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Original Research Article

Evaluation of quilting technique for reduction of post mastectomy seroma formation

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ABSTRACT

Background: Seroma formation is a common complication after mastectomy, causing discomfort and delayed recovery. The quilting technique, which reduces tissue dead space, may minimize seroma formation and improve patient outcomes.
Methods: This randomized controlled trial assigned patients to either an intervention group (quilting technique) or a control group. Clinical parameters included age, nutritional status, tumour size, and lymph node involvement. Surgical parameters assessed were quilting, drain output, days until drain removal, and seroma formation.
Results: Seromas occurred in 21% of participants, with 80% of those affected not undergoing quilting. The p=0.042 suggests quilting reduces seroma risk. Factors like tumor size, weight, and lymph node involvement also influenced seroma development.
Conclusions: Quilting may reduce seroma formation, enhancing comfort, shortening recovery, and reducing healthcare costs. The study's limitation is its focus on short-term outcomes; long-term effects, including patient satisfaction and quality of life, should be explored in future research.

Keywords: Seroma formation, Mastectomy complications, Quilting technique

INTRODUCTION

Seroma formation is a common and troublesome complication following mastectomy, a procedure in which breast tissue is removed due to cancer. Post-surgical seromas occur when fluid accumulates in the cavity left by the removed tissue.[1] This fluid accumulation can cause discomfort, extend recovery periods, and sometimes necessitate additional medical procedures such as drain placements or needle aspirations. Seromas are a result of the body's response to surgery, where the disrupted tissue space becomes a reservoir for serous fluid.

Despite various methods to manage or prevent seromas, they remain a persistent issue in post-mastectomy care, which underscores the need for effective interventions.[2]

To understand the significance of such studies, it is important to explore several key dimensions: the background of seroma formation, the principles of quilting techniques, the detailed methodology of the studies, the results obtained, and the broader implications for clinical practice.[1]

Quilting techniques are a surgical method developed to address this problem. The technique involves placing sutures in a specific pattern to attach the remaining tissue layers to underlying structures, thereby reducing the potential space for fluid collection. The primary aim is to minimize dead space, which is believed to be a key factor in seroma formation. By securing the tissue layers more effectively, quilting techniques theoretically reduce the volume of fluid that can accumulate and therefore lower the incidence of seroma. This approach contrasts with

traditional methods that might involve drain placements, which can have their own complications and may not be as effective in preventing seromas.[3]

The randomized controlled trial (RCT) methodology used to evaluate these quilting techniques involves a rigorous process designed to ensure the reliability and validity of the findings. In an RCT, participants are randomly assigned to either the intervention group-where the quilting technique is applied-or the control group, which receives standard care practices. This randomization helps control for potential biases, ensuring that the outcomes can be attributed to the quilting technique rather than other variables. Participants are selected based on specific criteria, such as having no contraindications to the technique and meeting general health requirements for undergoing mastectomy.[4]

The goal is to determine whether the quilting technique significantly reduces seroma formation and improves patient outcomes compared to standard postoperative care.[5,6]

The results of these studies have substantial implications for clinical practice. If the quilting technique proves to be effective in reducing seroma formation, it could lead to changes in surgical protocols and become a widely adopted practice in mastectomy procedures.[7-10] This shift could potentially reduce the frequency of seromas, lessen the need for additional interventions, and improve overall patient recovery. For patients, this could mean less discomfort, fewer follow-up visits, and a faster return to their daily lives.[11-14] For healthcare providers, it could lead to more efficient use of resources and a higher quality of care.[7]

Moreover, the findings from such research contribute to the broader field of surgical oncology by providing evidence-based insights into seroma management.[14] Successful implementation of the quilting technique could pave the way for further innovations and refinements in surgical techniques, influencing practices beyond mastectomy and into other areas of surgery where fluid accumulation is a concern.[13,15] The study also serves as a model for future research, highlighting the importance of rigorous methodologies and the need for continued exploration of effective interventions in surgical care.[8]

METHODS

This study was designed as a randomised controlled trial to evaluate the effectiveness of the quilting technique in reducing post-mastectomy seroma formation with participants randomly assigned to either the quilting or control group. The study was for a 2 years period conducted from June-2022 to March 2024 in a tertiary care hospital, Sassoon general hospital, Pune.

The sample size of the study is 100.

Inclusion criteria

Patients above the age of 18 years suffering from breast carcinoma and giving consent for modified radical mastectomy were included.

