluate the mechanical closure effect of the dead space by suture fixation of the mastectomy flaps to the underlying chest wall on the seroma formation after mastectomy.

## PATIENTS AND METHODS

A clinical trial study involved 54 patients with breast carcinoma who admitted for modified radical mastectomy at the oncosurgery unit, general surgery department, faculty of medicine, Zagazig University Hospitals. Patients were divided equally into: (a) study group and (b) control group.

### **Inclusion and exclusion criteria:**

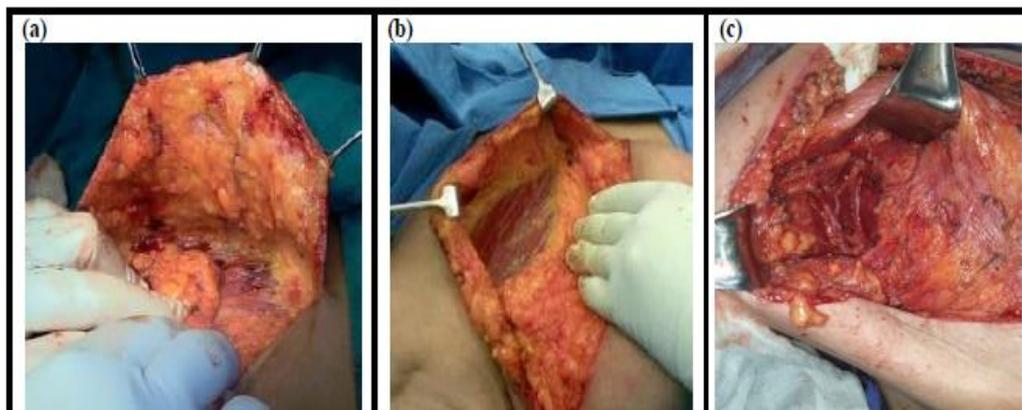
Patients who clinically diagnosed with breast carcinoma eligible for modified radical mastectomy. While, patients have had any immediate reconstructive surgery or post radiotherapy and patients had previous surgery on the axillary lymphatic system were excluded.

### **Methods:**

Breast cancer diagnosis was decided according to full clinical history and examination using Ultrasonography, Mammography, FNAC, Core needle biopsy or excisional biopsy.

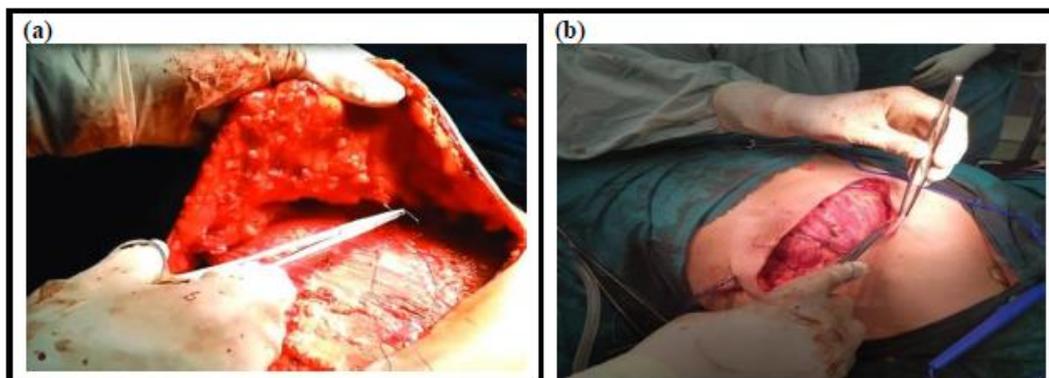
### **Surgical technique:**

The modified radical mastectomy applied for all patients of both groups under general anaesthesia as follow: Incision of skin in a modified radical mastectomy is oriented around the tumor site and nipple-areola complex. Resection with healthy margins must be ensured. Grasping the superior and inferior skin flaps with ring forceps facilitates subcutaneous dissection of the gland. Subcutaneous dissection of glandular tissue continues into the periphery-namely, from the second intercostal space into the infra-mammary fold and from alongside the sternum into the anterior axillary line. Classic axillary dissection is performed. Sentinel lymph-node dissection can be performed through the mastectomy skin incision (Figure 1).



