

Effect of Flap Fixation Technique in Modified Radical Mastectomy on Incidence of Postoperative Seroma Formation

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ABSTRACT

Background: The surgical treatment of choice for these patients with breast cancer is either modified radical mastectomy or breast conservation depending upon stage of disease. Seroma formation is the most frequent post-operative complication. The aim of the present study was 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.

Patients and methods: This study included fifty-four patients who admitted at the oncosurgery unit, general surgery department, faculty of medicine, zagazig university hospital. The patients were divided into 2 groups, the study group (27) and the control group (27). The diagnosis of breast cancer was determined according to clinical history, clinical examination and the results of different diagnostic procedures such as Ultrasonography, Mammography, FNAC, Core needle biopsy or Excisional biopsy.

Results: There is statistically non-significant difference between the studied groups regarding number of lymph nodes removed or positive lymph nodes removed. There The amount of seroma was significantly lower in flap fixation group. There is significant difference between the studied groups regarding days till drain removal which was significantly higher in classic technique group. There is statistically non-significant difference between the studied groups regarding need of neoadjuvant chemotherapy.

Conclusion: The flap fixation technique is a valuable procedure that significantly decrease the incidence of seroma formation, the total amount of drained fluid and also allowing for earlier removal of the drains as well as avoiding the patient the seroma complications.

Keywords: Flap Fixation; Breast Cancer; Mastectomy; Seroma Formation

INTRODUCTION

Breast cancer is the most common cancer diagnosed in women, accounting for more than 10% of the new cancer diagnosis each year. Breast cancer is the second most common cause of death from cancer among women after lung cancer. The surgeon role in management of operable breast cancer, have many options including, breast conserving surgery and different types of mastectomies with or without reconstruction (1).

Pathogenesis of seroma formation is poorly understood. Numerous factors take part in the formation of seroma. Dead space formation could be one of the leading mechanisms of postoperative seroma formation. Prolonged postoperative leakage of disrupted lymphatics and minute blood vessels into the dead space mostly is the main

contributing factor in seroma formation (2). The Type of operation, use of electrocautery, obesity and longer and higher drain outputs, are associated with increased risk, however, the age of the patient, neo-adjuvant chemotherapy, total number of retrieved axillary lymph nodes, the number of positive axillary lymph nodes, and the tumor size, are not. The surgical devices (laser scalpel, argon diathermy, and ultrasonic scalpel) have not proven to be superior to electrocautery in seroma reduction (3).

Other several factors make fluid accumulation likely after breast surgery. For example, if the dissection is extensive, it will result in a large dead space beneath the flaps. Irregularity of the chest wall, especially in the deep axillary fossa, makes it difficult for flaps to adhere. Constant chest wall movement due to respiration and shoulder use creates shearing forces that delay flap adhesion (4).

The amount of fluid drained was significantly less in the flap fixation group, and fixing of the skin flaps leads to less seroma formation, and fewer surgical site infections (SSIs) (5).

Therefore, The aim of the present thesis is 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.

PATIENTS AND METHODS

This is a clinical trial on fifty-four patients with breast carcinoma eligible for modified radical mastectomy. The fifty-four patients included from the admitted patients at the oncosurgery unit, general surgery department, faculty of medicine, zagazig university hospital. The patients were divided into 2 groups, the study group (27) and the control group (27).

Inclusion criteria:

Patients with breast carcinoma eligible for modified radical mastectomy.

Exclusion criteria:

Patients have had previous surgery on the axillary lymphatic system, any immediate reconstructive surgery or post radiotherapy.

Preoperative evaluation:

The breast cancer was known preoperatively for the patients. The diagnosis of breast cancer was determined according to clinical history, clinical examination and the results of different diagnostic procedures such as Ultrasonography, Mammography, FNAC, Core needle biopsy or Excisional biopsy.

Operative Assessment:

The classic known modified radical mastectomy was standardized for all patients of the two groups with the operation being done under general anaesthesia as follow:

A) The skin incision in a modified radical mastectomy is oriented around the tumor site and nipple–areola complex. The preferred incision is transverse or oblique, and extends from superolateral to inferomedial. Resection of tumors high in the superomedial quadrant is challenging, in that the scar may extend into the cleavage area. Ultimately, the primary concern is local tumor control.

B) Grasping the superior and inferior skin flaps with ring forceps facilitates subcutaneous dissection of the gland by keeping the skin taut. Care should be taken to remove all of the glandular tissue from the subcutaneous tissue. The technically challenging steps are subcutaneous dissection and exposure of the borders of the

gland. Subcutaneous dissection can be performed well with scissors; for dissecting the breast tissue off the chest wall, a scalpel or electrocautery, the dissection being done with the diathermy in all cases in this study. Bleeding from larger vessels entering from lateral also has to be controlled.