Exclusion criteria

Patients who have inoperable breast cancer, prior history of breast surgery, prior history of chemotherapy or breast irradiation, collagen vascular diseases, bleeding disorders and inflammatory carcinoma of breast were excluded.

Surgical procedure

After performing a standard mastectomy and making sure tumour negative margins were present during wound closure, in the test group, absorbable (vicryl 2-0) interrupted sutures are taken from upper flap to pectoralis muscle without including dermis. The same was continued in the lower flap. Post operatively drain is put of 14FG size with one limb in axilla and one limb over pectoralis muscle.

The primary clinical parameters assessed were age, nutritional status, tumour size and palpable lymph nodes. Surgical parameters involved whether quilting technique was done or not, the measurement of drain output, number of days after which drain removed and presence of seroma formation (Figure 1 and 2).

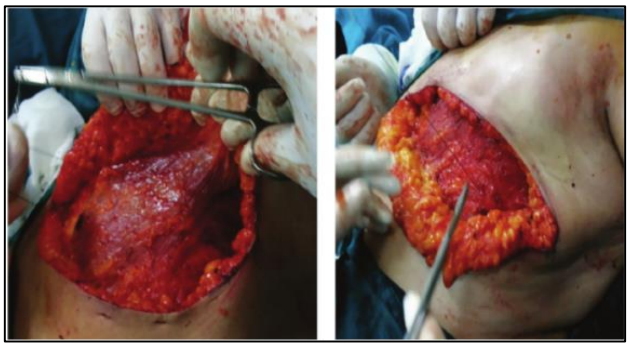

Figure 1: Intraoperative quilting technique.

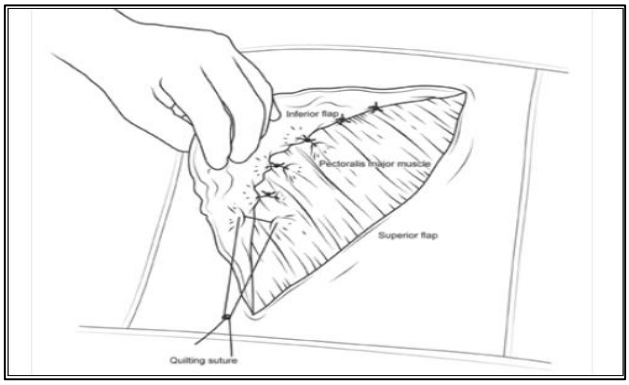

Figure 2: Quilting technique.

RESULTS

The study was conducted with 100 patients with quilting done for 53 patients and this was the test group.

Quilting technique among study participants

The data shows that 53% of the participants received the quilting technique, while 47% did not (Table 1).

Table 1: Quilting technique among study participants.

Quilting-Yes/no	N (%)
Yes	53 (53)
No	47 (47)
Total	100

Age distribution among study participants

The study examines the effectiveness of the quilting technique in reducing the incidence of seroma, a common complication after mastectomy. Based on the age distribution data, the majority of participants in the study are between 50-70 years old (51%), with a significant portion aged 25-50 years (42%), and a smaller group aged 75 and above (7%). This distribution suggests that the study's findings could be particularly relevant to middle-aged and older adults, which may impact the generalizability of the results across different age groups (Table 2).

Table 2: Age distribution among study participants.

Age (in years)	N	Percent (%)
25-50	42	42
50-70	51	51
75+	7	7
Total	100.0	100

Presence of seroma formation among study participants

The data indicates that 79% of participants did not experience seroma formation after the quilting technique was used, while 21% did. Hence the incidence of seroma in this study was 21% (Table 3).

Table 3: Presence of seroma formation among study participants.

Seroma formation-yes/no	N (%)
Yes	21 (21)
No	79 (79)
Total	100

Relationship between the use of the quilting technique and seroma formation among study participants

The data illustrates the relationship between the use of the quilting technique and seroma formation. 53 participants received the quilting technique and out of these only 4 developed seroma. On the other hand, 47 participants did not receive quilting technique and 17 patients developed seroma. The p=0.042 indicates that this difference is statistically significant, suggesting that the quilting technique is effective in reducing the risk of seroma formation post-mastectomy. This finding further supports the use of quilting as a beneficial intervention to lower the incidence of seroma in this patient population (Table 4).

Table 4: Relationship between the use of the quilting technique and seroma formation among study participants.

