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Effect of Mechanical Closure of Dead Space on Seroma Formation in Modified Radical Mastectomy

Authors
Dr Renjin R P, Dr Santhosh Kumar R. Dr S Sunil

ABSTRACT
Breast carcinoma is a common malignancy among women and the most common of complications associated with modified radical mastectomy is the formation of seroma. Various methods have been tried to reduce the incidence of seroma formation. This study aims to study effect of fixation of flaps using sutures in reduction of drain amount and duration of drain placement. 200 female patients who underwent modified radical mastectomy were divided to two groups, study group underwent flap fixation and control group had conventional flap closure. Average number of days of drain among the experimental group was 12.3+/-2.4 and that among the controls was 18.4+/-2.5 ($p<0.001$). The total amount of drain was 875+/-490 ml in control group as compared to 670+/-270 ml in fixation group ($p<0.05$). Thus it is seen that flap fixation using sutures is and effective method to reduce the total amount of drain output and duration of drain and thus the seroma formation.

INTRODUCTION

Breast cancer is a common malignancy among women. Surgery still remains the mainstay of treatment. The treatment options for primary operable breast cancer can be conservative breast therapy or modified radical mastectomy[1].

Among the many complications associated with breast cancer surgery, development of seroma is the most common. Even though the consequence of seroma formation is minor discomfort and anxiety, serious complications like necrosis of the flap or breakdown of the wound may occur at times. Development of infection within the seroma increases the morbidity and the need for readmission and intervention including imaging, drainage and antibiotic use. [2].

The reported incidence of seroma formation varies from study to study. As high as 85% incidence have been reported following breast surgeries. [3].

Seroma is a collection of liquefied fat, serum and lymphatic fluid under incisions, skin flaps and cavities formed by tissue dissection. The definition of seroma changes in the literature and frequency of this complication is variable. It occurs due to persistent drainage from severed lymphatics, local inflammatory response, use of electrocautery and creation of dead space. The etiology of seroma is not clear and is discussed widely in the literature. It is usually in the form of an exudates. Exudate occurs either from an acute inflammatory reaction or fibrinolytic activity in serum or lymph drainage [4].

Reduction of postmastectomy drainage and seroma formation has received active attention. Many techniques have been studied to minimise the postmastectomy drainage volumes and incidence of seroma formation. However none has

consistently shown to be successful in clinical practice.

Techniques that have been advocated over the years include shoulder immobilization, prolonged suction drainage, perioperative tranexamic acid, choice of surgical instrument, and obliteration of the dead space through fibrinogen, thrombin sealants, glues or tetracyclin with poor results. [5,14] Some recent evidence suggests that quilting suture reduces the incidence of seroma.[15-17] Quilting suture consists in suturing the skin flaps to the underlying musculature to reduce 'dead space'. [18]

The aim of the present study was to detect the efficiency of dead space obliteration technique to reduce postmastectomy seroma formation and early drain removal.

METHODS

This prospective randomised controlled trial was carried out in the Department of General Surgery of our institute from October 2011 to October 2012. Patients undergoing modified radical mastectomy for Carcinoma of the Breast were randomised into two groups of 100 according to wound closure methods : either flap fixation or standard wound closure group. The fluid that collected under the flaps assessed at the physical examination after the drains were removed was defined as seroma for the purpose of the study. Consecutive patients undergoing modified radical mastectomy for early carcinoma breast (stage I and II), who gave informed consent for participation were included in the study. Patients with immunosuppression, those who have undergone previous surgeries in axilla, patients with hypoprotenemia, those who received neoadjuvant chemotherapy, breast conservation procedures, those undergoing immediate breast reconstruction were excluded from the study. Patients who were included in study were numbered at the time they were hospitalized. Those with odd numbers were regarded as the fixation group (cases) and those with even numbers were regarded as non-fixation group (control). The effects of obliteration of dead space with the suture technique in the duration of drain placement, total amount of drain output and formation of seroma was assessed

In the no- fixation group (Control group), after performing the procedure of modified radical Mastectomy, the flaps and wound are closed in the classical way - that is the flaps are closed by suturing the wound edges, first the subcutis is closed with 3/0 Polyglactin 910 by interrupted simple sutures followed by skin closure by continuous subcuticular suturing with 3/0 polypropylene after placing a 14FG suction drain. In the fixation group (Study group), after completing the Modified Radical Mastectomy, the flaps are closed. The midway of each upper and lower flaps are first fixed to the pectoralis major muscle by suturing the subcutis to the muscle fibers. The suture in the flap is taken from the under surface of the flap, without piercing through the skin. 3 or 4 sutures are put in fixing the middle of each flap using 3/0 polyglactin 910. 14 FG suction drain was placed under the flaps. Care was taken to avoid tension at the flap edges and to avoid any external deformity of the flap. While suturing the wound edges also the suture bite is taken through the pectoral muscle, so that the flap is fixed to the muscle at the wound edge. Skin closure is done by continuous subcuticular suturing using 3/0 polypropylene. The skin incisions and dissections in raising the flaps(using electrocautery) are similar. The everyday closed vacuum drainage volume, drain removal time(when the drain is < 50ml for at least two consecutive days) total amount of drain, seroma volume were assessed. The groups were compared via chi-square and Levene tests. $P \leq 0.05$ was considered as statistically significant.

