Section: General Surgery

Original Research Article

QUILTING SUTURES VERSUS CONVENTIONAL SUTURES IN MODIFIED RADICAL MASTECTOMY IN REDUCING POST-OPERATIVE SEROMA FORMATION: PROSPECTIVE RANDOMIZED CONTROLLED TRIAL

J. A. Jayalal[1], Selwyn J Kumar[2], J. Ajin Manovah[3], L. Michael[3], Mohamed Haaris[4]

[1]HOD & Professor, Department of General Surgery, Kanyakumari Govt Medical College & Hospital, Tamil Nadu, India.
[2]Associate Professor, Department of General Surgery, Kanyakumari Govt. Medical College & Hospital, Tamil Nadu, India.
[3]Assistant Professor, Department of General Surgery, Kanyakumari Govt Medical College & Hospital, Tamil Nadu, India.
[4]Postgraduate, Department of General Surgery, Kanyakumari Govt Medical College & Hospital, Tamil Nadu, India.

Received : 08/01/2025
Received in revised form : 05/03/2025
Accepted : 21/03/2025

Keywords:
Seroma, Modified Radical Mastectomy, Quilting.

Corresponding Author:
Dr. L. Michael,
Email: 14michael1989@gmail.com

DOI: 10.47009/jamp.2025.7.2.102

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (2); 501-505

Abstract

Background: Seroma formation is the most common complication occurring in patients undergoing modified radical mastectomy for breast carcinoma. Historically, researchers have tried various methods to reduce seroma formation, but none have proven effective. This study compared the effects of a quilting suture and a conventional suture on the development of seroma in the pectoral region following a modified radical mastectomy with axillary lymph node dissection (ALND) for breast carcinoma. **Materials and Methods:** A prospective analysis of 42 individuals with breast carcinoma was conducted. The participants were randomly allocated into two groups: conventional and quilting groups. The patients were followed postoperatively for formation of seroma. Variables such as total duration of hospital stay, time for suturing, overall drain volume, and occurrence of SSIs were compared. **Result:** Quilting significantly reduced the formation of seroma and the overall drainage volume when compared to conventional suturing. Quilting increases, the duration of surgery. It does not significantly reduce the length of hospital stay and occurrence of SSIs. **Conclusion:** Quilting sutures reduced seroma formation in patients undergoing MRM during the first month after mastectomy. Quilting also reduced overall drain volume and thus shortened the length of days spent by the patient in the hospital. There is a need for a wider and multicentric study to prove the efficacy of quilting in reducing seroma incidence.

INTRODUCTION

The most common and standard therapy for breast cancer is mastectomy.[1] Seroma development is the most frequent side effect following mastectomy and/or axillary lymph node dissection (ALND).[2,3] During mastectomy or axillary lymph node dissection, seroma, an accumulation of serous fluid beneath the skin flaps, is one of the most common adverse effects. According to some surgeons, seroma is inevitable.[2,3]

There is a Seroma formation has an incidence ranging from 15% to 85%, though its exact pathophysiology remains incompletely understood. Various studies suggest a multifactorial origin for this fluid accumulation. Surgical procedures involving extensive soft tissue dissection are more likely to disrupt blood and lymphatic vessels, leading to transudative fluid collection. Additionally, significant tissue resection creates a large potential dead space, preventing proper adhesion of tissue flaps and generating shearing forces between surfaces. This process is believed to trigger an inflammatory response, resulting in exudative fluid secretion from tissues and contributing to seroma development.[4-8]

Previous studies have tried seroma prevention methods such as fibrin glue, thrombin sealants, pressure dressing, heparin injections and shoulder immobilization, some of which are costly.[9-13] Suction drainage is the conventional method of reducing seroma formation. However, drains are associated with patient discomfort, risk of infection, prolonged hospital stay, SSI or the need for drain care

ISSN (O): 2687-5365; ISSN (P): 2753-6556

at home and postoperative wound care.[14,15] Furthermore, seroma may recur after drain removal. Seroma may contribute to the development of SSI.[16] According to a study on the effectiveness of the quilting technique in reducing seroma following mastectomy, using the quilting technique considerably lowers the mean volume of seroma and the time it takes for seroma to completely end.[17] While some research found quilting sutures to significantly reduce seroma production, other studies found no such effect.

