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SEROMA FORMATION FOLLOWING BREAST SURGERY: A STUDY OF 143 PATIENTS

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ABSTRACT

Background: Seroma formation is the most frequent postoperative complication after breast cancer surgery. The aim of this study is to investigate the effect of various clinical and therapeutic variables on seroma formation. **Patients and methods:** A case series study of patients who underwent surgical therapy for breast disease with either modified radical mastectomy (MRM), wide local excision (WLE), or lumpectomy was carried out. The data clinical information was extracted from case records. Seroma formation was studied in relation to age, type of surgery, tumor size, level of axillary dissection, neoadjuvant chemotherapy, surgical instrument (electrocautery or scalpel), type of drain, and duration of drainage. **Study Setting:** Al-Jumhoori Teaching Hospital. **Results:** A total of 143 patients with breast disease were studied. The mean age of the patients was 47 years (SD ± 4). Twenty-nine percent underwent modified radical mastectomy, 11% with WLE, and the remaining 58% with lumpectomy. Seroma occurred in 15% of patients with cancer. No other factor studied was found to significantly affect the seroma formation after breast cancer surgery. **Conclusion:** The findings suggest that the nature of the disease, the type of surgery, and the use of cautery for dissection is a predicting factor for seroma.

KEYWORDS: electrocautery, seroma.

INTRODUCTION

Seroma following Breast Surgery

A seroma is a collection of liquefied fat, serum, and lymphatic fluid under the incision. The fluid is usually clear, yellow, and somewhat viscous and is found in the subcutaneous (SC) layer of the skin. Seromas represent the most benign complication after an operative procedure and are particularly likely to occur when large skin flaps are developed in the course of the operation, as is often with mastectomy, axillary dissection, groin dissection, and large ventral hernias.[1]Seroma is usually manifested as a localized and well-circumscribed swelling, pressure or discomfort, and occasional drainage of clear liquid from the immune surgical wound.[1]

Prevention of seroma formation may be achieved by placing suction drains under the skin flaps or in potential dead space created by lymphadenectomy. Premature removal of drains frequently results in large seromas that require aspiration under sterile conditions, followed by placement of a pressure dressing. A seroma that reaccumulates after at least two aspirations is evacuated by opening the incision and packing the wound with saline moistened gauze to allow healing by secondary intention. In the presence of synthetic mesh, the best option is open drainage in the operating room with the incision closed to avoid exposure and infection of the mesh; closed suction drains are generally placed. An infected seroma is also treated by open drainage. The presence of synthetic mesh in these cases will prevent the wound from healing. Management of the mesh depends on the severity and extent of infection. In the absence of severe sepsis and spreading cellulitis and the presence of localized infection, the mesh can be left in situ and removed at a later date when the acute infectious process has resolved. Otherwise, the mesh must be removed and the wound is to be managed with open wound care.[1]

Breast Anatomy

The breast is composed of 15 to 20 lobes, which are each composed of several lobules.[2] Fibrous bands of connective tissue travel through the breast (Cooper's suspensory ligaments), insert perpendicularly into the dermis, and provide structural support. The mature female breast extends from the level of the second or

third rib to the inframammary fold at the sixth or seventh rib. It extends transversely from the lateral border of the sternum to the anterior axillary line. The deep or posterior surface of the breast rests on the fascia of the pectoralis major, serratus anterior, and external oblique abdominal muscles, and the upper extent of the rectus sheath. The retromammary bursa may be identified on the posterior aspect of the breast between the investing fascia of the breast and the fascia of the pectoralis major muscles. The axillary tail of Spence extends laterally across the anterior axillary fold. The upper outer quadrant of the breast contains a greater volume of tissue than do the other quadrants. The breast has a protuberant conical form. The base of the cone is roughly circular, measuring 10 to 12 cm in diameter. Considerable variations in the size, contour, and density of the breast are evident among individuals. The nulliparous breast has a hemispheric configuration with distinct flattening above the nipple. With the hormonal stimulation that accompanies pregnancy and lactation, the breast becomes larger and increases in volume and density, whereas with senescence, it assumes a flattened, flaccid, and more pendulous configuration with decreased volume.[3]

The breast receives its principal blood supply from (a) perforating branches of the internal mammary artery; (b) lateral branches of the posterior intercostals arteries; and (c) branches from the axillary artery, including the highest thoracic, lateral thoracic and pectoral branches of the thoracoacromial artery. The second, third, and fourth anterior intercostals perforators and branches of the internal mammary artery arborize in the breast as the medial mammary arteries. The lateral thoracic artery gives off the lateral mammary branches. The veins of the breast follow the course of the arteries, with venous drainage being toward axilla. The three principal groups of veins are (a) perforating branches of the internal thoracic vein, (b) perforating branches of the posterior intercostals veins, and (c) tributaries of the axillary vein. Baston's vertebral venous plexus, which invests the vertebrae and extends from the base of the skull to the sacrum may provide a route for breast cancer metastases to the vertebrae, skull, pelvic bones, and central nervous system. Lymph vessels generally parallel the course of blood vessel.[3]

The boundaries for lymph drainage of the axilla are not well demarcated, and there is considerable variation in the position of the axillary lymph nodes. The six axillary lymph node groups recognized by surgeons are (a) the axillary vein group posterior to the vein and receives most of the lymph drainage from the upper extremity; (b) the external mammary group (anterior or pectoral group), which consists of five or six lymph nodes that lie along the lower border of the pectoralis minor muscle contiguous with the lateral thoracic aspect of the breast; (c) the scapular group (posterior or subscapular), which consists of five to seven lymph nodes that lie along the posterior wall of the axilla at the lateral border of the scapula contiguous with the subscapular vessels and receive lymph drainage principally from the lower posterior neck, the posterior trunk, and the posterior shoulder; (d) the central group, which consists of three or four sets of lymph nodes that are embedded in the fat of the axilla lying immediately posterior to the pectoralis minor muscle and receive lymph drainage both from the axillary vein, external mammary, and scapular groups of lymph nodes, and directly from the breast; (e) the subclavicular group (apical), which consists of six to twelve sets of lymph nodes that lie posterior and superior to the upper border of the other groups of axillary lymph nodes; and (f) the interpectoral group (Rotter' nodes), which consists of one to four lymph nodes that are interposed between the pectoralis major and pectoralis minor muscles and receive lymph drainage directly from the breast. The lymph fluid that passes through the interpectoral group of lymph nodes passes directly into the central and subclavicular groups.[3]

