Comparison Study Between Scalpel and Electrocautery, in Causation of Seroma After Modified Radical Mastectomy

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Abstract Worldwide, breast cancer is the commonest malignancy in female population, and an increasing number of women are undergoing modified radical mastectomy (MRM) as a treatment for breast cancer. Though for most patients mastectomy goes uneventful, but for some patients complications of mastectomy are seen that cause morbidity, prolong hospital stay, and delay the adjuvant treatment. Seroma is encountered as a commonest complication after mastectomy. Though various factors are suspected in causation of seroma, in this prospective study, we tried to evaluate outcome of two different surgical technique of MRM in causation of seroma formation. We randomized all patients of breast cancer undergoing MRM in to two groups; in one group, we used electrocautery for raising the skin flap and axillary dissection while in another group we used scalpel to raise the skin flap along with aid of scissors and suture ligation for axillary dissection. Incidence of seroma formation was compared in both the groups. Incidence of seroma was significantly more with use of electrocautery. Results in both the groups were compared by chi-square method, and statistically significant difference in incidence of seroma formation was found between two groups. So in breast surgery, there should not be an injudicious use of electrocautery.

Keywords Mastectomy · Electrocautery · Tissue damage · Seroma

Introduction

Seroma is a collection of sterile serous fluid in the dead space of post-mastectomy skin flap and axilla following breast and axillary surgery, and it is the commonest early complication that is seen [1, 2] with an incidence of 3 to 85 % reported from various studies [3]. Though some surgeons merely view it as a side effect and nuisance, seroma following mastectomy can lead to significant morbidity and at times delay in the initiation of adjuvant therapy [4]. Exact risk factors for its formation have still not been identified, but extent of surgery and technique of surgery are most important in its development. In order to prevent seroma, various techniques and their modifications have been practised and published, but there is little consensus as of yet. It is believed that meticulous attention to technique of breast surgery to minimize the leakage from dissected blood vessels and lymphatics may reduce the incidence of seroma formation [5]. Use of electrocautery because of its charring effect on tissue during breast surgery has been reported as one of the causative factors in seroma formation [6]. The aim of our study was to find if there is a significant association of use of electrocautery with seroma formation, while performing modified radical mastectomy (MRM).

Materials and Methods

The prospective study was conducted between the year 2008 and 2011, at the Breast Service Center IPGME & R, Kolkata, where 176 patients with early breast cancer (stages I and II defined by AJCC 6th staging system) within the age group of

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40 to 65 years were included (inclusion criteria) and patients with the following features were excluded from study (exclusion criteria): (a) locally advanced breast cancer (stages III and IV), (b) body mass index (BMI) greater than 30 kg/m² and less than 18.5 kg/m², (c) diabetes mellitus, (d) uncontrolled hypertension (systolic BP > 150 or diastolic BP > 100), (e) patients having received neoadjuvant treatment, and (f) anticipated of low compliance for follow up. MRM was an uniform initial treatment for all patients. After giving single dose of IV antibiotic (1.2 g Amoxicillin + Clavulanate) at the time of induction of anesthesia, all patients were operated under general anesthesia. Informed consent was obtained from all patients. All the procedures were done by an in-charge surgeon of the Breast Service Center IPGME & R Kolkata, who is the consultant professor and had experience of nearly 15 years for breast surgeries at the commencement of this study. For all operations, we have used the same electrocautery instrument and with the same setting of blend mode with cutting and coagulation of 35 each. To reduce the selection bias further and to increase comparability between two groups by avoiding confounding factors, patients were randomized in to two groups, A and B using table of random numbers. In group A (sample size 109), during MRM, coagulating mode electrocautery was used to raise the skin flap and for axillary dissection. In group B (sample size 67), during MRM, scalpel blade no 15 was used to raise the skin flap, along with aid of scissors and suture ligation for axillary dissection wherever necessary. Further in group B, there was an extremely minimal use of electrocautery wherever found necessary to achieve hemostasis (with coagulating mode), but use of electrocautery in group B was absolutely avoided for routine raising of the skin flap and for axillary dissection. To ensure an uniform skin flap thickness, and to avoid it as a confounding variable, all patients were operated by the same team of surgeons; the main operating surgeon who raised the skin flap and did axillary dissection was the same for all the cases and plane of dissection while raising skin flap maintained between sub-dermal fat and breast tissue. Both the groups underwent standard modified radical mastectomy with lymph node dissection of level I, II, and III. Closed suction drain with negative pressure (number 16) was kept in both the groups, with one tube along the lower skin flap and another tube in the axilla. Skin closure was done with nonabsorbable monofilament. Arm compression was avoided in both the groups. On histopathology report, adequate lymph node dissection (minimum 10 number axillary nodes) was ensured in both the groups. In the postoperative period, drain quantity was monitored and noted every 24 h for both the groups. Postoperatively our criteria for drain removal was when drain quantity in the last 24 hours had fallen to less than 30 ml. Development of seroma as a complication was defined when drain quantity continued to be more than 40 ml after postoperative day 7 or if there was clinically evident fluid