Seroma formation	Quilting		P value
	Yes (n=53)	No (n=47)	
Yes	4	17	0.042
No	49	30	
Total	53	47	

Relationship between tumour size and seroma formation post-mastectomy among study participants

The data examines the relationship between tumor size and seroma formation post-mastectomy. Among participants who did not develop seroma, 28 had tumors larger than 5 cm, 43 had tumors between 2-5 cm, and 8 had tumors smaller than 2 cm. In contrast, among those who developed seroma, 9 had tumors larger than 5 cm, 10 had tumors between 2-5 cm, and 2 had tumors smaller than 2 cm. The p=0.036 indicates that there is a statistically significant association between tumor size and the likelihood of seroma formation. Larger tumor sizes may be associated with a higher risk of seroma formation, emphasizing the importance of considering tumor size when evaluating postoperative outcomes (Table 5).

Table 5: Relationship between tumour size and seroma formation post-mastectomy among study participants.

Tumour size (cm)	Seroma formation		P value
	Yes	No	
<2	2	8	0.036
2-5	10	43	
>5	9	28	
Total	21	79	

Relationship between weight status (BMI) and seroma formation after mastectomy among study participants

The data highlights the relationship between weight status and seroma formation after mastectomy. Among those who did not develop seroma, 70 were classified as healthy weight, and 9 were overweight. Conversely, among those who developed seroma, 14 were healthy weight, and 7 were overweight. The p=0.001 indicates a statistically significant association between weight status and seroma formation. This suggests that being overweight may

increase the risk of seroma formation, underscoring the importance of considering weight status in postoperative care and risk management (Table 6).

Table 6: Relationship between weight status and seroma formation after mastectomy among study participants.

Weight status, BMI (kg/m^2)	Seroma formation		P value
	Yes	No	
Healthy (<24.9)	14	70	0.001
Overweight (25.0- 29.9)	7	9	
Total	21	79	

Relationship between clinical lymph node status and seroma formation post-mastectomy among study participants

The data examines relationship between lymph node status and seroma formation post-mastectomy. Among those who didn't develop seroma, 17 had no lymph node involvement clinically, while 62 had lymph node involvement. Among those who developed seroma, 5 had no lymph node involvement, and 16 had lymph node involvement. The p=0.000 indicates a highly statistically significant association between lymph node status and seroma formation. This suggests that patients with palpable lymph node involvement are at a significantly higher risk of developing seroma after mastectomy (Table 7).

Table 7: Relationship between lymph node status and seroma formation post-mastectomy among study participants.

Lymph node status	Seroma formation		P value
	Yes	No	
Yes	16	17	0.000
No	5	62	
Total	21	79	

Drain output among study participants

Data shows that participants who did not develop seroma had an average total drain output of 389.49 mL, with a standard deviation of 84.60 mL, indicating moderate variability. In contrast, those who developed seroma had a higher average drain output of 510.48 mL, with slightly less variability (standard deviation of 63.76 mL). This suggests that higher drain output may be associated with increased risk of seroma formation (Table 8).

Table 8: Drain output among study participants.

Seroma formation	Average of total drain output	Standard deviation of total drain output
Yes	510.47	63.7
No	389.48	84.5

DISCUSSION

The primary aim of this study is to evaluate the effectiveness of quilting procedure on reduction of post mastectomy seroma formation. Reducing seroma formation not only enhances patient comfort and satisfaction but also decreases the likelihood of additional interventions such as needle aspiration, thereby reducing healthcare costs. Furthermore, this study addresses a gap in existing literature by providing a comprehensive analysis of the factors influencing seroma formation, including patient demographics, tumour characteristics, and surgical techniques.

Relationship between quilting technique and seroma formation

The data from this study illustrates a strong relationship between the use of the quilting technique and reduced seroma formation. Among those who did not receive quilting, 30 participants did not develop seroma, while 17 did. In contrast, among those who received quilting, 49 participants did not develop seroma, and only 4 did. The p=0.042 suggests that this difference is statistically significant, indicating the effectiveness of the quilting technique in reducing seroma risk. This finding is supported by previous research, such as the study by Khater et al which found a similar reduction in seroma formation rates from 78.3% in the control group to 20% in the quilting group.[17] Additionally, Awad et al reported a reduction in seroma incidence from 21.75% to 3.5% with the use of quilting, further corroborating the current study's results.[19] The consistent findings across these studies underscore reliability of quilting as a preventive measure against seroma. The statistical significance of the findings in this study reinforces the utility of quilting in clinical practice, particularly for patients at higher risk of seroma.