C) In modified radical mastectomy, classic axillary dissection is performed en bloc. Dissection is carried from the peripheral projections of the breast tissue over the lateral border of the pectoralis directly into the axillary adipose tissue. After opening of the preaxillary fatty tissue, the hot lymph node or nodes are removed with the aid of a gamma probe.

After completing the modified radical mastectomy procedure:

In the study group: Multiple stitches 3 cm apart were taken, in rows, between the subcutaneous tissues of the skin flaps and the underlying muscles at various parts of the flap and also, at the wound edge using fine absorbable sutures (vicryl 3/0). Closed suction drains were used.

In the control group: The wound was closed in the conventional method. Closed suction drains were, also used.

After the operation, the amount and colour of drained fluid have been recorded daily. The drains were removed when the amount became less than 50 cc /24 hours. The total amount and duration of drained fluid and the formation of seroma have all been recorded.

Postoperative Follow up:

Patients were examined clinically for presence of seroma one week after drain removal. Patients were called again for weekly follow ups in surgical outpatient clinic first one 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. Data were expressed as number and percentage for qualitative variables and mean + standard deviation (SD) for quantitative one. The student "t" test, Mann Whitney test, Chi- square test (X²), Z-test for percentage, Odds ratio (OR), Sensitivity specificity predictive value and ROC curve 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

There is statistically non-significant difference between the studied groups regarding T or N tumor grading (**Table 1**).

There is statistically non-significant difference between the studied groups regarding number of lymph nodes removed or positive lymph nodes removed (**Table 2**). There is statistically significant difference between the studied groups regarding amount of seroma (significantly lower in flap fixation group) (**Table 3**).

There is significant difference between the studied groups regarding days till drain removal which was significantly higher in classic technique group (**Figure 1**).

There is statistically non-significant difference between the studied groups regarding need of neo adjuvant chemotherapy (**Table 4**).

There is statistically non-significant difference between the studied groups regarding postoperative complications (85.2% of flap fixation group versus 59.3% within classic group had no postoperative complications) (**Figure 2**).

Table (1) Comparison between the studied groups regarding tumor grading:

Parameter	Groups		test	
	Flap fixation group	Classic technique group	χ^2	p
	N=27 (%)	N=27 (%)		
T				
T1	8 (29.6)	7 (25.9)	0.845	0.358
T2	11 (40.7)	8 (29.6)		
T3	5 (18.5)	9 (33.3)		
T4	3 (11.1)	3 (11.1)		
N:				
N0	9 (33.3)	4 (14.8)	3.515	0.061
N1	13 (48.1)	13 (48.1)		
N2	5 (18.5)	10 (37.1)		

χ^2 Chi square for trend test

Table (2) Comparison between the studied groups regarding lymph node removed:

Lymph node	Groups		test	
	Flap fixation group	Classic technique group	Z	p
	27 (%)	N=27 (%)		
Number removed				
Median	15	17	-1.41	0.159
Range	10 – 20	13 – 20		
Positive removed:				
Median	9	10	-1.325	0.185
Range	1 – 20	2 – 19		

Z Mann Whitney test

Table (3) Comparison between the studied groups regarding seroma:

Parameter (mL)	Group		Test	
	Flap fixation group	Classic technique group	Z	P
	N=27	N=27		
Seroma:				
Median	780	1000	-2.881	0.004*
Range	140 – 3100	550 – 4100		

Z Mann Whitney test *p<0.05 is statistically significant

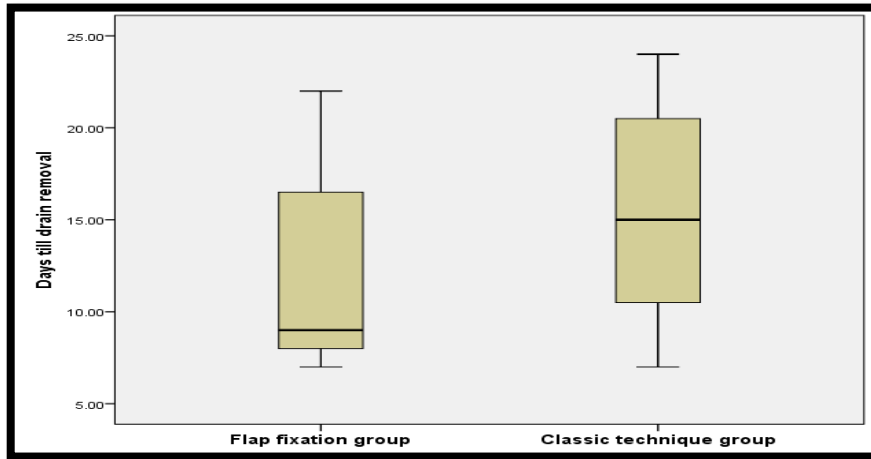


Figure (1): Boxplot showing comparison between the studied groups regarding days till drain removal