The quilting suture technique minimizes dead space by suturing the upper and lower flaps to the underlying musculature. In order to prevent seroma formation in the pectoral area, some research evaluated the use of quilting suture and drains in combination, whereas other studies employed quilting suture alone together with an axillary drain. Some studies even excluded all drains following mastectomy and axillary lymph node dissection. Seroma production is associated with comorbidity, higher hospital visits, and a greater financial burden on healthcare.[18]

According to Sakkary et al., the quilting approach considerably decreased the total drainage volume and overall seroma formation following modified radical mastectomy.[19]

Despite these findings, there remains no clear consensus on the optimal approach to seroma prevention. The variability in study outcomes suggests that factors such as patient characteristics, surgical techniques, and postoperative management may influence the effectiveness of quilting sutures. Additionally, while some studies advocate for the combined use of quilting sutures and drains, others suggest that quilting alone may be sufficient in reducing seroma formation. This lack of standardization highlights the need for further research to establish evidence-based guidelines. A well-designed prospective randomized controlled trial comparing quilting sutures to conventional sutures in modified radical mastectomy is essential to clarify their role in reducing postoperative seroma. By providing robust clinical evidence, this study aims to determine whether quilting sutures offer a significant advantage in minimizing seroma formation, reducing hospital visits, and improving overall patient outcomes.

MATERIALS AND METHODS

This prospective randomized controlled study was conducted at the Department of General Surgery, Kanyakumari Government Medical College Hospital, Kanyakumari, between March 2024 and September 2024. A total of 42 patients undergoing modified radical mastectomy were included in the study using consecutive sampling. Patients aged 18 years or older with breast cancer, including in situ carcinoma and early breast cancer, were eligible for inclusion. Patients who had undergone neoadjuvant chemotherapy, immediate breast reconstruction, breast conservation surgery, or palliative surgery/toilet mastectomy were excluded. Additionally, patients with locally advanced breast carcinoma were not included in the study.

Patient-related data, including age, gender, body mass index (BMI), TNM stage, diabetes, hypertension, and coronary artery disease, were recorded. Randomization was achieved using sealed envelopes, which were opened by the operating surgeon before surgery to assign patients to either the conventional suture group or the quilting suture group.

Electrocautery was used in all procedures. In the conventional group, two suction drains were placed, one in the axillary region and one in the pectoral region. In the quilting group, only a single axillary drain was placed, while the pectoral drain was omitted. Instead, the skin flaps over the pectoral area were secured to the underlying pectoral muscle using absorbable sutures (Polyglactin 910) in 2–3 rows, with 10–12 sutures per row. The axillary region was left open to allow fluid drainage into the axillary area. In both groups, the skin edges were closed using absorbable sutures, and the skin was sealed with 2-0 Ethilon sutures.

Drain fluid volume was recorded daily in millilitres. The drain was removed once the volume reduced to less than 25 mL/day or at the time of discharge. Patients were followed up for six months, with clinical and ultrasound examinations conducted to assess seroma formation.

For statistical analysis, continuous variables were presented as mean and standard deviation, while categorical variables were expressed as frequency and percentage. The independent sample t-test was used to compare continuous variables, and the Pearson chi-square test was applied to compare categorical variables. A p-value of less than 0.05 was considered statistically significant. The data analysis was done using IBM-SPSS version 21.0 (IBM SPSS Science Inc., Chicago, IL).

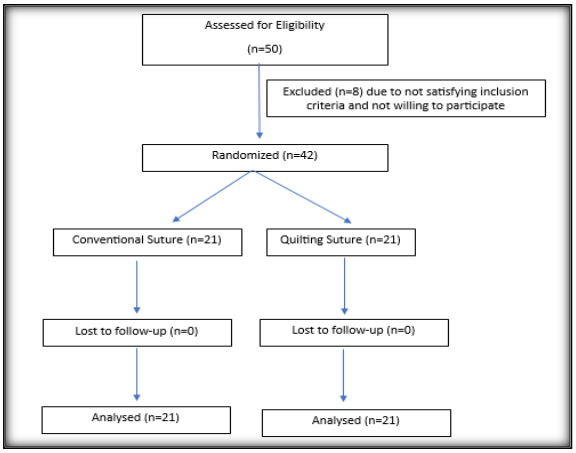

Figure 1: CONSORT diagram

ISSN (O): 2687-5365; ISSN (P): 2753-6556

RESULTS

[Table 1] shows the characteristics of patient enrolled in the study. The mean age was comparable in both groups (50.8 in conventional group vs 52.7 in intervention group). The mean BMI in both groups was also comparable (22.9 in conventional group vs 22.7 in internation group). 60% of patient in conventional group were TNM stage 2 and 52.3% were TNM stage 2 in quilting group.

