



Original Research Article

Influence of Surgical Techniques in Axillary Seroma Formation after Breast Cancer Surgery- A Prospective Randomised Study

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Abstract

Breast cancer is a major public health problem for women throughout the world. Surgery is the main stay of treatment for breast cancer. Seroma formation is seen in all cases post surgery. We conducted a Prospective randomized study of 120 breast carcinoma patients, to compare whether the axillary dissection techniques like electrocautery, cold knife & suture ligation and scissor technique has any impact on seroma formation.

The study shows that mean seroma volume with respect to different techniques had significant statistical difference on day five & ten. The mean days of drain removal were 8.65 days for cautery group, 8.10 days for ligation group and 9.2 days for scissor group. There was increase in seroma volume seen with advanced stage ($p = 0.022$). Seroma volume was slightly less in post chemotherapy cases. There was no significant difference observed in seroma volume with respect to nodal status. Seroma volume increased with increase in age.

Keywords: Axillary seroma, Cancer breast, prospective study, randomized study, breast cancer surgical techniques. Modified radical mastectomy. Breast conservation surgery.

Introduction

Breast cancer is a major public health problem for women throughout the world. In United States breast cancer remains most frequent cancer in women and second most frequent cause of cancer death. In Rajasthan, India Breast Cancer forms the sixth most common site of carcinoma in both

sexes combined (i.e., 8.47% of all malignancies). In females, it is the most common site of malignancy (20.44%), whereas in males it constitutes only 0.19%.^[1]

Surgery is the main stay of treatment for carcinoma breast. Seroma formation is seen in all cases. Incidence of seroma formation after breast

surgery varies between 2.5% and 51%.^[2-4] Although seroma is not life threatening, it can lead to significant morbidity, flap necrosis, infection at local site, prolonged drainage & delay in adjuvant treatment. Delay in adjuvant treatment may lead to loco-regional & metastatic failure.

Several factors have been investigated as the cause of seroma formation. These include age, obesity, type of mastectomy, type of wound drainage system used, duration of wound drainage, use of pressure garment, postoperative arm activity, preoperative chemotherapy, comorbid conditions and use of electrocautery.^[5-9]

The etiology of seroma formation is multifactorial. Seroma fluid is the mixture of inflammatory exudates & lymph. To reduce seroma formation & its morbidity several interventions have been proposed which includes the use of ultrasound scissors in performing axillary lymphadenectomy^[10], buttress suture^[11], fibrin glue^[12], fibrin sealant^[13], bovine thrombin application^[14], and altering surgical technique to close dead space.^[15]

We compared the three surgical techniques, electrocautery, cold knife with suture ligation and scissor dissection technique & its effect on seroma volume & duration of seroma formation.

Aims of this study

1. To evaluate the influence of three axillary dissection surgical techniques in seroma formation after breast carcinoma surgery.
2. To evaluate the effect of age, tumour size, nodal status, chemo therapy status, type of surgery on seroma formation.

Material and Methods

We conducted a prospective, double blind, randomized study in the Department of Surgical Oncology, Bhagwan Mahaveer Cancer Hospital and Research Centre, Jaipur.

Inclusion Criteria

- 1) Early stage & Operable locally advanced breast carcinoma.

- 2) Inoperable or large non metastatic breast carcinoma which were down staged by neo adjuvant chemo therapy.

Exclusion Criteria

1. Patients who had undergone previous lumpectomy or biopsy.
2. Patients where breast reconstruction was done.
3. Palliative breast cancer surgery.
4. Male breast cancer.
5. Metastatic breast cancer

Total 121 breast carcinoma cases were studied. Informed consent was taken. Three arms were created & a randomized, double blind study was done.

The three arms were—

- 1) **Electrocautery Dissection Arm:** axillary dissection was done with electrocautery & named vessels were ligated. Total 40 cases.
- 2) **Cold knife with Suture Ligation Arm:** axillary dissection was done with cold knife & all bleeders, lymphatics were suture ligated. Total 38 cases.
- 3) **Scissor Dissection Arm:** axillary dissection was done with scissor named vessels were ligated. Total 43 cases.