collection beneath the skin flap during follow up of patients after discharge from hospital. After removal of drain, we kept follow up for the next 12 weeks, skin flaps were examined regularly to see any fluid collection noticing fluctuation, and seroma was confirmed with aspiration of fluid (Fig. 1). Chi-square test was applied for comparison of seroma formation between both the groups. The level of significance was set at p value <0.05.

Result and Analysis

Group A comprised of 109 females with mean age of 52 (40–65) years, and group B comprised of 67 females with mean age of 53 (40 to 65). There were no significant differences between the two groups with respect to age, BMI, tumor size, nodal yield (both groups underwent level I, II, and III nodal clearance), and nodal involvement. The number of patients who developed seroma in groups A and B has been shown in the following table. Duration of surgery was longer in group B (mean duration for groups A and B was, 77 and 109 min, respectively). Mean duration of time for removing a drain in number of days was 9 for group A and 5 for group B.

Comparison of seroma formation in both the groups in the form of percentage of patients in either group is shown in Fig. 2.

Discussion

Post-mastectomy seroma is often perceived as a side effect of breast surgery rather than a complication, still, it can lead to significant morbidity after the procedure. It continues to be an unresolved problem as the risk factors for its causation have still not been found, but extent and technique of procedure are often considered as responsible factors for its development. Though precise pathogenesis of seroma has not been fully elucidated, it is believed that seroma forms due to acute

Fig. 1 Seroma detection during follow up period

Fig. 2 Percentage of patients developing seroma

inflammatory exudates in response to surgical trauma in an acute phase of wound healing [7]. As lymphatic drainage of breast is rich which goes through intramammary lymphatics to the axillary, supraclavicular, and internal mammary nodal basins, this causes the tendency for seroma formation after breast surgery. During breast surgery, damage to small blood vessels and lymphatics cause leakage of fluid which forms as a seroma [8]. It has been proposed that the low fibrinogen levels and net fibrinolytic activity within lymphatic fluid collections aggravates seroma formation [7, 9]. Collection of seroma raises the flaps from the chest wall and axilla thereby preventing their adherence to the tissue bed. It thus can lead to significant morbidity such as wound hematoma, delayed wound healing, wound infection, wound dehiscence, prolonged hospitalization, delayed recovery, and initiation of adjuvant therapy and cosmetically poor skin flap as seen in Fig. 3 [7, 8]. Learning some factors in its development might help in its prevention. There seems to be an evidence against the use of electrocautery in breast surgery, as electrocautery produces significant thermal trauma and inflammation after its charring effect on fat, blood, and lymphatic vessels. So it is believed that electrocautery leads to more seroma formation [7]. Two prospective clinical trials by K Porter et al. and Keogh G et al. randomly assigned patients who had breast cancer, to undergo surgery either only with electrocautery or with scalpel, and these studies have confirmed that there is lower incidence of seroma formation with dissection by scalpel blade compared to electrocautery [6, 10]. Our finding matches with above studies, as evident from Table 1 from results and analysis, seroma formation is less in group B