RESULTS

The mean age of patients in study group was 48.6 +/- 12.1 and in control group was 46+/-11.4. The two groups did not differ with regard to the stage of malignancy. The total duration of surgery in study group was 140+/- 25 and that in control group was 127+/-30 ($p>0.05$). The total dissected lymph nodes were 18.2+/-7.1 in study and 17.8+/-

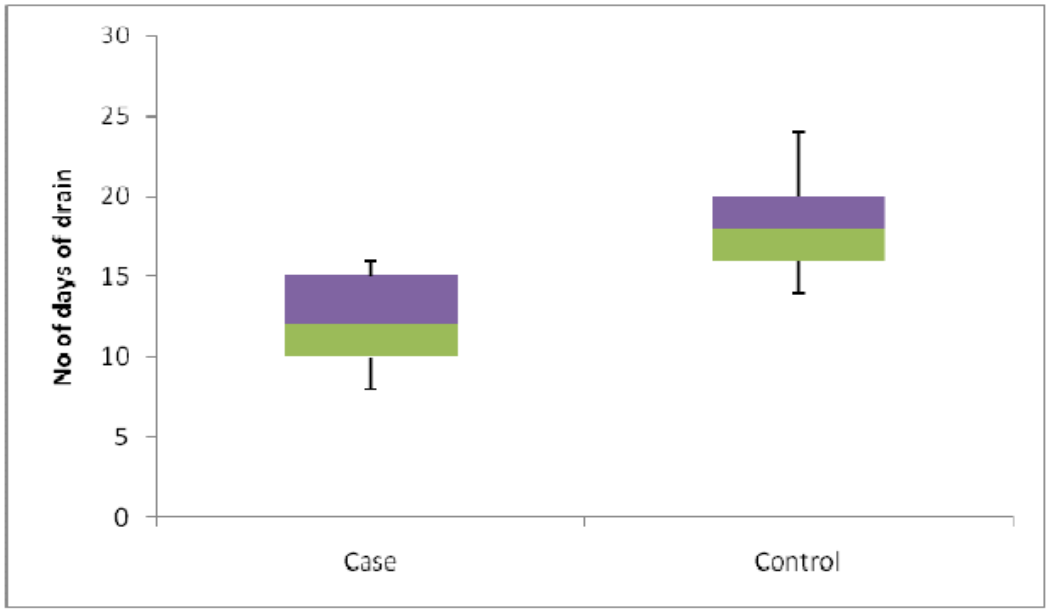
7.9 in control groups. The groups were comparable with regard to number of metastatic nodes 3.2+/-5.9 in study and 3.8+/-5.2 in control group. The presence of co-morbid conditions in both groups are shown in Table 1.

Table 1: Co-morbid conditions among study and control groups

Co morbidities	Experimental		Control	
	N	%	N	%
Nil	51	51.0	48	48.0
DM	20	20.0	18	18.0
HTN	15	15.0	18	18.0
MORBID OBESE (BMI>30)	10	10.0	14	12.0
DM+HTN	12	12.0	13	13.0
CAD	4	4.0	4	4.0
OBESE+HTN+DM	9	9.0	11	11.0
Total	**100**	**100.0**	**100**	**100.0**

The main parameter which was used to assess the outcome of the study was the number of days the drainage system was required for each patient. Post operatively, the amount of drain was assessed every day and drain was removed when the amount was less than 50 ml for 2 consecutive days. Average number of days of drain among the experimental group was 12.3+/-2.4 and that among the controls was 18.4+/-2.5 ($p<0.001$). Median days of drain among the cases and controls, was 12 and 18 respectively. (Fig1).

Figure1: Total number of days of drain placement



The total amount of drain was more (875+/-490 ml) in control group as compared to (670+/-270 ml) that in study group ($p<0.05$) (Table2)

Table 2: Amount of Drain and Total drain

Amount of Drain and Total Drain

Table 6

DAY	Volume in ml	Volume in ml
1 post operative day	220±85	225±70
2 nd to 7th day	400±30	700±50
8th to 14 th day	90±20	400±50
>14 days	40±20	170±30
Total average drain	**650±270**	**875±490**

P<0.05

DISCUSSION

Carcinoma breast remains the most common site specific malignancy diagnosed in women. More than a million cases of carcinoma breast are diagnosed worldwide yearly. The overall incidence has been rising because of increased life span, life style changes and various other concerns. Surgical treatment remains the mainstay of treatment in treatment with curative intent. The surgical approaches for carcinoma of breast are modified radical mastectomy or breast conservation surgery. The formation of seroma is one of the most common complications associated with breast surgeries. Seroma formation results in minor discomfort and anxiety to patients, and occasionally can cause more complications like flap necrosis, wound dehiscence, infection of seroma etc. Such occurrences results in morbidity and hospital admission among patients.

