Original Article
DOI: https://doi.org/10.70749/ijbr.v3i7.2851

INDUS JOURNAL OF BIOSCIENCE RESEARCH
https://ijbr.com.pk
ISSN: 2960-2793/ 2960-2807

The Comparison of Quilting Sutures and Conventional Sutures for Flap Fixation in Modified Radical Mastectomy for Seroma Formation: A Randomized Controlled Trial

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ARTICLE INFO

Keywords: Quilting sutures, modified radical mastectomy, seroma formation, conventional sutures, postoperative complications

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Declaration
Authors' Contribution: All authors equally contributed to the study and approved the final manuscript.

Conflict of Interest: No conflict of interest.

Funding: No funding received by the authors.

Article History
Received: 08-06-2025 Revised: 01-07-2025
Accepted: 10-07-2025 Published: 15-07-2025

ABSTRACT

Background: Seroma is a frequent postoperative complication in modified radical mastectomy (MRM) surgery that may cause patient discomfort, extended hospitalization, and adjuvant therapy delay. A number of methods, such as quilting sutures, have been suggested to stop the formation of seroma by eliminating dead space and decreasing fluid accumulation. **Objective:** To evaluate the efficacy of quilting sutures in reducing seroma formation compared to conventional sutures in patients undergoing modified radical mastectomy. **Patients and Methodology:** It is a randomized controlled trial conducted between 17 February **to** 17 June at the Holy Family Hospital in Rawalpindi. It comprised 60 female patients receiving MRM to treat carcinoma breast wherein 30 patients in each group were involved. Group A had quilting suture and Group B had conventional suture. The primary results were the occurrence of seroma formation but the secondary results were the drain output, the drainage time and postoperative complications. The data analysis was done using SPSS version 23.0, and the p-value of less than 0.05 was considered to be statistically significant. **Results:** The study population had mean age of 51.53 years with standard deviation of 8.49. The incidence of seroma was 3.3 percent in quilting group (Group A) versus 26.7 percent in conventional suture group (Group B) and the difference between them was statistically significant (p = 0.026). The mean length of stay of the drains inserted was much lower in Group A (3.93 ± 0.83 days) than in Group B (6.00 ± 0.74 days), and the overall drain output was much lower in Group A (93.00 ± 7.96 ml) than in Group B (121.87 ± 11.98 ml) (p = 0.01). The two groups did not exhibit any significant difference in terms of age, BMI, pain and shoulder mobility. **Conclusion:** Quilting sutures significantly reduce seroma formation in modified radical mastectomy compared to conventional sutures, with fewer aspirations and shorter drainage duration, making it a valuable technique for seroma prevention.

INTRODUCTION

Breast cancer is the most widespread cancer among women across the world and has continued to be a major health challenge among the community particularly in the low and middle-income countries. Despite advances in screening, neoadjuvant therapy, and breast-conserving approaches, a substantial proportion of patients still require modified radical mastectomy (MRM) due to advanced stage at presentation, tumor characteristics, or limited access to specialized oncological care. In South Asian countries, including Pakistan, delayed presentation is common, making MRM one of the most frequently performed surgical procedures for breast cancer management.[1,2]

Of all the postoperative complications that follow MRM, seroma is the most prevalent and problematic. The seroma is defined as the presence of serous fluid under the flaps of the skin or in the axillary dead space following breast surgery. Reported incidence varies widely in the literature, ranging from 15% to as high as 90%, largely due to differences in operative technique, extent of dissection, drain policy, and definitions used to identify seroma.[3,4] Recent observational studies have reported high seroma incidence following mastectomy, with up to 71.1% of women developing clinically significant seroma postoperatively and multiple risk factors such as overweight/obesity and extensive nodal dissection identified.[16] Additionally, large cohort analyses continue to demonstrate the frequent occurrence of seroma and its association with risk factors such as patient age, smoking, and axillary dissection extent, reinforcing its clinical burden.[17] Patient discomfort, recurrent aspirations, higher risk of surgical site infection, slow healing of the wound, necrosis of flaps, extended length of stay, and possible delay in starting adjuvant chemotherapy or radiotherapy are all associated with clinically significant seroma.[5,6]

Seroma has been developed as a result of various patient and surgical factors such as age, body mass index, diabetes, and the degree of axillary dissection, and length of drainage.[7,8] Conventional preventative interventions like long-term suction drainage and external compression have proven not to confer a significant advantage.[9,10] Consequently, attention has redirected on mechanical removal of dead space, such as quilting on the suture, anchoring the mastectomy skin flaps to the chest wall, which diminishes the existence of fluid buildup. Few studies, including one by Bhagchandani et al., show a substantial reduction in the seroma development rates, with quilting sutures compared with conventional closure, with the rates declining from 58% to 23%.[1] Other studies have found a reduced drain output with quilting, fewer aspirations, and reduced duration of drainage with quilting.[11,12,18]