The lymph node groups are assigned levels according to their anatomic relationship to the pectoralis minor muscle. Lymph nodes located lateral to or below the lower border of the pectoralis minor muscle are referred to as *level I lymph nodes*, which include the axillary vein, external mammary, and scapular groups. Lymph nodes located superficial or deep to the pectoralis minor muscle are referred to as *level II lymph nodes*, which include the central and interpectoral groups. Lymph nodes located medial or above the upper border of the pectoralis minor muscle are referred to as *level III lymph nodes*, which consist of the subclavicular group. The plexus of lymph vessels in the breast arises in the interlobular connective tissue and in the walls of the lactiferous ducts and communicates with the subareolar plexus of lymph vessels. Efferent lymph vessels from the breast pass around the lateral edge of the pectoralis major muscle and pierce the clavipectoral fascia, ending in the external mammary (anterior, pectoral) group of lymph nodes. Some lymph vessels may travel directly to the subscapular (posterior, scapular) group of lymph nodes. From the upper part of the breast, a few lymph vessels pass directly to the subclavicular (apical) group of lymph nodes. The axillary lymph nodes usually receive >75% of the lymph drainage from the breast. The rest is derived primarily from the medial aspect of the breast, flows through the lymph vessels that accompany the perforating branches of the internal mammary artery, and enters the parasternal (internal mammary) group of lymph nodes.[3]

Seroma following Breast Surgery

Seroma is an abnormal collection of serous fluid in the dead space of post-mastectomy skin flap, axilla or breast following breast-conserving surgery and is the commonest early wound sequel. However, there is inconsistency in the definition of seroma across published works. This presumed complication, albeit usually of minor consequence, may prolong recovery, length of hospital stay and over-stretch health budget.

The reported incidence of seroma formation varies widely between 15 and 81%.[4-9] It can delay the initiation of adjuvant therapy, predispose to wound infection, delay wound healing and has also been linked to arm lymphoedema. There are several factors implicated in the formation of seroma, but opinion differs as to their individual role in its pathogenesis.[4-6, 10-12] The main pathophysiology of seroma is still poorly understood and remains controversial. The optimal ways to reduce the incidence of seroma formation are unknown, but there are different techniques that have been reported and are currently in practice.[12]

Eversince mastectomy was first carried out by Halsted in 1882, surgeons have faced several problems such as necrosis of the skin flaps, breakdown of the wound, hematoma, Seroma, and infection. Among them, seroma is a common problem in breast surgery. As it usually resolves within a few weeks, many surgeons view this problem as an unavoidable nuisance rather than a serious complication.[12,13] However, excessive accumulation will stretch the skin and cause it to sag, resulting in patient discomfort and sometimes prolongation of hospital stay.[14]

There was no risk factor supported by strong evidence, but there was moderate evidence to support a risk for seroma formation in individuals with heavier body weight, extended radical mastectomy as compared with simple mastectomy, and greater drainage volume in the initial three days. On the other hand, the following factors did not have a significant influence on seroma formation: duration of drainage; hormone receptor status; immobilization of the shoulder; intensity of the negative suction pressure; lymph node status or lymph node positivity; number of drains; number of removed lymph nodes; previous biopsy; removal of drains on the fifth postoperative day versus when daily drainage volume fell to minimal; stage; type of drainage (closed suction versus static drainage); and use of fibrinolysis inhibitor. Box 1. demonstrates the direction and strength of each risk factor for seroma formation.[15]

In contrast, sentinel lymph node biopsy reduced seroma formation. Available evidence was inconclusive for whether or not skill or experience of the surgeon influences seroma formation, for quantity of blood loss, and for use or non-use of a skin graft.[15] Thus, although a number of factors have been correlated with seroma formation, strong data on factors associated with seroma formation are still rare, and it seems to be difficult to identify patients who will ultimately suffer from seroma.[15]

Box 1: Direction and strength of each risk factor for seroma formation.

Grade	Direction of association		
	Increase	**No association**	**Decrease**
Grade A	**None**	**None**	**None**
Grade B	Body weight (heavier), Extended radical mastectomy (versus simple mastectomy), Total drainage volume during the initial 3 days (greater)	Duration of drainage, Hormone receptor status, Immobilization of shoulder, Intensity of negative suction pressure, LN status or positivity of LNs, Number of drains, Number of removed LNs, Previous biopsy, Removal of drain on the fifth POD versus when daily drainage volume fell to a minimal, Stage, Type of drainage (closed suction drain versus static drainage), Use of fibrinolysis inhibitor.	Sentinel LN biopsy (versus Axillary LN dissection)
Grade C	Diagonal skin incision (versus vertical skin incision), Hypertension, Multiple holes type drains (versus multiple channel type drain), No drainage (versus drainage), Obesity, Operation time (longer), Removal of drain on the 5 POD (versus on the 8 POD), Use of electrocautery in flap and fascia dissection (versus cold scalpel)	Anemia, Blood transfusion, Breast size, Diabetes mellitus, Extent of LN dissection, Grade, Histological type, Neoadjuvant therapy, No drainage with suture flap fixation versus drainage without suture flap fixation, Pathological tumor size, Radiation , Removal of drain on the 3 POD versus on the 6 POD, Removal or preservation of pectoral fascia, Smoking, Side, Specimen size, Specimen weight, Timing of shoulder movement, Type of anesthesia, Type of drainage unit (evacuated versus bellow typr), Tumor location, Use of laser scalpel, argon diathermy, and ultrasound scalpel, Use of adhesive glue.	MRM + immediate reconstruction (versus MRM), Suture flap fixation, Use of ultrasonic scissors
Grade D	Inconclusive Troublingly inconsistent	Age, Blood loss, Body mass index/obesity index, Drainage volume in the 24 h before removal, Number of positive LNs, Removal of drain within the third POD versus removal of drain when daily drainage volume fell to a minimal amount, Skin graft, Surgeon, Total drainage volume, Total drainage volume during the initial 5days, Tumor size, Type of mastectomy (Radical mastectomy versus MRM), Use of pressure garment or external compression dressing Type of mastectomy (MRM versus BCS)	