Table 1 Comparison of seroma formation in two groups

Group	Dissection technique and total number of patients	Number of patients who developed seroma	Number of patients who did not develop seroma
Group A	Electrocautery (109)	26	83
Group B	Scalpel and scissors (67)	5	62

Fig. 3 Cosmetically poor skin flap who developed prolonged seroma

compared to group A where scalpel blade was used during the dissection instead of electrocautery. According to chi-square test, p value for association between use of electrocautery and seroma development is 0.0307, and this is significant, at p value <0.05 . That is in our study, statistically significant association exists between the use of electrocautery and seroma development after MRM. The association of electrocautery and seroma formation following mastectomy could be due to two reasons, i.e., (1) the fact that use of electrocautery leads to temporary sealing of lymphatic channels, which open up later on allowing egress of fluid without cells, and (2) extensive fat necrosis and lymphatic vessels damage due to tissue burn leads to further seroma formation. However, we feel that further study is still needed to find what should be the optimum setting of electrocautery while performing mastectomy and what other alternative technical modalities could be better to prevent seroma, and simultaneously to ease the procedure of mastectomy in terms of minimizing the duration of surgery and achieving hemostasis. This is because with scalpel dissection, though it decreases incidence of seroma, it makes the field more oozing, blood loss is more, operating time and duration of anesthesia increases, and above that, except of expertise, scalpel dissection may have variable flap thickness.

Conclusion

Electrocautery is significantly associated with the seroma formation in breast surgery, so *there should not be an injudicious use of electrocautery during mastectomy for breast cancer*. Routine use of electrocautery to raise the skin flap should be avoided, and its use should be restricted to achieve hemostasis whenever necessary.

Compliance with Ethical Standards

Conflict of Interest The authors declare that there is no conflict of interests regarding the publication of this paper.

Informed consent Informed consent was obtained from all patients regarding the procedure and study.

References

1. Chilson TR, Chan FD, Lonser RR et al (1992) Seroma formation after modified radical mastectomy. *Am Surg* 58:750–4
2. Hashemi E, Ahmad K, Masoume N (2004) Seroma formation after surgery for breast cancer. *World J Surg Oncol* 2:44. doi:[10.1186/1477-7819-2-44](https://doi.org/10.1186/1477-7819-2-44)
3. Kumar S, Lal B, Misra MC (1995) Post-mastectomy seroma: a new look into the aetiology of an old problem. *J R Coll Surg Edinb* 40: 292–294
4. Srivastava V, Basu S, Shukla VK (2012) Seroma formation after breast cancer surgery: what we have learned in the last two decades. *J Breast Cancer* 15(4):373–80. doi:[10.4048/jbc.2012.15.4.373](https://doi.org/10.4048/jbc.2012.15.4.373)
5. Gong Y, Xu J, Shao J et al (2010) Prevention of seroma formation after mastectomy and axillary dissection by lymph vessel ligation and dead space closure: a randomized trial. *Am J Surg* 200:352–356
6. Porter KA, O'Connor S, Rimm E, Lopez M (1998) Electrocautery as a factor in seroma formation following mastectomy. *Am J Surg* 176:8–11. doi:[10.1016/S0002-9610\(98\)00093-2](https://doi.org/10.1016/S0002-9610(98)00093-2)
7. Pogson CJ, Adwani A, Ebbs SR (2003) Seroma following breast cancer surgery. *Eur J Surg Oncol* 29:711–717
8. Sanjitha S, Gabriel R (2010) Seroma formation after mastectomy: pathogenesis and prevention. *Indian J Surg Oncol* 1(4):328–333. doi:[10.1007/s13193-011](https://doi.org/10.1007/s13193-011)
9. Bonnema J, Ligtenstein DA, Wiggers T, van Geel AN (1999) The composition of serous fluid after axillary dissection. *Eur J Surg* 165: 9–13
10. Keogh G, Doughty J, McArdle C et al (1998) Seroma formation related to electrocautery in breast surgery: a prospective, randomized trial. *Breast* 7:39–41