Table (4) Comparison between the studied groups regarding need for neoadjuvant chemotherapy:

Neoadjuvant chemotherapy	Group		Test	
	Flap fixation group	Classic technique group	χ^2	p
	N=27 (%)	N=27 (%)		
No need	22 (81.5)	18 (66.7)	1.54	0.214
Needed	5 (18.5)	9 (33.3)		

χ^2 Chi square test

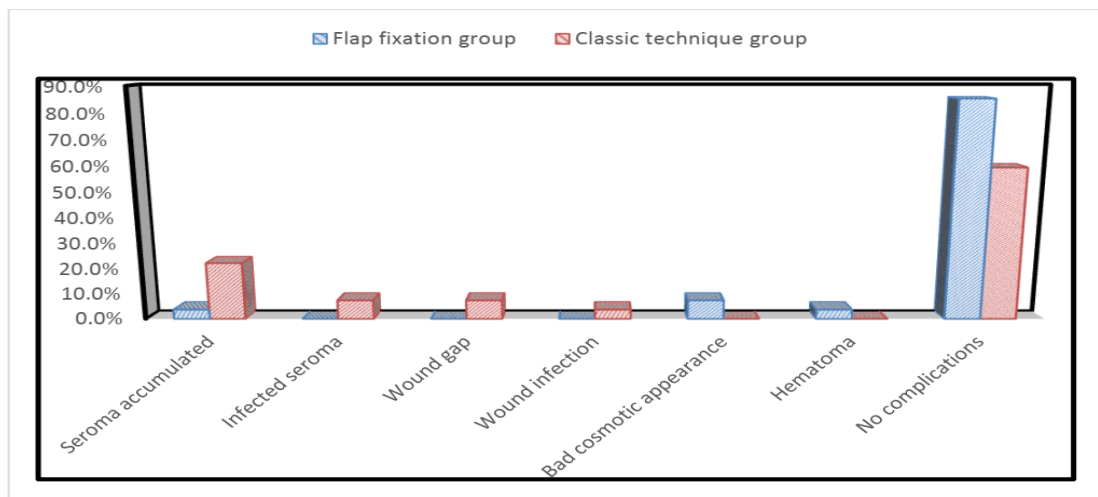


Figure (2): Multiple bar chart showing comparison between the studied groups regarding postoperative complications.

DISCUSSION

Flap fixation is a surgical technique that reduces the dead space in patients undergoing mastectomy for invasive breast cancer or DCIS. It appears to reduce the occurrence of seroma and the need for seroma aspirations. A prospective trial can further evaluate the effect of flap fixation, including long-term outcome measures such as cosmesis, shoulder function and patient satisfaction (6).

Seroma formation is a common complication following mastectomy for invasive breast cancer. Mastectomy flap fixation is achieved by reducing dead space volume using interrupted subcutaneous sutures (7).

There are however measures that can be taken to reduce seroma significantly, through good use of drains, mechanical dead space closure, and delaying physiotherapy. No single method is considered to be constantly effective. At present we recommend, especially in patients with increased risk factors, to utilize a combination of proven seroma-reducing measures (8).

In this study there are (54 patients) with breast carcinoma scheduled for modified radical mastectomy with axillary lymphadenectomy. The fifty-four patients included from the admitted patients at the Department of General Surgery oncosurgery at Zagazig University Hospital. The patients were divided into 2 groups, the study group (27) and the control group (27). 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.

The present study showed there is statistically non-significant difference between the studied groups regarding T or N tumor grading, number of lymph nodes removed or positive lymph nodes removed. There is significant difference between the studied groups regarding days till drain removal which was significantly higher in classic technique group.

The concept of suturing the skin flaps to the underlying muscle and obliteration of the axillary space is not new (9).

Flap fixation by quilting the flap.10 They concluded that incidence of seroma decreased from 80.5% to 22.5 % ($p < 0.001$). They also reported statistically significant results in reducing seroma related complications and surgical site infections (10).

Bastelaar et al. (10) supported flap fixation as a valuable option in reducing flap fixation after mastectomy.

Also, **Bastelaar et al. (10)** compared the flap fixation done either by sutures or fibrin glue compared to drain only group in another study. They reported significantly reduced seroma formation after mastectomy using flap fixation technique ($p < 0.001$). Altundag supported Bastelaar et al. in his research. Moreover, he also linked formation of lymphedema of arm after mastectomy with seroma formation. He reported that if seroma formation could be reduced effectively by flap fixation techniques using either sutures or tissue glue, it could have implication on formation of lymphedema, too.