Modified Radical Mastectomy or Breast Conservation Surgery with axillary dissection was done upto level III in all cases. Skin flaps were raised with electrocautery in all arms, and axillary dissection was randomized by sealed envelopes to either of the three techniques as mentioned above. Two silicone tube drains (16Fr) (one axillary and one pectoral) were inserted in all the patients. Both the drains were connected to a single 600 ml suction bottle (Romovac). Patients were discharged between 2nd to 4th day of surgery. Any morbidity encountered was recorded. Patients were taught to empty the drain bag, measure the volume in ml/day & record the seroma volume daily at a fix time. The drain was removed once the seroma volume was less than 30 ml/24hrs.

Data analysis was done by chi square in non parametric analysis and students ‘t’ test and ANOVA (analysis of variance) in parametric analysis.

Results

A total 40 cases were included in cautery group, 38 cases were in ligation group and 43 cases were in scissor group.

Table 1: Distribution of cases according to age, type of surgery and pathological tumor size

		Cautery group n (%)	Ligation group n (%)	Scissor group n (%)
Age	<40	3 (7.50%)	5 (13.16%)	5 (11.63%)
	40-49	14 (35.00%)	10 (26.32%)	12 (27.91%)
	50-59	12 (30.00%)	14 (36.84%)	15 (34.88%)
	≥60	11 (27.50%)	9 (23.68%)	11 (25.58%)
Pathological tumor size	pT1	7 (17.50%)	5 (13.16%)	8 (18.60%)
	pT2	25 (62.50%)	26 (68.42%)	26 (60.47%)
	pT3	2 (5.00%)	4 (10.53%)	5 (11.63%)
	pT4	6 (15.00%)	3 (7.89%)	4 (9.30%)

The age distribution of cases <40, 40-59, >60 years in percentage, in cautery group is 7.5, 35.0, 27.5. In ligation group 13.16, 26.32, 23.68. In scissor groups 11.63, 27.91, 25.58%. More than 60% of patients were in age group of 40 to 59 yrs. Distribution of cases according to type of surgery MRM / BCS (%), in cautery group is 82.5/17.5, In ligation group 89.47/10.53, In scissor group 93.2/6.98. MRM surgery was done in more than 80% of patients in all three groups. Distribution of cases according to pathological tumour size, pT1,

pT2, pT3, pT4 in % respectively; in cautery group is 17.5, 62.5, 5, 15. In ligation group 13.16, 68.42, 10.53, 7.89. In scissor group 18.6, 60.47, 11.63, 9.3. More than 60% of breast carcinoma were of pT2 category in all three groups followed by pT3, pT4 category. Distribution of cases according to pathological nodal status, PN0, pN1, pN2, pN3 in % respectively; in cautery group is 47.5, 20, 20, 12.5. In ligation group 52.63, 23.68, 15.79, 7.89. In scissor group 37.21, 39.53, 16.28, 6.98. [Table 1]

Table 2: Distribution of cases according to pathologically metastatic nodal status

Tech	Nodal Status				Total
	N0	N1	N2	N3	
Cautery	19 (47.50%)	8 (20.00%)	8 (20.00%)	5 (12.50%)	40 (100.00%)
Ligation	20 (52.63%)	9 (23.68%)	6 (15.79%)	3 (7.89%)	38 (100.00%)
Scissor	16 (37.21%)	17 (39.53%)	7 (16.28%)	3 (6.98%)	43 (100.00%)
Total	55 (45.45%)	34 (28.10%)	21 (17.36%)	11 (9.09%)	121 (100.00%)

In all three groups maximum patients were N0, followed by N1, N2, and N3, except scissor arm as shown in Table 2

Table 3: Distribution of cases according to pathological stage for breast carcinoma

Stage	Cautery dissection Arm	Cold Knife with suture Ligation Arm	Scissor dissection Arm	Total
1	2	2	5	9
11A	16	17	12	45
11B	6	8	10	24
111A	5	8	10	23
111B	3	1	4	8
111C	8	2	2	12
Total	40	38	43	121

As shown in the above table maximum number of cases were of stage IIA, followed by stage IIB and IIIA.