Pathogenesis

The pathogenesis of seroma has not been fully elucidated. Seroma is formed by acute inflammatory exudates in response to surgical trauma and acute phase of wound healing.[16, 17] Oertli *et al.*[18] believed that the fibrinolytic activity contributes to seroma formation. Petrek *et al.*[19] in a prospective randomized trial showed that the most significant influencing factors in the causation of seroma were the number and the extent of axillary lymph node involvement. However, Gonzalez *et al*.[20] and Hashemi *et al*.[21] reported that the only statistically significant factor influencing the incidence of seroma formation was the type of surgery. They reported higher seroma rate in modified radical mastectomy than following wide local excision and axillary dissection. Factors such as age of the patient, obesity, tumour size, and neoadjuvant therapy did not influence the incidence of seroma formation in the three mentioned studies. Extensive dissection in mastectomy and axillary lymphadenectomy damages several blood vessels and lymphatics and the subsequent oozing of blood and lymphatic fluid from a larger raw surface area when compared with breast-conserving procedures leads to seroma.[22] Seroma accumulation elevates the flaps from the chest wall and axilla thereby hampering their adherence to the tissue bed. It thus can lead to significant morbidity such as wound haematoma, delayed wound healing, wound infection, flap necrosis, wound dehiscence, prolonged hospitalization, delayed recovery and initiation of adjuvant therapy.[12, 24]

PATIENTS AND METHOD

In this study 143 patients who underwent different types of surgery at Al-Jumhoori Teaching Hospital, 1st surgical ward; between Oct.1, 2010 and March31, 2011 were included. All the 143 patients were enrolled in the study. The patients were grouped according to their age. The research was a case series.

All patients with benign breast mass were treated by lumpectomy, and all patients with malignant breast mass were treated either by mastectomy or by wide local excision, with axillary clearance varying from level I to level III; the choice of procedure was made after consideration of the site of the tumor and the wishes of the patient.

Eighty-three patients with benign breast disease underwent lumpectomy, forty-three patients with carcinoma of the breast underwent mastectomy; and sixteen patients underwent wide local excision, and one patient had only axillary clearance. Surgery was performed by general surgeon assisted by senior house officer. All patients received 1g of a 3rd generation cephalosporin (ceftriaxone or cefotaxime) preoperatively. Electrocautery was used for dissection in fifty four patients whereas the eighty nine patients by sharp dissection by scalpel or scissors. Seventy-four patients kept without drain and sixty nine patients needed drain. Fifty-three patients with carcinoma needed drain; forty five patients with closed suction drain (18 FG) with three of them have two drains, five patients with corrugate drain, and sixteen patients with benign breast disease needed drain (open system). Drain removal started from day one postoperatively to more than 10 days after operation depending on the surgeon will primarily. Pressure dressing were placed on all patients with axillary dissection and maintained until drain removal. Early arm motion was encouraged in all patients one day after surgery.

The data were analyzed for the possible etiologic effect of the patient's age, nature of the mass, tumor size, the level of axillary dissection, type of surgery performed, tool of dissection, neoadjuvant chemotherapy, drainage system, and duration of the drain.

RESULTS

In this study one hundred and forty three patients with different breast diseases were included, eighty-three patients with benign breast disease and sixty patients with malignant breast disease. Nine patients developed seroma, all with malignant breast disease. The patients with benign disease did not develop seroma.

Table 1. Nature of the Disease

Disease	Patients	Seroma	
		No.	%
Benign	83	0	0
Malignant	60	9	15
Total	143	9	6

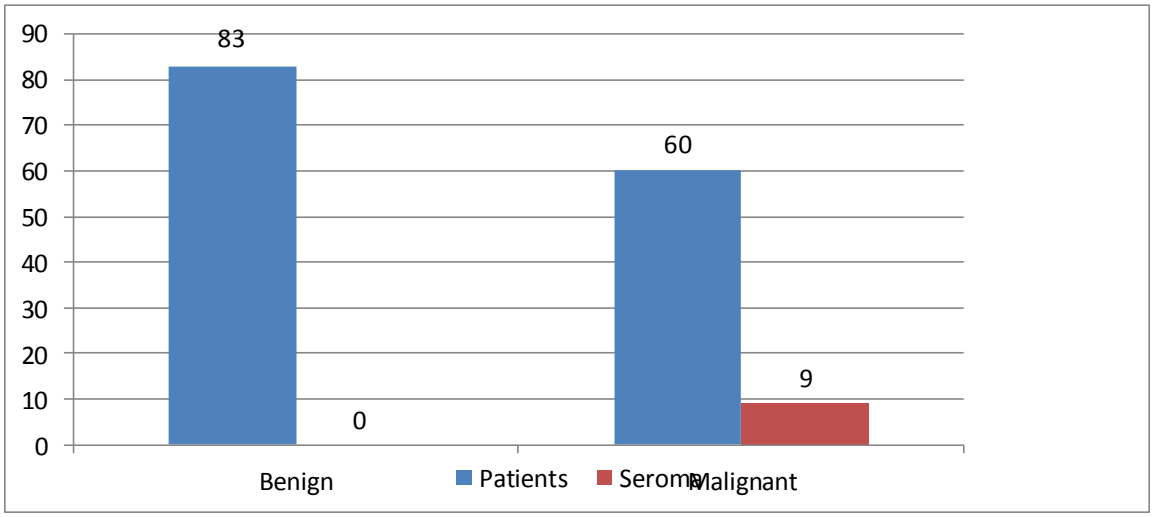

Figure 1: Nature of the Disease.

The age group of the malignant breast disease started from 20 to 79-year-old; seroma occurs in the age group from 40- to 79-year-old.

Table 2: Age.