Table 1: Demographic characteristics among study participants

Characteristics	Conventional(n=21)	Quilting(n=21)	P value
Age	50.8(7.2)	52.7(6.9)	0.3878
BMI	22.9(4.2)	22.7(4.1)	0.87
Menopause	12(57.1%)	10(47.6%)	0.66
TNM Stage I	5(23.8%)	6(28.5%)	0.818
TNM Stage 2	13(60%)	11(52.3%)	
TNM Stage 3	3(14.2%)	4(19%)	

Table 2: Comparison of Seroma Formation, Surgical Outcomes, and Postoperative Parameters Between Conventional Sutures and Quilting Sutures

Characteristics	Conventional(n=21)	Quilting(n=21)	P value
Prescence of seroma	10(47.6%)	4(19%)	<0.05
Seroma grade I	4(19%)	2(9.5%)	
Seroma grade II & III	6(28.5%)	2(9.5%)	
Length of hospital stay	6.58±3.87	7.21±4.21	0.616
Time for suturing	16.21±4.28	25.5±5.87	<0.001
Drain Volume	451.67±90.85	368.98±101.65	0.0083
Surgical site infection	1(4.7%)	1(4.7%)	1.00

The incidence of seroma formation shows difference between both the groups with 47.6% in conventional group and 19% in quilting group. The length of hospital stay is comparable in both the groups. There is a difference in time for suturing for application of quilting sutures (16.21+4.28 min in conventional group versus 25.5+5.87 in quilting groups, which is statistically significant. The drain volume in both groups is statistically significant with lesser drain volume in quilting group than conventional group (368.98+101.65 in quilting vs 451.67+90.85 in quilting group with a p value= 0.0083). The occurrence of surgical site infections in both groups is comparable in both groups with 1 case occurring in both groups.

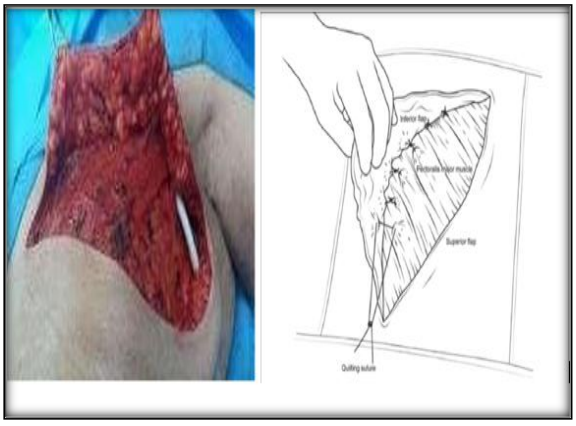

Figure 2: Quilting Suture

DISCUSSION

Breast carcinoma is the most common carcinoma affecting women worldwide. 14% of all cancer diagnosis are the patients of breast carcinoma. Many treatment modalities have been in practice for treatment of breast carcinoma. William Halsted performed the first radical mastectomy in1882. This technique remained the standard treatment for breast carcinoma till the start of 20th century. As investigatory facilities grew and with the much earlier detection of breast carcinoma, new and less disfiguring surgical techniques have been practiced. The more ethical and less morbid mastectomy was developed in 1932. Various newer treatment modalities such as chemotherapy, radiotherapy and immunotherapy have been brought into the surgeon's armory in tackling the recurrence and improve lifestyle of breast cancer patients. However, even with the advent of many treatment modalities, modified radical mastectomy (MRM) remains the primary treatment for breast carcinoma. MRM can be done for early breast carcinoma and after neoadjuvant chemotherapy in locally advanced breast carcinoma. MRM involves the in toto removal of the breast tissue along with the overlying skin enclosing nipple- areola complex with the dissection and removal of axillary lymph nodes with preservation of Pectoralis muscles. MRM is always often followed by a course of adjuvant chemotherapy to achieve 100% removal of tumor cells. But complications occurring as a result of MRM delay the referral of patients to chemotherapy.