Table 4: Distribution of cases according to her 2-neu status, ER, PR status, post surgery chemotherapy/ neoadjuvant chemotherapy

		Cautery group n (%)	Ligation group n (%)	Scissor group n (%)
Her 2 neu	Positive	17 (42.50%)	19 (50.00%)	24 (55.81%)
	Negative	23 (57.50%)	19 (50.00%)	19 (44.19%)
ER, PR status	Positive	13 (32.50%)	19 (50.00%)	23 (53.49%)
	Negative	27 (67.50%)	19 (50.00%)	20 (46.51%)
Per Primum		37 (92.50%)	36 (94.74%)	35 (81.40%)
Post CT		3 (7.50%)	2 (5.26%)	8 (18.60%)

Table 4 shows distribution of cases according to her 2-neu (c-erb2), negative / positive in % respectively; in cautery group is 57.5 / 42.5. In ligation group 50 / 50. In scissor group 44.19 / 55.81. Distribution of cases according to ER, PR status, negative / positive in % respectively; in cautery group is 67.5 / 32.5. In ligation group 50 / 50. In scissor group 54.55 / 45.45. Distribution of cases according to Per primum / Post chemotherapy

in % respectively are; in cautery group is 92.5 / 7.5, In ligation group 94.74 / 5.26, In scissor group 81.4 / 18.6.

Mean days of drain removal were 8.65 days for cautery group, 8.10 days for ligation group and 9.2 days for scissor group.

The Volume of seroma was found progressively decreasing in all three techniques of axillary dissection as shown in Graph 1.

Graph 1

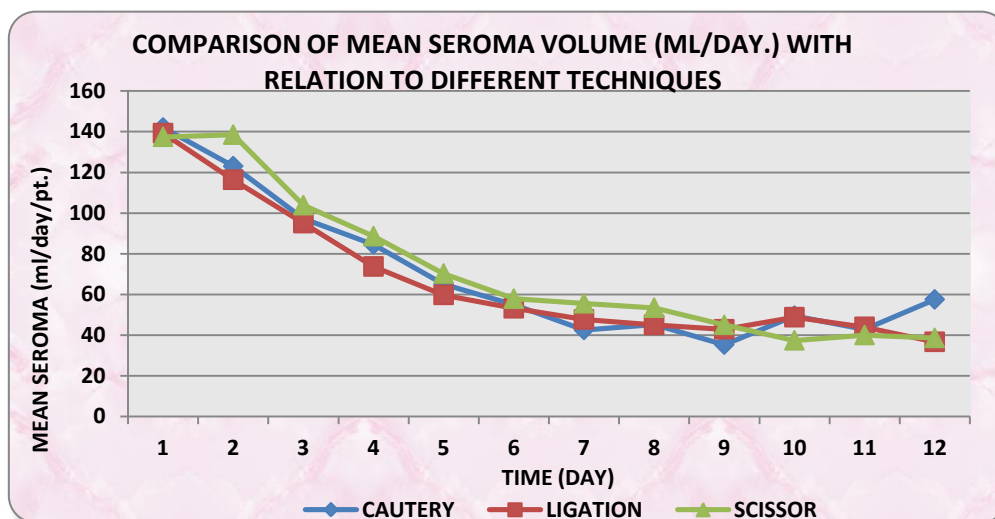
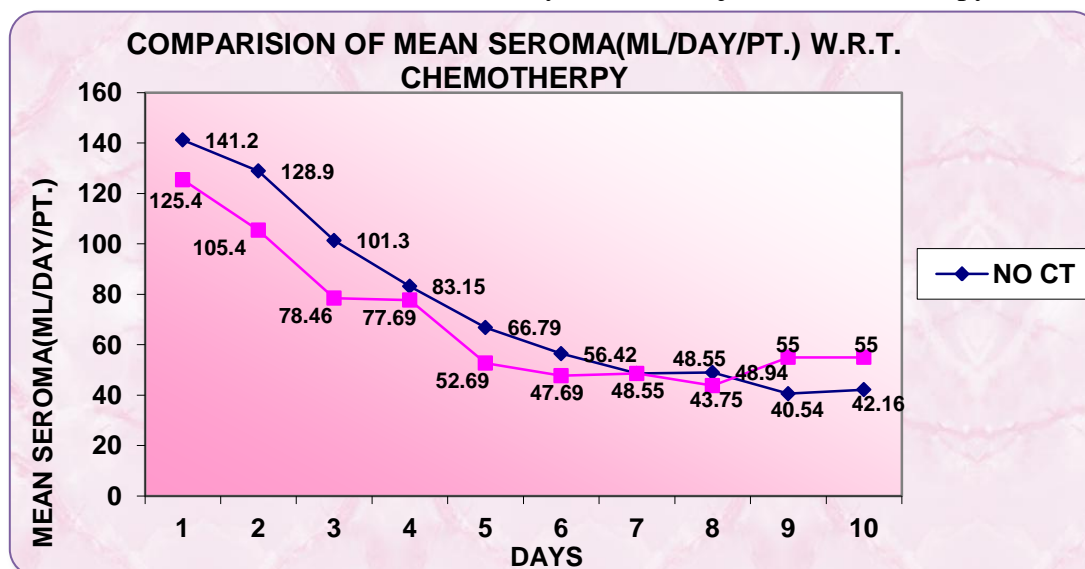