Age; years	Patients	Seroma	
		No.	%
10-19	0	0	0
20-29	2	0	0
30-39	13	0	0
40-49	15	2	13
50-59	11	3	27
60-69	13	2	15
70-79	6	2	33
>=80	0	0	0
Total	60	9	15

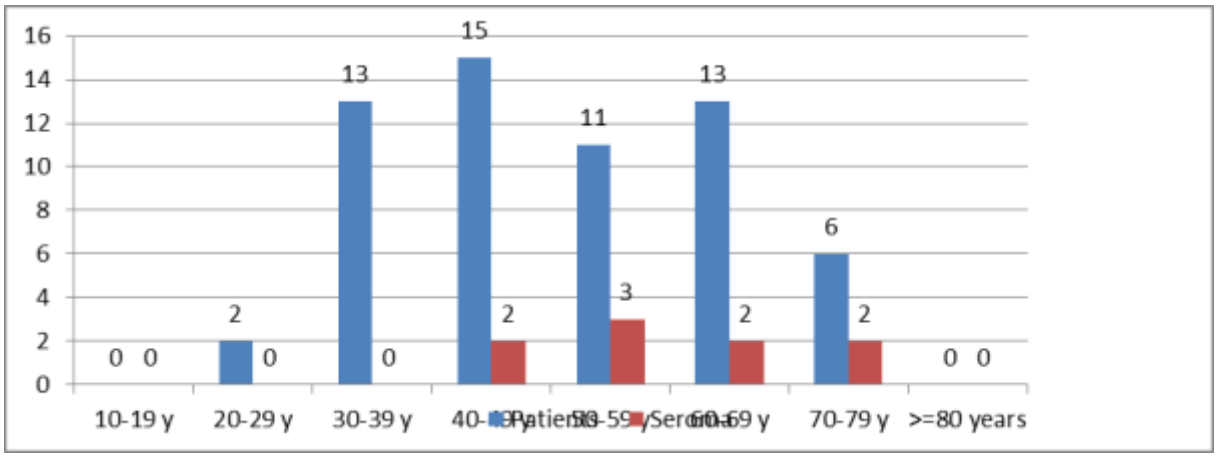

Figure 2: Age.

Eleven patients were seen with a mass size less than 2 cm; two of them developed seroma, thirty seven patients with a tumor size 2-5 cm; four of them developed seroma, and twelve patients had a mass size more than five cm; three of them developed seroma.

Table 3: Tumor Size.

Tumor Size	Patients	Seroma	
		No.	%
< 2 cm	11	2	18
2-5 cm	37	4	11
> 5 cm	12	3	25
Total	60	9	15

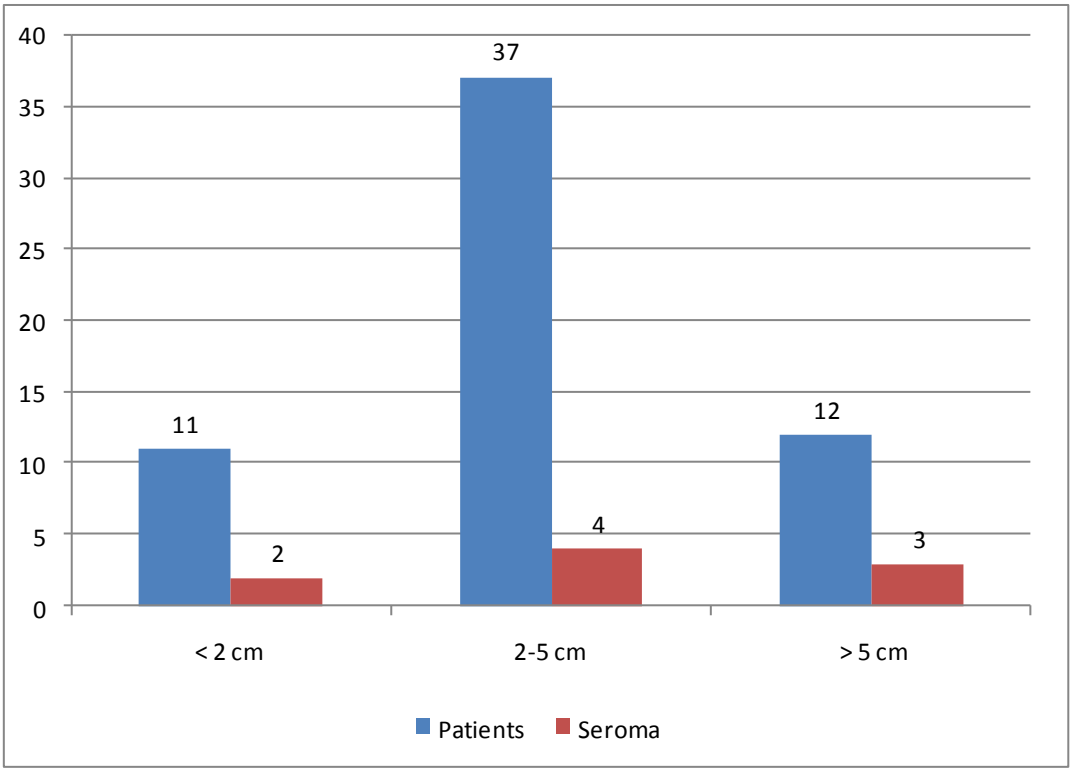

Figure 3: Tumor Size.

Forty-three patients underwent mastectomy; eight of them had seroma, sixteen patients underwent wide local excision of which one patient had seroma, and one patient underwent axillary sampling only.

Table 4: Type of Surgery.

Surgery	Patients	Seroma	
		No.	%
Lumpectomy	83	0	0
Wide Local Excision	16	1	6
Mastectomy	43	8	19
Axillary Sampling	1	0	0
Total	143	9	6

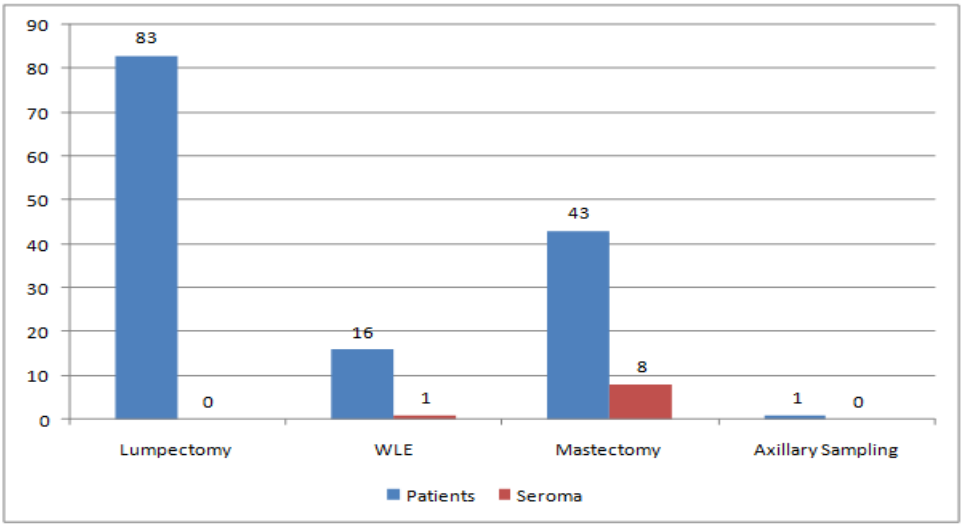

Figure 4: Type of Surgery.