One of the most common problems occurring after MRM is the seroma formation. Seroma is the accumulation of fluid underneath the surgical site in post-operative period. Seroma occurs due to damage to the lymphatic vessels during surgery and can cause leakage of clear fluid into the dead space. Various techniques have been tried to reduce the seroma rate. In our study, we used one such technique, the Quilting technique with the aim to reduce seroma formation and the stress it inflicts on patients

ISSN (O): 2687-5365; ISSN (P): 2753-6556

postoperatively. Further seroma can prolong the time of wound healing and pose a risk for infection. Hence elimination of seroma can greatly vary the outcome of the surgery and patients experience.

In the present study, the quilting procedure significantly reduced seroma formation as compared to conventional procedure. This is similar to the results obtained by Madhu et al (2016) and in contrary with that conducted by Yuhi wu et al. (2020) which showed that quilting did not significantly reduce late seroma formation (seroma after drain removal).[20] Quilting sutures caused significant increase in the time taken for application of quilting sutures and this is in acceptance with the study conducted by Myint et al. (2020).[21] In our study, the difference in surgical technique arises only during the closure of the flaps after excision of the tumor. The quilting sutures required an additional time to be made compared with the conventional group.

In our study, quilting has significant decrease in the volume of fluid drained. This is like the results produced by Madhu et al. (2016).[22] This study has shown that Quilting had no significant effect on the incidence of infections. Quilting did not result in increase of occurrence of SSI. This is similar in result as compared to Myint et al. (2020) which also showed that quilting does not significantly increase infection rate.[21] This study also showed that quilting did not significantly reduce the duration of hospital stay.

Limitations of the Study

Despite the promising findings, this study has several limitations that should be acknowledged. First, the sample size of 42 patients may not be large enough to generalize the results to a broader population. A larger, multicentric study would provide more robust evidence. Second, the follow-up duration of six months may not be sufficient to assess long-term outcomes such as the recurrence of seromas or late complications. Additionally, the study did not account for variations in surgical techniques or surgeon experience, which could influence the outcomes. Third, the exclusion of patients undergoing neoadjuvant chemotherapy or immediate breast reconstruction may limit the applicability of the results to all breast cancer patients. Finally, the study did not evaluate patient-reported outcomes, such as pain levels or quality of life, which are important factors to consider when assessing the impact of surgical techniques. These limitations suggest the need for further research to confirm the findings and explore additional aspects of quilting sutures in modified radical mastectomy.

CONCLUSION

The findings of this study suggest that quilting sutures during flap closure in modified radical mastectomy effectively reduce drain volume and seroma formation in the postoperative period. The quilting technique proves advantageous by closing and obliterating dead space, which helps minimize fluid accumulation. However, further investigation through larger-scale, multi-center studies is required to fully establish the efficacy of quilting sutures. Despite the promising results with quilting, the conventional drain tube technique remains a straightforward and reliable approach for managing seroma, supporting early wound healing, and enabling timely patient discharge for continued care.