Seromas beneath the skin flaps represent the most frequent complication of mastectomy and axillary lymph node dissection, reportedly occurring in as many as 35-97 % of cases. Seroma is a collection of liquefied fat, serum and lymphatic fluid under incisions, skin flaps and cavities formed by tissue dissection. The definition of seroma changes in the literature and frequency of this complication is variable. It occurs due to persistent drainage from severed lymphatics, local inflammatory response, use of electrocautery and creation of dead space. The etiology of seroma is not clear and is discussed widely in the literature. It is usually in the form of an exudates. Exudate occurs either from an acute inflammatory reaction or fibrinolytic activity in serum or lymph drainage. Seroma is influenced by a large dissection area, dead space under the skin flaps and axillary region, chest movement because of breathing, shoulder movements, which affects the attachment of skin flaps.

The incidence of seroma is correlated with certain factors like obesity, patient's age, breast volume, presence of malignant lymph nodes in the axilla, number of metastatic nodes, number of dissected nodes, early shoulder exercise and use of certain drugs like tamoxifen, heparin etc While the use of electrocautery decreases bleeding it increases the total drain output. In addition electrocautery dissection increases proinflammatory cytokine response in wound fluid which in turn will reflect an aggravated inflammation and increased tissue damage influencing seroma formation. Seroma formation is distressing to the patient as it predisposes to infection, flap necrosis, heavy use of antibiotics, increases hospital stay, high economic burden and thus increases the morbidity. It delays the initiation of adjuvant chemotherapy and radiotherapy and thus loses

valuable time in arresting the progression and curing the disease process.

Seroma needs treatment when it is symptomatic and causes discomfort to the patient. The optimal closure of wound should decrease seroma formation, by obliterating dead space. The use of closed system suction drainage reduces the influence of this complication. A small amount of serous fluid does not necessitate treatment. More important is the probability of infection as infected seroma is a serious problem for the patient. Pressure wound dressing has no effect on reducing the amount of seroma. Different chemical methods are used for obliterating the dead space, such as fibrin glue, tissue adhesive and sclerotherapy agents, but the effects are not clear. Tetracycline was also used for obliteration and sclerotherapy, but because of pain it's use was abandoned.

Mechanical approaches for closure of dead space following mastectomy are twofold – external compression or flap fixation with sutures. Concept of external pressure in obliterating dead space has long been used by plastic surgeons. Use of elastic compression bandages following mastectomy have been used by surgeons. External compression encourages flap adhesion to the underlying muscles. In breast surgery, use of fixation of flaps was first advocated by Halstead [19]. Fixation of sutures through the skin, increased the post operative pain as well as the risk of local pressure necrosis. It was Larsen who proposed the subcutaneous suture fixation to the deep muscles and fascia.[20,21] Cotton sutures were used to fix the subcutaneous tissue to the deep structure. And large pressure dressing were used to exert external compression. Atiken used subcutaneous absorbable sutures for tacking and securing the flaps following mastectomy.[22] Studies have varied in the placement of sutures in the flap - fixation at wound edges, at middle of flap, and some at axilla alone.

In our study, the mean duration of drain placement was significant lower in the fixation group as compared to the control group. The total amount of drain output was also lower in the fixation group. Thus fixation of flaps using absorbable suture is associated with better than no fixation with regard to drain output and duration of drains. The duration of surgery in our study was slightly longer in the fixation group as compared to the no fixation group. Similar results were shown by Natalie et al. [23] and Alaa Eldin [24]

Ouldamer et al in a study of 119 patients noted that the overall seroma rate was 15.2% in the quilting suture group and 51.7% in the conventional closure group [25]. In an RCT by Purushotham et al. [26], breast surgery without drainage did not increase surgical or psychological morbidity including seroma formation if flaps were fixed with sutures. The early discharge of patients resulted in reduced over all hospital expenditure. Similarly, the axillary flap fixation with sutures was useful in avoiding axillary drainage in patients undergoing BCS and conventional axillary lymph node dissection.

At present, axillary flap fixation with sutures has not gained widespread acceptance, possibly because of the longer operation time required (10 to 20 minutes) [27,21,22]. However, this additional time is well invested if it results in fewer seromas and other complications, less nursing care, and fewer office visits for the patients.

CONCLUSION

Carcinoma of the breast is a common malignancy among women, the primary mode of treatment being surgery in the form of modified radical mastectomy. The most common complication associated with modified radical mastectomy is the formation of seroma. Even though seroma formation do not cause significant morbidity, the anxiety and discomfort experienced by patients are high. The seroma can get infected as well cause wound dehiscence and flap necrosis, increasing the morbidity and cost of treatment. Various mechanical methods have been tried – external compression and obliteration of dead space – aimed at reducing the drain output and seroma formation. This study shows that the duration of drain and the seroma formation are significantly low when dead space is obliterated

with flap fixing sutures as compared to conventional closure, with a slightly increased duration of surgery while fixing the flap. Thus flap fixation is an effective method to reduce the incidence of seroma formation and needs favourable attention from surgeons performing mastectomies to decrease the incidence of seroma formation.

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