Relationship between tumor size and seroma formation

This study found a statistically significant relationship between tumor size and seroma formation, with larger tumors (>5 cm) being associated with a higher risk of seroma (p=0.036). Among participants who did not develop seroma, 28 had tumors larger than 5 cm, 43 had tumors between 2-5 cm, and 8 had tumors smaller than 2 cm. In contrast, among those who developed seroma, 9 had tumors larger than 5 cm, 10 had tumors between 2-5 cm, and 2 had tumors smaller than 2 cm. This finding is supported by Abbass, who reported that larger tumor sizes were associated with an increased risk of seroma, with the quilting group showing a significantly lower incidence of seroma (20% vs. 46.8%, p=0.012) compared to the non-quilting group.[18] The study by Khater et al also supports this, noting that patients with larger tumors benefited significantly from quilting, with a reduction in seroma incidence from 78.3% in control group to 20% in quilting group.[17] These studies suggest that tumor size should be a key consideration in surgical planning, particularly in deciding whether to implement quilting techniques.

Relationship between weight status and seroma formation

The relationship between weight status and seroma formation was significant in this study, with overweight participants showing a higher incidence of seroma (p=0.001). Among participants who did not develop seroma, 70 were classified as healthy weight, and 9 were overweight. Conversely, among those who developed seroma, 14 were healthy weight, and 7 were overweight. The impact of body mass on postoperative outcomes is well-documented, with excess adipose tissue contributing to increased dead space and fluid accumulation, leading to higher seroma rates. Awad et al further supports this, showing that quilting significantly reduced the mean fluid drained in overweight patients (246.08±78.94 mL vs. 664.75±69.43 mL in the non-quilting group).[16]

Relationship between clinical lymph node status and seroma formation

Lymph node involvement was a significant predictor of seroma formation in this study, with a p=0.000 indicating a highly significant association. Among those who did not develop seroma, 17 had no lymph node involvement, while 62 had lymph node involvement. Conversely, among those who developed seroma, 5 had no lymph node involvement, and 16 had lymph node involvement. Khater et al also reported similar results, with a significant reduction in seroma rates from 78.3% in the control group to 20% in the quilting group, particularly in patients with lymph node dissection.[17] The results of this study, supported by previous research, underscore the importance of implementing quilting techniques in patients undergoing lymph node dissection to reduce the risk of seroma formation and improve postoperative outcomes.

Total drain output among study participants

The total drain output among study participants was a critical factor in evaluating the effectiveness of the quilting technique. The average total drain output was 414.80 mL, with a standard deviation of 94.055 mL, indicating moderate variability. The data also showed that participants who developed seroma had a higher average drain output (510.48 mL) compared to those who did not (389.49 mL). This finding is supported by Khater et al who showed that quilting manoeuvre had significantly decreased the total drainage fluid from mean of 1160 to 710 ml.[17] These results highlight the importance of monitoring drain output as part of postoperative care, with higher outputs potentially necessitating extended drainage periods or additional interventions to prevent seroma formation.

Limitations

While this study provides robust evidence supporting the quilting technique, it has several limitations that should be acknowledged. Firstly, the study's sample size, while adequate, may not fully capture the variability in patient responses to the quilting technique, particularly across different demographics or surgical setting. Another drawback of the study was that it focused on short term outcomes and did not assess long term effects such as patient satisfaction, cosmetic outcome, quality of life. Additionally, the study was conducted in a specific clinical setting, which may limit the generalizability of the findings to other hospitals or surgical teams with different levels of experience with the quilting techniques.

CONCLUSION

Based on the study's findings, it is recommended that the quilting technique be routinely implemented in mastectomy procedures, especially in patients identified as having a higher risk of seroma formation, such as those with larger tumours, lymph node involvement, or higher body mass index. Surgeons should receive adequate training in the quilting technique to ensure its effective application. Furthermore, postoperative monitoring should include careful assessment of drain output as an early indicator of seroma formation, with extended drainage periods considered for patients with high fluid accumulation. It is also recommended that future guidelines for mastectomy procedures incorporate the use of quilting as a standard practice, supported by the growing body of evidence demonstrating its effectiveness in reducing postoperative complications.