**Figure (1): The modified radical mastectomy showing: (a) elliptical skin incision around the tumor site and nipple areola complex; (b) upper Skin flap is elevated to the indicated line with dissection of subcutaneous adipose tissue ; (c)Optimal exposure of the axillary region after axillary lymph node excision.**

After completing the modified radical mastectomy procedure, in the study group: multiple stitches 3 cm apart in raw s, between the subcutaneous tissues of the skin flaps and the underlying muscles at various parts of the flap and wound edge using fine absorbable sutures (vicryl 3/0). Special attention was taken to the obliteration of the largest potential dead space, the empty axillary apex. While, the wound was closed in the conventional method in the control(Figure 2). Closed suction drains were used in both groups.



**Figure (2): (a) The flap is fixed to the pectoralis by multiple rows of absorbable sutures in the study group ; (b) closures of the skin flap by conventional method in the control group.**

#### **Postoperative care& follow up:**

The post operative results have been compared between the two groups and the effect of flap fixation on the amount and duration of fluid drainage and formation of seroma was concluded.

Formation of seroma was diagnosed clinically as collection of fluid under the mastectomy flaps and axilla as fluctuant, non-tender swelling, radiological evaluation was used in indicated cases.

Patients were followed ups in surgical outpatient clinic at first month, then every two weeks next month.

**Statistical analysis:**

Data analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences SPSS version 23 for data processing and expressed as number and percentage for qualitative variables and mean + standard deviation (SD) for quantitative one. The student "t" test, Mann Whitney test and Chi-square test ( $\chi^2$ ) were used. For all above-mentioned statistical tests done, the threshold of significance was fixed at 5% level (P-value). P value of  $> 0.05$  indicates non-significant results. P value of  $< 0.05$  indicates significant results. The smaller the P value obtained the more significant are the results.

**RESULTS**

The present study showed a statistically non-significant difference between the studied groups regarding age (**Table 1**).

There is statistically non-significant difference between the studied groups regarding side of lesion or presence of skin changes (**Table 2**).

There is statistically non-significant difference between the studied groups regarding pathological type. IDC was the commonest type in each group (63% within flap fixation group versus 66.7% within classic technique group) (**Table 3**).

There is significant difference between the studied groups regarding days till drain removal which was significantly higher in classic technique group (**Table 4**).

Regarding postoperative complications, there was 85.2% of flap fixation group had no postoperative complications compared to 59.3% of the classic group (**Table 5**).

**Table (1): Comparison between the studied groups regarding demographic data:**

	Group		Test	
	Flap fixation group	Classic technique group	t	p
	N=27 (%)	N=27 (%)		
<b>Age (year):</b>				
Mean $\pm$ SD	56.96 $\pm$ 10.37	52.37 $\pm$ 8.78	1.756	0.085
Range	39 – 69	39 – 70		

t Independent sample t test

**Table (2) Comparison between the studied groups regarding side of lesion and skin changes:**

Parameter	Group		Test	
	Flap fixation group	Classic technique group	$\chi^2$	p
	N=27 (%)	N=27 (%)		
<b>Side:</b>				
Right	13 (48.1)	15 (55.6)	0.297	0.586
Left	14 (51.9)	12 (44.4)		
<b>Skin changes:</b>				
Absent	24 (88.9)	25 (92.6)	Fisher	$>0.999$
Present	3 (11.1)	2 (7.4)		

**Table (3) Comparison between the studied groups regarding pathological type:**

Parameter	Group		Test	
	Flap fixation group	Classic technique group	$\chi^2$	p
	N=27 (%)	N=27 (%)		
Type:				
IDC	17 (63.0)	18 (66.7)	MC	0.786
ILC	8 (29.6)	6 (22.2)		
Mixed	2 (7.4)	3 (11.1)		

$\chi^2$ Chi square test MC Monte Carlo test

**Table (4) Comparison between the studied groups regarding days till drain removal:**

Lymph node	Group		Test	
	Flap fixation group	Classic technique group	Z	P
	N=27	N=27		
Days till removal:				
Median			-2.44	0.015*
Range	9 7 – 22	15 7 – 24		