Table 5: Mean seroma volume in ml/day according to stage of disease

Stage	Number of patients	Mean volume (ml/day)	Standard deviation	'P' Value
I	9	71.62	24.22	P =0.022
IIA	45	81.91	21.31	
IIB	24	73.41	23.32	
IIIA	23	63.37	22.07	
IIIB	8	82.71	38.97	
IIIC	12	90.46	31.90	

As shown by above table increase in seroma volume was seen with advanced stage (p =0.022).

Graph 3: Correlation of mean seroma volume (ml/day) with neoadjuvant chemotherapy



The seroma volume was less in post chemotherapy patients than in patients who were taken up for surgery up- front, irrespective of surgical technique.

Table 6: Mean seroma volume on Day 5 and Day 10

	Number of patients	Mean	Standard deviation	p value
Day 5				
Cautery	40	63.375	31.726	0.000
Ligation	38	58.157	30.389	
Scissor	43	25.166	32.181	
Day 10				
Cautery	40	12.375	25.46	0.294
Ligation	38	10.263	22.955	
Scissor	43	18.255	23.091	

As shown in Table 6 on Day 5, there was statistically significant difference in seroma volume cautery, ligation and scissor group. The mean seroma volume in scissor group was significantly less (25.66) in comparison to ligation (58.157) and cautery group (63.375). On day 10, mean seroma volume was higher (18.255) in comparison to ligation (10.263) and cautery group (12.375).

Discussion

The present study was undertaken to identify the influence of surgical techniques of axillary dissection on seroma formation after breast cancer surgery.

Seroma is the inflammatory exudate from the dissected surface and the leakage of the lymphatic fluid following axillary lymph node dissection, Hanne Galatius et, al^[16]. Meticulous surgical technique may reduce the volume of exudate from

the wound surface and perhaps that of the lymphatic fluid that leaks from transected lymph ducts. However, it is not possible to eliminate seroma formation completely.

Other ideas have been considered in an attempt to obtain a more radical reduction in postoperative seromas formation. Different attempts have been made to close the large dead space left after mastectomy.

A technique involving closure of the dead space in the axilla and the dead space beneath skin flaps reduced seroma formation by up to 60%, Coveney E C, et al, Chilson TR, et al^[17,18] A recently introduced fibrin sealant reduces fluid formation significantly. Sanders RP, et al.^[19]

Effect of Surgical Technique

In our study the three different axillary surgical techniques did not affect the volume of & duration of seroma formation.

In our study the electrocautery was used to raise the breast flaps in all arms, and different techniques were randomized in axillary dissection but in other studies the breast flaps were raised with either cautery or cold knife and they found increased seroma volume with cautery arm. This increase in seroma volume in cautery arm was due reaction of tissues to thermal injury.

In Cold Knife With suture Ligation surgical technique, the duration of seroma formation was slightly less than other techniques. The mean duration of seroma formation was 8.10 days as compared to 8.65 in electrocautery and 9.2 in scissor group. Cold knife with suture ligation surgical technique effectively sealed the lymphatics, blood vessels & as there was no thermal injury to tissues hence leading to decrease in seroma volume & duration of seroma formation. In Scissors Surgical Technique the volume initially was more and duration was slightly longer than other techniques, (9.2 days) this could be due to poor haemostasis and ineffective sealing of lymphatics.

Nadkarni et al^[22] in their study used electrocautery for raising flaps, the technique of axillary dissection in mastectomy or breast conservation was dictated by the randomization as in our study. Their study showed that the use of electrocautery in the axilla was not associated with an increased incidence of seromas.

Similarly Hashmi et al^[21] have not found increased seroma formation with electro cautery.

In contrast to our study Porter et al^[20], Doughty et al^[23], Sheen-Chen et al^[24], Keogh et al^[25] and Patrek et al^[26] observed increased seroma formation with the use of electrocautery.