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REFERENCES

1. Khater A, Elnahas W, Roshdy S, Farouk O, Senbel A, Fathi A, et al. Evaluation of the quilting technique for reduction of postmastectomy seroma: a randomized controlled study. Int J Breast Cancer. 2015;2015(1):287398.
2. Madhu BS, Kalabairav S, Reddy AV, Mallikarjunappa SS. A randomized controlled trial evaluating the efficacy of mastectomy flap quilting sutures in reducing post modified radical mastectomy seroma formation. Int Sur J. 2017;4(2):714-8.
3. McCarthy C, Lennox P, Germann E, Clugston P. Use of Abdominal Quilting Sutures for Seroma Prevention in TRAM Flap Reconstruction: A Prospective, Controlled Trial. Ann Plastic Surg. 2005;54(4):361-4.
4. Chakrabarty B, Samaddar JB, Samaddar D, Ray D. Evaluation of different modalities in prevention of seroma formation post-modified radical mastectomy–An observational study from a rural tertiary care center. Asian J Med Sci. 2024;15(7):156-63.
5. Dancey AL, Cheema M, Thomas SS. A prospective randomized trial of the efficacy of marginal quilting sutures and fibrin sealant in reducing the incidence of

seromas in the extended latissimus dorsi donor site. Plastic Reconstruct Surg. 2010;125(5):1309-17.
6. Sajid MS, Betal D, Akhter N, Rapisarda IF, Bonomi R. Prevention of postoperative seroma-related morbidity by quilting of latissimus dorsi flap donor site: a systematic review. Clin Breast Cancer. 2011;11(6):357-63.
7. Kumar V N, Hulikal N, Banoth M. A Randomized Controlled Study of Quilting with Axillary Lymphatic Ligation Versus Conventional Modified Radical Mastectomy in Patients with Breast Cancer. Indian J Surgical Oncol. 2022;13(2):245-50.
8. Lee J, Bae Y, Jung JH, Kim WW, Hwang SO, Kwon TJ, et al. Effects of quilting suture interval on donor site seromas after breast reconstruction with latissimus dorsi muscle flap: a randomized trial. Clin Breast Cancer. 2016;16(6):e159-64.
9. Ten Wolde B, van den Wildenberg FJ, Keemers-Gels ME, Polat F, Strobbe LJ. Quilting prevents seroma formation following breast cancer surgery. Complications Following Breast Cancer Surg. Ann Surg Oncol. 2021(3):63.
10. Granzier RW, Van Bastelaar J, Van Kuijk SM, Hintzen KF, Heymans C, Theunissen LL, et al. Reducing seroma formation and its sequelae after mastectomy by closure of the dead space: the interim analysis of a multi-center, double-blind randomized controlled trial (SAM trial). The Breast. 2019;46:81-6.
11. Ouldamer L, Caille A, Giraudeau B, Body G. Quilting suture of mastectomy dead space compared with conventional closure with drain. Ann Surgical Oncol. 2015;22:4233-40.
12. Pramegia DK, Adiputra PA, Sudarsa IW. The Difference of Interleukin-6 Level and Seroma Volume Between Quilting and Conventional Suture After Modified Madical Mastectomy. Int J Scient Adv. 2023;4(6):943-9.
13. Fairhurst K, Roberts K, Fairbrother P, Potter S. Current use of drains and management of seroma following mastectomy and axillary surgery: results of a United Kingdom national practice survey. Breast Cancer Res Treat. 2024;203(2):187-96.
14. Velotti N, Limite G, Vitiello A, Berardi G, Musella M. Flap fixation in preventing seroma formation after mastectomy: an updated meta-analysis. Updates Surg. 2021;73:1307-14.
15. Mehrotra R, Yadav K. Breast cancer in India: Present scenario and the challenges ahead. World J Clin Oncol. 2022;13(3):209-18.
16. Awad AT, Alhussini MA, Balbaa MA. Quilting of mastectomy flaps; a simple way to avoid postmastectomy seroma. Indian J Surg. 2020;82:9-13.
17. Khater A, Elnahas W, Roshdy S, Farouk O, Senbel A, Fathi A, et al. Evaluation of the Quilting Technique for Reduction of Postmastectomy Seroma: A Randomized Controlled Study. Int J Breast Cancer. 2015;2015:287398.
18. Abbass M. The Role of Quilting Technique of Mastectomy Flap in Prevention and Reduction of Seroma Complication in Breast Cancer Patients. J Glob Pharma Technol. 2018;10(8):85-91.
19. Arafa A, Fayek F, Awad J. Efficacy of mastectomy flap fixation in minimizing seroma formation after breast cancer surgery. Egypt J Surg. 2019;38(3):656-61.

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