Z Mann Whitney test \*p<0.05 is statistically significant

**Table (5) Comparison between the studied groups regarding postoperative complications**

Complications	Group		Test	
	Flap fixation group	Classic technique group	$\chi^2$	p
	N=27 (%)	N=27 (%)		
Seroma accumulated	1 (3.7)	6 (22.2)	0.081	0.777
Infected seroma	0 (0)	2 (7.4)		
Wound gap	0 (0)	2 (7.4)		
Wound infection	0 (0)	1 (3.7)		
Bad cosmetic appearance	2 (7.4)	0 (0)		
Hematoma	1 (3.7)	0 (0)		
No complications	23 (85.2)	16 (59.3)		

$\chi^2$ Chi square test

## DISCUSSION

A variety of changes in surgical technique have been described in an attempt to reduce post-operative breast and axillary seromas. These can be categorized as changes in operative technique, drain usage, and adhesive techniques which approximate tissue flaps to the chest wall (6).

In this study included 54 patients with breast carcinoma admitted for modified radical mastectomy with axillary lymphadenectomy at the Department of General Surgery on cosurgery at Zagazig University Hospital. The patients were divided equally into 2 groups, the study group and the control group. We aimed to study the effect of mechanical closure of dead space by suture fixation of the mastectomy flaps to the underlying chest wall on the amount and duration of postoperative drainage and seroma formation after mastectomy.

There are two mechanical approaches for closure of dead space beneath skin flaps after breast surgery; compression by external pressure or flap fixation with sutures. The concept of the former is to obliterate dead space by applying external pressure to the flaps and to encourage flap adhesion to the underlying muscles whereas the latter secures skin flaps to the chest wall with sutures. The importance of the latter has long been recognized, particularly by plastic surgeons (7).

Our results showed a statistically non-significant difference between the studied groups regarding age. In our study there is statistically non-significant difference between the studied groups regarding side of lesion or presence of skin changes. There is statistically non-significant difference between the studied groups regarding pathological type. IDC was the commonest type in each group (63% within flap fixation group versus 66.7% within classic technique group).

The key to reducing seroma formation seems to partly lie in the obliteration of dead space. However, the techniques used to achieve this goal are subject of much controversy and debate (8). In a randomised controlled study, it was difficult to elucidate whether reducing the dead space or ligation of lymphatics or a combination of both were responsible for reduction of seroma formation. The extent of the dissection plane seems to be an important factor in seroma formation, and therefore, obliteration of dead space in patients undergoing mastectomy or modified radical mastectomy seems to be pivotal. Pressure garments or compression bandages are not effective in combating seroma; however, quilting of the skin flaps or skin flap fixation seems to be much more effective (9).

Effectively, few articles have been published on the occurrence of seroma and its sequelae in patients undergoing flap fixation after mastectomy for patients with breast cancer (1).

**Coveney et al. (10)** clarified significantly less drainage in the group of patients, where skin flaps were sutured down to the chest wall muscles compared with just conventional skin flap closure.

**Van Bastelaar et al. (11)** have started a prospective, randomized, controlled trial (seroma reduction after mastectomy) to evaluate the effects of flap fixation, including seroma formation and its sequelae, as well as long-term outcome measures, such as cosmesis, shoulder function, patient satisfaction, quality of life, and cost-effectiveness.

**Khater and colleagues (12)** was published in 2015. Patients undergoing modified radical mastectomy (n=120) were randomized into one of the two groups. In the first group, quilting was applied to the skin flaps using a Vicryl 2/0 suture. In the second group, mastectomy was performed in the same manner without quilting of the skin flaps. All patients received a 18-Fr tube drain. Seroma was present in 20% of the patients that underwent quilting and in 78.3% of the patients in the drain-only group (P<0.001). There was a significantly higher number of aspirations in the drain-only group (4.7 vs. 2.1, P<0.001). Postoperative hematoma formation and skin flap

necrosis were indifferent. Patients in the intervention group had a significantly longer operative time in comparison to the drain-only group (127 vs. 105 min,  $P < 0.001$ ).