Nevertheless, the evidence is still inconclusive, with some research showing no statistically significant differences in seroma incidence with quilting versus conventional sutures, especially when standardized drainage protocols are observed.[13,14] Meena *et al.* also reported no statistically significant reduction in seroma formation with quilting sutures following modified radical mastectomy. Concerns have also been raised about increased operative time, postoperative pain, shoulder mobility, and cosmetic outcomes associated with quilting.[3,4] This variability, combined with inconsistent results, has led to quilting sutures not being universally adopted.

The vast majority of high-quality evidence is based on Western studies, which cannot be generalized to the South Asian environment where MRM is the general practice. Local data are also necessary to determine whether the benefits of quilting sutures can be reproduced under such environments. Given the gaps in the literature, inconsistent findings, and absence of strong local randomized evidence, it is evident that additional investigation of the effectiveness of quilting sutures in the prevention of seroma occurrence after modified radical mastectomy is needed.

This randomized controlled trial was therefore designed to compare quilting sutures with conventional sutures for flap fixation in patients undergoing modified radical mastectomy, with the primary objective of assessing their effect on seroma formation. The findings of this study aim to contribute local evidence to existing literature and support the development of standardized, cost-effective surgical strategies for improving postoperative outcomes in breast cancer patients.

PATIENTS AND METHODOLOGY

The randomized controlled trial was conducted between 17 February to 17 June and it was approved by the Institutional Ethical Review Board. This research was conducted in the Department of General Surgery, Holy Family Hospital, Rawalpindi. There were 60 female patients who underwent modified radical mastectomy due to carcinoma breast. The sample size was determined with WHO sample size calculator of RCTs with 95% confidence interval and power of 80%. According to a previous study, the prevalence of seroma formation was reported to be 58% in the traditional suturing group and 23% in the quilting suturing group, which was used to estimate the sample size.

Patients were selected using non-probability consecutive sampling. The inclusion criteria included female patients aged between 18 and 55 years with a history of carcinoma breast to be subjected to MRM. The exclusion criteria included locally advanced or inflammatory breast cancer, prior surgery on the same side, neoadjuvant chemotherapy, bleeding disorders, uncontrolled diabetes, chronic liver/renal disease, and unwillingness to give informed consent. Patients were randomly allocated into two equal groups using the lottery method immediately before wound closure:

- **Group A (quilting sutures)** – 30 patients
- **Group B (conventional sutures)** – 30 patients

The same surgical team conducted all the procedures under the general anesthesia. Modified radical mastectomy was performed with electrocautery. Group A-quilting sutures were used to secure the mastectomy flaps to the muscle pectoralis beneath the flaps with interrupted absorbable 2-0 Vicryl sutures. Group B had a wound simply closed without flap fixation. Group A was provided with one axillary drain and two suction drains (axillary and chest wall) were provided in Group B.

Data were collected using a pre-designed form. We measured age and body mass index (BMI) at the beginning. We recorded the daily drain output, duration of drain retention, and seroma formation after surgery. We measured the output of the drain on a daily basis and removed the drain in case the output was 30 ml or lower in 24 hours. The patients were examined on the 7th and 14th day after surgery to determine whether or not they had a seroma; a seroma was considered to be a fluid that had to be aspirated.

The primary outcome was seroma formation following MRM. Secondary outcomes were the total drain output and the duration of drain placement. SPSS version 23.0 was used to analyze the data. Continuous variables were presented in the form of mean and standard deviation, whereas the categorical ones (seroma formation) were presented in the form of frequencies and percentages. Group comparisons were conducted using the chi-square test of the categorical variable and the independent sample t-test of the continuous variable. The p-value of 0.05 or less was interpreted as statistically significant.

RESULTS

The study involved 60 female patients with carcinoma breast undergoing Modified Radical Mastectomy (MRM). The study population had a mean age of 51.53 ± 8.49 years, and a mean BMI of 26.90 ± 2.93 kg/m 2. The overall time of the placement of the drains was 4.97 ± 1.30 days and the average drainage was 107.43 ± 17.71ml (Table 1).

The population was split equally into two groups (30 patients in Group A: quilting sutures; and 30 patients in Group B: no quilting sutures). Seroma had been found in 9 (15%) patients and 51 (85) patients had no seroma. In comparison of seroma between the two groups, in Group A, it was only 1 patient who had seroma i.e 3.3% as compared to 8 patients in Group B i.e. 26.7%. This was statistically significant and the p-value was found to be 0.026 (Table 2).