REFERENCES

1. *Li J*, Zhang BN, Fan JH, Pang Y et al. A nation-wide multicenter 10-year (1999-2008) retrospective clinical epidemiological study of female breast cancer in China. *BMC Cancer*. 2011;11:364.
2. Van Bemmel AJ, van de Velde CJ, Schmitz RF et al. Prevention of seroma formation after axillary dissection in breast cancer: a systematic review. European Journal of Surgical Oncology 2011;37: 829–835
3. Kuroi, K. et al. Pathophysiology of seroma in breast cancer. Breast Cancer 12, 288– 293. https:// doi. org/ 10. 2325/ jbcs. 12. 288 (2005).
4. Kuroi K, Shimozuma K, Taguchi T, Imai H, Yamashiro H, Ohsumi S, Saito S. Pathophysiology of seroma in breast cancer. Breast Cancer. 2005;12(4):288-93.
5. Andrades P, Prado A, Danilla S, Guerra C, Benitez S, Sepulveda S, Sciarraffia C, De Carolis V. Progressive tension sutures in the prevention of postabdominoplasty seroma: a prospective, randomized, double-blind clinical trial. Plast Reconstr Surg. 2007 Sep 15;120(4):935-946.
6. Seretis K, Goulis D, Demiri EC, Lykoudis EG. Prevention of Seroma Formation Following Abdominoplasty: A Systematic Review and Meta-Analysis. Aesthet Surg J. 2017 Mar 01;37(3):316-323.
7. Unalp HR, Onal MA. Analysis of risk factors affecting the development of seromas following breast cancer surgeries: seromas following breast cancer surgeries. Breast J. 2007 Nov-Dec;13(6):588-92.
8. Janis JE, Khansa L, Khansa I. Strategies for Postoperative Seroma Prevention: A Systematic Review. Plast Reconstr Surg. 2016 Jul;138(1):240-252.
9. Turner EJ, Benson JR, Winters ZE. Techniques in the prevention and management of seromas after breast surgery. Future Oncol. 2014; 10: 1049-63.
10. Burak WE Jr, Goodman PS, Young DC, et al. Seroma formation following axillary dissection for breast cancer: risk factors and lack of influence of bovine thrombin. J Surg Oncol. 1997; 64: 27-31.
11. Jayalal et al Study to Evaluate the Effectiveness of Prophylactic Intravenous Heparin Injection in Preventing Flap Necrosis in Case of Ventral Hernias International Journal of Science and Research (IJSR) ISSN: 2319-7064SJIF(2022):7.942https://dx.doi.org/10.21275/MR24328185126
12. Carless PA, Henry DA. Systematic review and meta-analysis of the use of fibrin sealant to prevent seroma formation after breast cancer surgery. Br J Surg. 2006; 93: 810-819.
13. J A Jayalal, Selwyn J Kumar, et al Effect of single-dose antibiotic prophylaxis versus conventional antibiotic therapy in surgery Int J Sci Stud 2015;3(8):109-113.DOI: http://dx.doi.org/ 10.17354/ijss/2015/520
14. Van Zeelst LJ, Ten Wolde B, Van Eeker RR, et al. Quilting following mastectomy reduces seroma, associated complications and healthcare consumption without impairing patient comfort. J Surg Oncol. 2022; 125: 369-376.
15. Ouldamer L, Caille A, Giraudeau B, et al. Quilting suture of mastectomy dead space compared with conventional closure with drain. Ann Surg Oncol. 2015; 22: 4233- 4240.
16. Van Bemmel AJ, Van de Velde CJ, Schmitz RF, et al. Prevention of seroma formation after axillary dissection in breast cancer: a systematic review. Eur J Surg Oncol. 2011; 37: 829-835.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

17. Keshav Prakash S, Ganesh Babu CP, Vinoth Kumar S. Evaluation of Quilting Technique for Reduction of Post Mastectomy Seroma Formation – A Randomized Control Study. World J Surg Surgical Res. 2022; 5: 1354.
18. Meena SP et al. A quilting sutures technique for flap closure in patients undergoing modified radical mastectomy for the prevention of seroma: A single-center, randomized controlled trial. J Edu Health Promot 2024;13:240.
19. Sakkary MA. The value of mastectomy flap fixation in reducing fluid drainage and seroma formation in breast cancer patients. World J Surg Oncol 2012;10:8.
20. Wu Y, Wang S, Hai J et al. Quilting suture is better than conventional suture with drain in preventing seroma formation at pectoral area after mastectomy. BMC Surg. 2020 Apr 6;20(1):65. doi: 10.1186/s12893-020-00725-8. PMID: 32252732; PMCID: PMC7137264.
21. Myint ST, Khaing KS, Yee W. Quilting suture versus conventional closure in prevention of seroma after total mastectomy and axillary dissection in breast cancer patients. ANZ J Surg 2020;90:1408–13.
22. Madhu BS, Reddy NKM, Kumar SHB et al. A randomized controlled trial evaluating the efficacy of mastectomy flap quilting sutures in reducing post modified radical mastectomy seroma formation. Int Surg J 2017;4:714-8.

ISSN (O): 2687-5365; ISSN (P): 2753-6556