In the study by Porter et al^[20] eighty consecutive mastectomies in 74 patients were randomly assigned to dissection of the mastectomy flaps with either scalpel (n 38) or electrocautery. Seromas developed in 16 wounds in the electrocautery group compared with 5 in the scalpel group (38% and 13%). Use of electrocautery to create skin flaps in mastectomy reduced blood loss but increased the rate of

seroma formation. The association between the use of cautery and seroma formation remained significant ($P < 0.004$). The authors postulated that inadequately sealed lymphatics might predispose the seroma formation. Furthermore, they observed no significant difference in total days of drain retention or total drain output with either scalpel or cautery. In our study we raised skin flaps in all three arms with cautery & this may be the reason for not much difference in seroma volume in all three arms. The increase in seroma in cautery arm in Porter et al^[20] is due to the reaction of the thermal effect on flaps & more lymphatic leak.

Another study Sheen-Chen et al^[24] compared electrocautery with scalpel in two series of consecutive patients, and found no differences in seroma between the groups.

Patrek et al^[26] in their study concluded that the Use of electrocautery was associated with increased incidence of seroma formation as compared to cold knife. It was also reported that tissue ligation around the axillary vein rather than mere transaction with knife or diathermy may reduce the amount of postoperative seroma.

Effect of age was evaluated in our study. The mean age of patients in our study was between 51.2 years. We found significant effect of age on pattern of seroma formation ($p = 0.008$). The volume of seroma formation increased with increasing age irrespective of surgical technique. Similarly Wings et al^[27] found increase in seroma formation in patients of more than 45 years of age. This could be due to impaired healing with advancing age or due to laxity of skin flaps not allowing flaps to adhere to chest wall. Hashmi et al^[21], Gonzalez et al^[7], Porter et al^[8] found no relationship between the incidence of seroma formation and the patients' age.

Patients in our study belonged to early stage, Maximum patients in our study were of Tumour size T2 (63.66%). Most of the patients in our study had N0 Nodal status (45.45%). We found that tumour size, and nodal status had no effect on seroma formation. Which is comparable to Porter et al^[8], Hashmi et al^[21] and Gonzalez et al^[7].

Increase seroma volume was seen with advancing STAGE ($p=0.022$). In our study 12% of cases were of advance stage. Nadkarni et al^[22] study concluded that the only factor that independently predicted increase in postoperative seroma volume was the higher stage of disease. Likewise seroma formation also probably increases linearly with the number of axillary lymph nodes dissected although this has never been documented in any study. This they explained on the basis of more lymphatics being transected when more lymph nodes are removed coupled with the fact that the apex of the axilla, being a non-collapsible space, would not permit lymphatics to close by tamponade effect. Thus, dissection of level-III axillary lymph nodes could also theoretically contribute to the increased incidence of seroma. Patrek et al^[26] also concluded the same.

In our study Modified Radical Mastectomy was done in 88% and Breast Conservation Surgery in 12% of patients. In our study axillary dissection was done upto level-III in all arms. There was no significant difference in seroma formation in breast conservation surgery or modified radical mastectomy. However increase seroma volume was seen from days 10 to 14 in breast conservation group this could be due to the reaction of breast tissue which led to increased seroma formation as compared to raw chest wall in case of modified radical mastectomy. In contrast to our study Hashmi et al^[21], Gonzalez et al^[7], found increased seroma formation with modified radical mastectomy. This was explained by higher rate of positive axillary nodes compared to those who received breast preservation. (78% vs. 21% respectively).

In our study 88% of patients were per primum operable, whereas 12% received neoadjuvant chemo therapy to make them operable. We found no difference in duration of seroma formation in Per Primum Or Post Chemo Therapy patients, though in postchemotherapy group seroma volume per day was slightly less. Same finding was observed by Hashmi et al^[21] also.

There is statistically significant difference in seroma volume on day 5, Scissor group had lesser seroma volume in comparison to rest two techniques. But over next 5 days there was a reduction significant reduction of seroma formation in Cautery and Ligation group.

Conclusion

The three surgical techniques of axillary dissection did have significant effect on the seroma volume but duration of axillary seroma formation remained almost same.

There is no significant effect of tumour size and nodal status on volume & duration of axillary seroma formation. Though the volume of seroma formation increased with increasing stage of Breast Carcinoma.

The axillary seroma formation decreased with decreasing age & in neoadjuvant setting.

The type of surgery (MRM / BCS) did not significantly affect volume & duration of seroma formation.

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