Thirty-seven patients were dissected by using scalpel and scissors; three of them developed seroma, and twenty three patients have their surgical dissection by cautery; six of them developed seroma.

Table 5: Tool of Dissection.

Dissection	Patients	Seroma	
		No.	%
Electrocautery	23	6	26
Scalpel or Scissors	37	3	8
Total	60	9	15

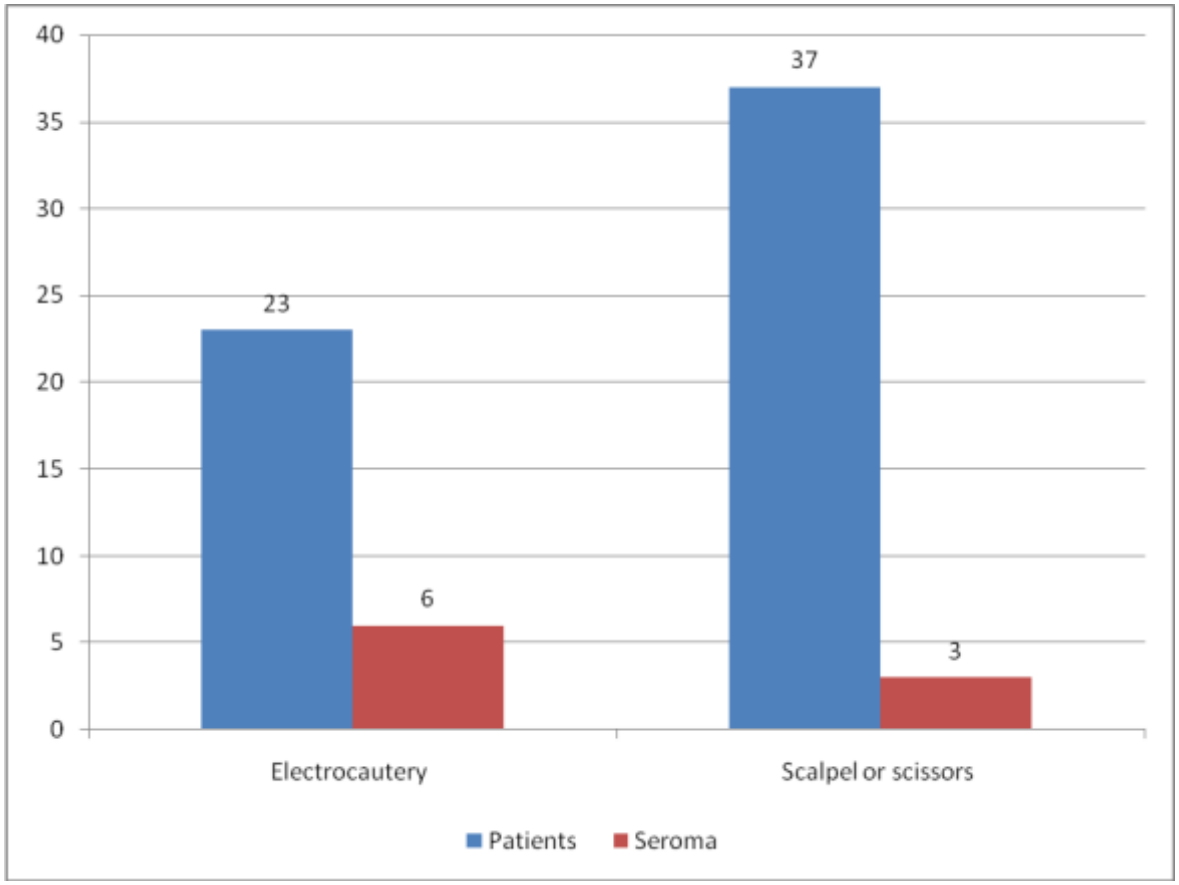

Figure 5: Tool of Dissection.

Fifty-three patients had axillary dissection; eleven patients with level I, thirty patients with level II, and twelve patients with level III. Five patients of level II developed seroma; three patients with level III developed seroma whereas one patient who underwent just mastectomy without axillary dissection developed seroma.

Table 6: Axillary Dissection.

Axillary Dissection	Patients	Seroma	
		No.	%
Level I	11	0	0
Level II	30	5	17
Level III	12	3	25
No Dissection	7	1	14
Total	60	9	15