Demographic and secondary outcome variables comparison between the two groups showed that there was no significant difference in the age and BMI between Group A and B (p = 0.39 and p = 0.82 respectively). The mean time of drain placement was significantly lower in Group A (3.93 + -0.83 days) compared to Group B (6.00 + -0.74 days) and a p-value of 0.01. Similarly, the average drain output was significantly low in Group A (93.00 ± 7.96 ml) and in Group B (121.87 ± 11.98 ml) and also the difference between the two was statistically significant (p = 0.01) (Table 3).

The stratification analysis was conducted to evaluate the relationship between age groups and seroma formation. Patients between the ages of 51-60 years were most commonly observed to have Seroma and then the patients between the age group of 41-50 years. Nevertheless, there was not any statistically significant correlation between age groups and seroma formation (p-value 0.86) Table 4).

Table 1

Demographic Profile and Baseline Variables of the Study Population

Study Variable	Mean (n=60)
Age (years)	51.53 ± 8.49
BMI (kg/m^2)	26.90 ± 2.93
Duration of Drain (days)	4.97 ± 1.30
Drain Output (ml)	107.43 ± 17.71

Table 2

Comparison of Seroma Formation between the Two Study Groups

Seroma Formation	Study Group		P-value
	Group A	Group B	
Yes	1	8	0.026
No	29	22	
Total	30	30	

Table 3

Comparison of Demographic and Secondary Outcome Variables between the Study Groups

Variable	Group A	Group B	P-value
Age (years)	50.50 ± 8.98	52.57 ± 7.99	0.39
BMI (kg/m^2)	26.92 ± 2.91	26.88 ± 2.99	0.82
Duration of Drain (days)	3.93 ± 0.83	6.00 ± 0.74	0.01
Drain Output (ml)	93.00 ± 7.96	121.87 ± 11.98	0.01

Table 4

Stratification Analysis of Study Outcome Variable with Respect to Age

Age group	Seroma formation		P-value
	Yes	No	
31-40 years	1	8	0.86
41-50 years	3	11	
51-60 years	4	23	
61-70 years	1	9	
Total	9	51	

DISCUSSION

This research indicates that that quilting sutures are much more effective in minimizing the amount of seroma development after modified radical mastectomy (MRM) as compared to traditional methods of suturing. The rates of seroma were lower in quilting group at 3.3% compared to 26.7% in conventional suture group with the difference being significant (p = 0.026). Moreover, quilting sutures lead to a major decrease in seroma frequency and volume, with the mean drain output in quilting group being 93.00 ± 7.96 ml, which was much lower than that of 121.87 ± 11.98 ml in the conventional group (p = 0.01). These results are congruent with other researchers, including Foulon et al. (2023), who reported lower rates of seroma in quilting sutures, and van Zeelst et al. (2023), who found less frequent drainage and lower rates of aspiration when using quilting.[6,10] In comparison to their research, which indicated decreased seroma rates as low as 30.8, the present study has also found that quilting sutures consistently reduced the incidence of seroma, although some of their patients still had to receive drainage, The cause of this difference might be the dissimilarity in surgical methods, patient selection, and study design.[1]

A key finding in our study is that quilting sutures increased operative time by approximately 10–15 minutes, consistent with findings by van Zeelst et al. (2023), where quilting added 10 minutes to the surgical duration.[6] While this extra time may seem insignificant, the clinical benefits — such as fewer seromas and reduced need for drainage procedures — justify the additional time, especially in high-risk settings. Notably, there were no notable findings in regard to the postoperative pain or shoulder movement between the quilting and conventional groups. This is in line with the Foulon et al. (2023) study that indicated no significant difference in pain and functional outcomes using the two methods, implying that when a quilting technique is used appropriately, it does not worsen postsurgery pain.[10]

Despite the promising results of quilting suture application, there is still an incongruence in the literature. Other studies, such as Meena et al. (2024), have not identified statistically significant differences in seroma rates between quilting and conventional sutures.[15] This shows the inconsistency of the findings between various studies and points to the necessity of more standardized protocols. Our study contributes to the growing body of evidence supporting quilting as an effective method for seroma prevention, but further research is necessary to optimize the technique and determine its long-term clinical and aesthetic outcomes.

CONCLUSION

Quilting sutures significantly reduce seroma formation in modified radical mastectomy compared to conventional sutures, with fewer aspirations and shorter drainage duration, making it a valuable technique for seroma prevention.

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