Ten Wolde et al. (11) identified the increase in surgery time and the potential increase in postoperative pain as potential drawbacks of the quilting technique. Our technique of suturing the flap with absorbable sutures in multiple rows is easily reproducible and adds only about 10 min more to the operative time. In our study, the incidence of seroma in the suturing group was significantly lower than the control group ($P = 0.004$). Our data suggest closing subcutaneous wounds carefully with dead space obliteration being important.

As regarding the correlation between the incidence of seroma formation and; histological type of the tumor, stage of cancer, T-stage and N-stage of the tumor and administration of neoadjuvant chemotherapy or radiotherapy: the small scale of this study cannot give a significant result, due to small number of cases in each group. The results indicate positive correlation between total amount of drained fluid and the number of positive lymph nodes which is also against the results found in the

study conducted by **Browse, et al. (12)** claimed that there is no association between positivity of lymph nodes and the incidence of seroma formation, taking in mind that the study by **Lumachi, et al.(13)** found that existing evidence was inconclusive regarding a correlation between number of positive lymph nodes and the incidence of seroma formation.

Another study was done by **Sakkary (14)** included forty patients with breast carcinoma, scheduled for modified radical mastectomy, were randomly divided into 2 groups.

The present study showed that there is statistically non-significant difference between the studied groups regarding postoperative complications (85.2% of flap fixation group versus 59.3% within classic group had no postoperative complications). According to **Sakkary, (14)** revealed the complications detected were either cellulitis (which was seen in 10% of both groups without significant difference) and flap necrosis, which was seen in only 2 of his cases. In this study, the overall complications rate is 15% (6/40) of cases with no mortality. This rate is less than that reported in most studies.

In contrast, several preliminary or retrospective studies, and prospective studies, as well as RCTs have found it useful to close the dead space by securing the flaps to the chest wall with sutures. Similarly, this technique significantly reduced the incidence of seroma formation, breakdown of wound edges, and prolonged serous discharge, and did not lead to a reduced functional range of shoulder motion among patients who underwent conventional mastectomy. Moreover, it allowed the early and safe removal of drains at 48 hours or 72 hours after surgery **(15)**.

In this regard, it is interesting to note that in the RCT by **Purushotham et al. (16)** revealed breast surgery without drainage did not increase surgical or psychological morbidity including seroma formation if flaps were fixed with sutures, and early discharge as a consequence of avoiding wound drainage resulted in an overall reduction in cost.

Similarly, the axillary flap fixation with sutures was useful to avoid axillary drainage in patients undergoing BCS and conventional axillary lymph node dissection **(17)**.

A prospective study by **Classe et al.(18)** demonstrated that BCS without axillary drainage was safe and feasible on a 1-day surgery basis if axillary dead space was padded at the end of FAL.

The present study showed that there is statistically non-significant difference between the studied groups regarding need of neoadjuvant chemotherapy. The surgical interruption of lymphatic channels provides an extensive source of drainage fluid that weeps into the surgical site. We exclude patients who received prior chemotherapy from our study as there are many studies such as that study done by **Ranisavljević et al., (19)** revealed the impact of neoadjuvant chemotherapy on wound complications after breast surgery and concluded that the incidence of postoperative wound complications after neoadjuvant chemotherapy and breast cancer surgery was 27% and only 10% after surgery without neoadjuvant chemotherapy. Also, he found that the average reduction of tumor volume after neoadjuvant chemotherapy was 30%, most common complications were prolonged seroma formation and minor skin necrosis. For this reason, we exclude patients who had neoadjuvant chemotherapy from our study.

The main limitations of this study are related to the retrospective nature. Being a retrospective study, indications for seroma aspiration had not been defined

beforehand. This might be a potential confounder in this study. However, this is the first study to evaluate seroma aspiration in mastectomy patients treated with flap fixation and low suction wound drainage. Assessing the presence of seroma is difficult due to the subjective nature of this procedure. How does one objectively measure the presence of seroma? Maybe the only true measure for seroma is seroma aspiration. There were no major policy changes in the treatment of seroma in both time intervals, but bias is of course possible. There does seem to be an increasing surgical tendency towards watchful waiting when treating postoperative wound seroma.

CONCLUSION

The flap fixation technique is a valuable procedure that significantly decrease the incidence of seroma formation, the need for frequent visits to the physician for seroma fluid aspiration, the total amount of drained fluid and also allowing for earlier removal of the drains as well as avoiding the patient the complications resulting from the occurrence of seroma, this method thus appears to have much many advantages that over exceed the disadvantage of time loss during the operation.

No Conflict of interest.

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