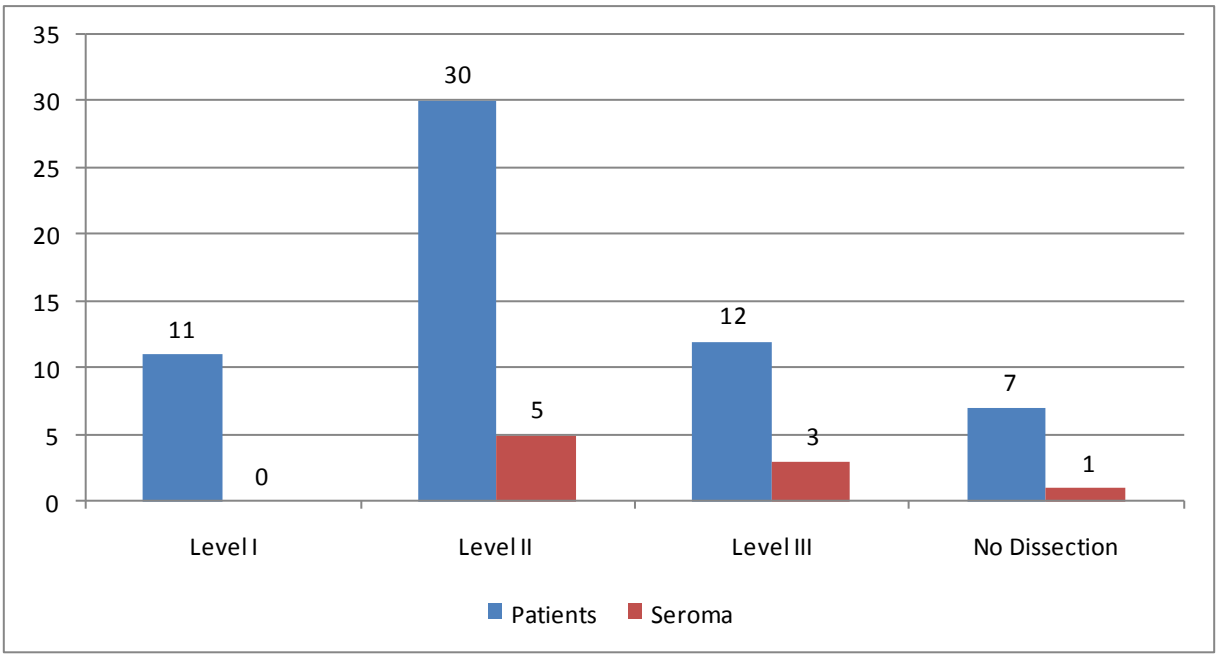

Figure 6: Axillary Dissection.

Thirteen patients had a neoadjuvant chemotherapy; three of them developed seroma, whereas forty seven patients with no neoadjuvant chemotherapy; six of them developed seroma.

Table 7: Neoadjuvant Chemotherapy.

Chemotherapy	Patients	Seroma	
		No.	%
Yes	13	3	23
No	47	6	13
Total	60	9	15

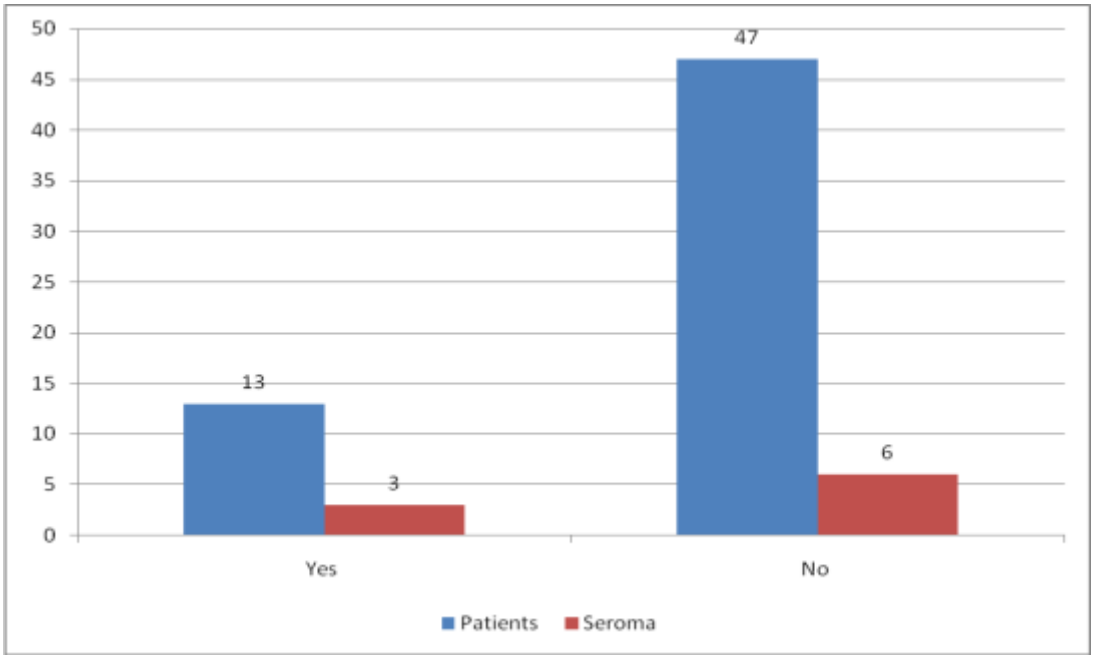

Figure 7: Neoadjuvant Chemotherapy.

In forty-five patients with a single redivac drain; seven patients developed seroma, whereas in a three patients with two redivac drains; two patients developed seroma while five patients with corrugate drain did not develop seroma.

Table 8. Type of Drain.

Drain		Patients	Seroma%	
			No.	%
Corrugate		5	0	0
Redivac	One Drain	45	7	16
	Two Drains	3	2	67
No Drain		7	0	0
Total		60	9	15

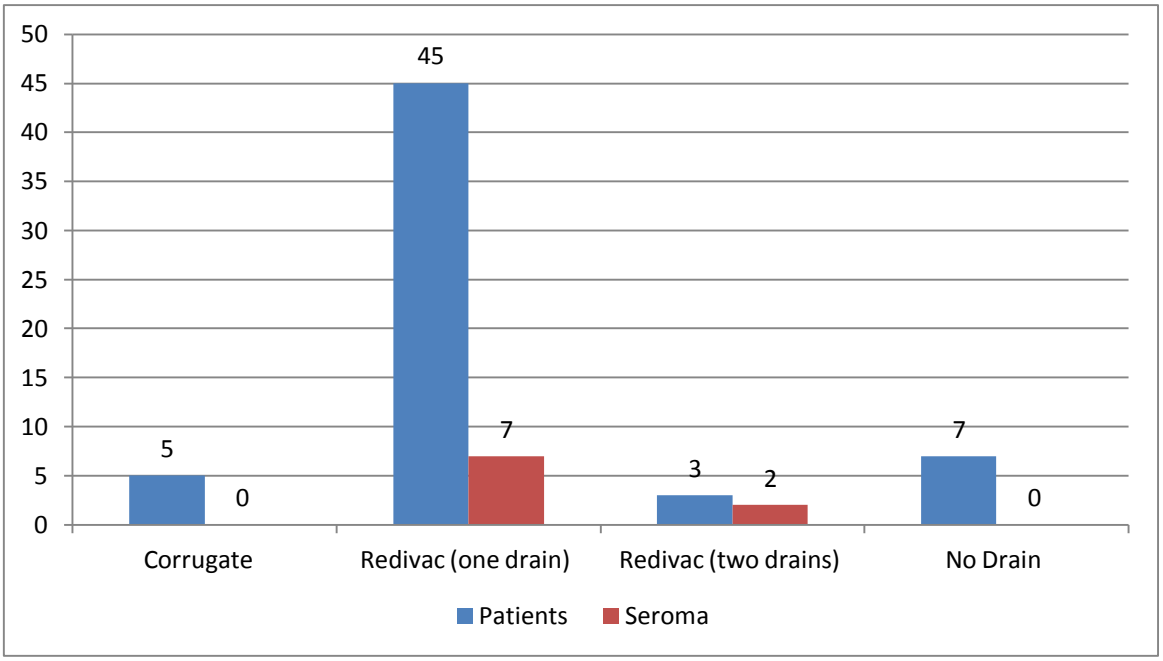

Figure 8: Type of Drain.