Also, these results were similar to the results published by **van Bastelaar et al., (11)** with two differences; the first one was that the overall complication rate in our study was slightly higher than that of van Bastelaar et al study; and the second difference was that they did not record the percentage of skin dimpling or shoulder limitation of mobility in their study.

## CONCLUSION

The flap fixation technique is proving its validity in decreasing the incidence of seroma formation and its subsequent complications, so that it can be introduced as a step in the mastectomy operation.

**No Conflict of interest.**

## REFERENCES

- 1- **vanBemmel AJM, van de Velde CJH, Schmitz RF, Liefers GJ. (2011).** Prevention of seroma formation after axillary dissection in breast cancer: a systematic review. *Eur J SurgOncol* 2011; 37:829–835.
- 2- **Narod, S. A. (2018).** Personalised medicine and population health: breast and ovarian cancer. *Human genetics*, 137(10), 769-778.
- 3- **Sowa, Y., Numajiri, T., Kawarazaki, A., Sakaguchi, K., Taguchi, T., & Nishino, K. (2016).** Preventive effects on seroma formation with use of the harmonic focus shears after breast reconstruction with the latissimusdorsi flap. *Journal of plastic surgery and hand surgery*, 50(6), 349-353.
- 4- **Kuroi, K., Shimozuma, K., Taguchi, T., Imai, H., Yamashiro, H., Ohsumi, S., & Saito, S. (2006).** Effect of mechanical closure of dead space on seroma formation after breast surgery. *Breast Cancer*, 13(3), 260-265.
- 5- **Scalise, A., Calamita, R., Tartaglione, C., Pierangeli, M., Bolletta, E., Giocchini, M., Di Benedetto, G. (2016).** Improving wound healing and preventing surgical site complications of closed surgical incisions: a possible role of incisional negative pressure wound therapy. A systematic review of the literature. *International wound journal*, 13(6), 1260-1281.
- 6- **Gong, Y., Xu, J., Shao, J., Cheng, H., Wu, X., Zhao, D., & Xiong, B. (2010).** Prevention of seroma formation after mastectomy and axillary dissection by lymph vessel ligation and dead space closure: a randomized trial. *The American journal of surgery*, 200(3), 352-356.
- 7- **Ten Wolde B, van den Wildenberg FJ, Keemer-Gels ME, Polat F and Storbbe LJ. (2014).** Quilting prevents seroma formation following breast cancer surgery: closing the dead space by quilting prevents seroma following lymph node dissection and mastectomy. *Ann SurgOncol*; 21: 802-7.
- 8- **Gambardella, C., Clarizia, G., Patrone, R., Offi, C., Mauriello, C., Romano, R., Conzo, G. (2019).** Advanced hemostasis in axillary lymph node dissection for locally advanced breast cancer: new technology devices compared in the prevention of seroma formation. *BMC surgery*, 18(1), 1-9.
- 9- **Al-Masri, M., Alawneh, F., Daoud, F., Ebous, A., Hamdan, B., Al-Najjar, H., Abu Farah, M. (2021).** Effectiveness of Cyanoacrylate in Reducing Seroma Formation in Breast Cancer Patients Post-Axillary Dissection: A Randomized Controlled Trial. *Frontiers in Oncology*, 3042.

- 10- Coveney, E. C., O'Dwyer, P. J., Geraghty, J. G., & O'Higgins, N. J. (1993).** Effect of closing dead space on seroma formation after mastectomy--a prospective randomized clinical trial. *European journal of surgical oncology*, 19(2), 143-146.
- 11- vanBastelaar J, Beckers A, Snoeijs M, Beets G, Vissers Y. (2016).** Flap fixation reduces seroma in patients undergoing mastectomy: a significant implication for clinical practice. *World J SurgOncol* 2016; 14:66.
- 12- Khater A, Elnahas W, Roshdy S. (2015).** Evaluation of the quilting technique for reduction of postmastectomyseroma: a randomized controlled study. *Int J Breast Cancer* 2015 287398.