Twenty five patients have their drain removed on day two postoperatively; three of them developed seroma, fifteen patients have their drain removed on day seven and after; five of them developed seroma, of eight patients got their drain removed on day five; one patient developed seroma. Patients with corrugate drain removed on day one had no seroma.

Table 9: Drain Removal.

Drain Removal	Patients	Seroma %	
		No.	%
Day 1	5	0	0
Day 2	25	3	12
Day 5	8	1	13
Day 7 & Later	15	5	33
No Drain	7	0	0 0
Total	60	9	15

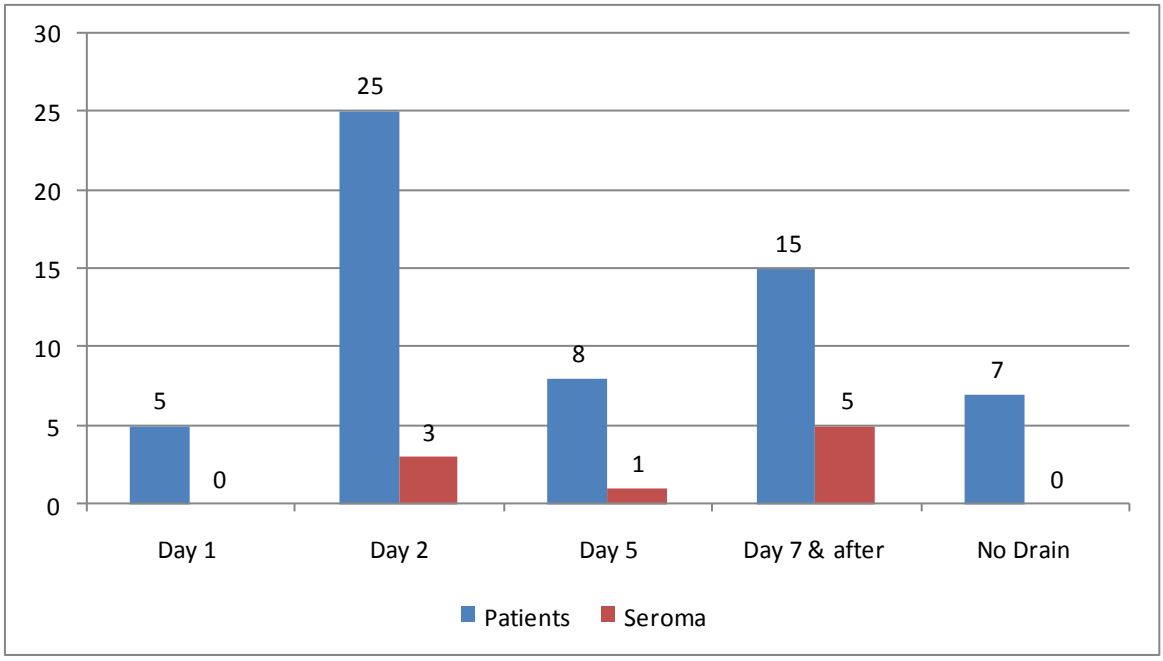

Figure 9: Drain Removal.

DISCUSSION

Mastectomy is still the most common surgical procedure for treating breast cancer. Seroma formation is a common problem occurring after mastectomy under the dead space of skin and the axillary region. Seroma needs treatment when it is symptomatic and causes discomfort to the patient.[24] Multiple needle aspiration or insertion of a new drain under the flaps is necessary in treatment. The optimal closure of the wound should decrease seroma formation, by obliterating the dead space. Techniques should minimize the lymph spillage and serum ooze, and facilitate the rapid removal of accumulating fluid.[24] Some authors have used ultrasonography to detect seroma at the dead space. In the radiological techniques a small amount of fluid accumulation can be detected when it is not palpable at the physical examination.[24]

The incidence of seroma varies between 10% and 85%, due to the difference in detection methods.[15, 24] However; a small amount of serous fluid does not necessitate treatment. Trying to treat this small amount of seroma does not help the patients and causes discomfort. In our experience if the amount is small and the patient has no complaints about seroma, treatment is not necessary. A careful physical examination is important in confirming seroma. Jeffrey et al. showed that seromas resolve in 1 month at the physical examination and 4 months at the ultrasonographic examination.[25] In our practice, we did not use ultrasonography for detecting seroma formation because of its cost inefficiency.

Tissue dissection techniques in breast cancer surgery have been implicated as a major factor that influences the incidence and volume of seroma formation. Since Kakos and James in the 1970s suggested the use of

electrocautery for breast dissection, it has been shown to decrease incision time, reduce blood loss and transfusion requirements but may be associated with increased wound complications.[26-32] Studies comparing sharp dissection, electrocautery are shown in Table 10.[33] Therefore, there seems to be evidence against the use of electrocautery in breast excision and axillary dissection because of the degree of thermal trauma and inflammation followed by increase in the incidence of seroma formation.

Table 10: Data on tissue dissection techniques.[33]

Authors	Year	Type of study	Total no. patients	Incidence of seroma on electrocautery (%)	Incidence of seroma on sharp dissection (%)	P-value
Porter et al.	1998	RCT	80	38	13	0.01
Keogh et al.	1998	RCT	42	38	10	0.03
Lumachi et al.	2004	RCT	92	NA	42	NS
Deo et al.	2002	Comparative	46	22	NA	NS
Galatius et al.	2003	Comparative	59	NA	69	NS
Hoefer et al.	1990	Retrospective	101	30	9	NA

NA, not applicable; NS, non-significant; RCT, randomized controlled trial.

Gonzalez et al. in a retrospective study found no significant association between seroma formation and neoadjuvant chemotherapy.[20]

The use of drain after surgery for breast cancer is probably the most investigated and at the same time most controversial of all techniques aimed at preventing or reducing the incidence of seroma formation. A drain is used routinely after breast cancer surgery with the understanding that it will reduce or prevent seroma accumulation. The influence of negative pressure causing skin flap apposition to the chest wall may facilitate wound healing, reduce the incidence of wound infection, wound dehiscence or flap necrosis and prevent seroma formation.[46,49,52] There are, however, controversies correlating to the optimal suction pressure, number of drains, duration of drainage or in fact whether the drain should be used at all following breast cancer surgery.[34,50-55] Suction drain is known to obliterate the dead space left after breast surgery for cancer thereby preventing accumulation of seroma.[34,48-50,56,59] However, the incidence of seroma formation has been found to be higher when suction drains were used compared with passive drains[34,53] whereas some other investigators reported no significant difference correlating to the rate of seroma between the two types of drains.[48,54] In contrast, the incidence of seroma was unacceptably high when suction drains were not used in a study by Kopelman et al.[58]

Most surgeons tend to remove the drain when the drainage volume is less than 20–50 mL in the preceding 24 h and this may take up to 10 days,[4,14,58-60] but increasingly in practice, patients are discharged early with the drain in situ. Barwell et al. showed that 74% of total fluid drained after wide local excision and axillary dissection was collected within the first 48 h postoperatively.[61] Kopelman et al. recommended that drains may be removed if the drainage volume within the first three postoperative days is less than 250 mL, as keeping them longer in situ did not protect against seroma formation.[58] Gupta et al. in a prospective randomized study grouped patients into 5-day and 8-day drainages after mastectomy and axillary dissection.[62] They showed that removal of drain on the fifth day postoperatively was safe but was associated with an increase in incidence of seroma aspiration and volume. Dalberg et al. in a large multicentre Swedish randomized trial showed that early removal of axillary drain shortened the length of hospital stay but with a significantly higher incidence of seroma.[63] Parikh et al. in a randomized trial showed persistent drainage from those whose drains were left for 6 days rather than 3 days, but after removal of the drains, the number, volume and duration of seroma aspirations were not different in the two groups.[64] The evidence in most published work seems to favour early removal of drain without risking high incidence of seroma formation and other wound complications. However, in cases where there is persistent seroma production, increasingly in practice, drains are left in situ to be managed in the community.

Different methods were used in order to reduce seroma. External compression dressing to the chest wall and axilla to obliterate the dead space has been traditionally used to reduce the incidence of seroma formation. Pressure wound dressing has no effect on the reducing the amount of the seroma.[34] Compression dressing generally has been abandoned, as there is only anecdotal evidence in support of its use after surgery for breast cancer. Chen et al. and O'Hea et al. in randomized trials found that compression dressing failed to reduce the seroma formation and instead increased its incidence. Besides conflicting efficacy, the other problems with compression dressing are discomfort and low tolerance by the patients.[35,36]

Different chemical methods are used for obliterating the dead space, such as fibrin glue, tissue adhesive and sclerotherapy agents. Yet, the effects of chemical agents are not clear. Some authors have stated that fibrin glue significantly reduces the total seroma drainage, allows

earlier drain removal, and reduces hospital stay.[35-39] On the other hand, some other studies report no advantage of using fibrin glue.[13, 39,40] Tetracycline is also used for obliteration and sclerotherapy. Yet, because of the pain, the use of tetracycline has been abandoned.[34]

For the first time, Halsted used suturing with interrupted silk to the fascia and tried to achieve mechanical obliteration of the dead space.[13,43] Aitken et al. tried to obliterate the dead space during radical mastectomy and modified radical mastectomy with dexon tacking sutures to skin flaps. They detected 9.5% seroma rate in the 204 patients.[13,37] Chilson et al. designed a randomized study and reported a rate of 38.6% in the no flap fixation group.[23] They found a 25% seroma rate in the flap fixation group to the muscle in different levels. Because of the long operation time and increased necrosis ratio, O'Dwyer suggests that flap fixation at the incision decreases the seroma rate from 85% to 25%, and it causes less total drain output.[45,46] Flap suturing is an easy method for wound closure. Care must be taken during suturing to ensure that the skin flap is not pulled, which can break the blood flow and prevent wound healing. Schuijtvlot et al. showed that skin flap fixation decreases the seroma rate from 52% to 24%.[47] Purushotham et al. did not use drains and patients were discharged from hospital earlier when flap fixation suturing was used.[48]

Octreotide is a long-acting somatostatin analogue, which suppresses secretion, and its role is well documented in reduction of gastrointestinal tract secretions by reduction of sphlanchnic blood flow. It has been shown in animal models to reduce local inflammatory reaction, which is one of the pathophysiological mechanisms implicated in seroma formation and probably can have a direct effect on the lymphatic circulation by reduction of lymph production.[42, 65, 66] Carcoforo et al. in a prospective trial randomized 261 consecutive patients following axillary dissection for breast cancer into treatment group who received 0.1 mg octreotide s.c. t.i.d. for 5 days starting on the first postoperative day and the control group who received no treatment. They found no significant difference in the wound infection and haematoma rates between the two groups and concluded that octreotide may be used successfully for the treatment of seroma following axillary dissection and potentially in its prevention.[65]

CONCLUSION

Seroma formation after breast cancer surgery is a persistent problem much to the annoyance of surgeon and patient alike, in spite of advances in surgical techniques and haemostasis. Present evidence clearly attributes increase in the incidence of postoperative seroma to electrocautery because of increased thermal trauma. As the exposure of raw area to a relatively less pressurized dead space appears to be yet another pathophysiological factor besides thermal trauma, techniques of obliteration of dead space, therefore, seem to be advantageous. Various methods thus can be used to obliterate this dead space, including tacking of the flaps of mastectomy to the chest wall or the use of surrounding soft tissue to fill in after conserving surgery. The use of drain to evacuate collection in the dead space till the biological absorption of seroma overrides its production is probably the most controversial. Closed suction drain is preferred to no suction drain and provides better flap apposition to the chest wall and promotes healing. Possible usage of drain and subsequent duration of drainage and suction pressure, therefore, remains largely to the clinician's discretion.

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