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A STUDY ON ROLE OF FLAP TACKING AND COMPRESSIVE DRESSINGS IN POST-MASTECTOMY SEROMA IN BREAST CARCINOMA PATIENTS

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ABSTRACT

Background: Post-mastectomy seroma is a common early complication after modified radical mastectomy (MRM) that can prolong drainage, increase outpatient visits for aspiration, and delay wound healing and adjuvant therapy. The objective was to determine the effectiveness of flap tacking and compressive dressings in the management of post-mastectomy seroma in breast carcinoma patients. **Materials and Methods:** This single-centre, hospital-based prospective comparative study was conducted at Aarupadai Veedu Medical College and Hospital, Puducherry (October 2024–March 2026), enrolling 80 women undergoing MRM for carcinoma breast. **Results:** Baseline characteristics were comparable between the control and flap-fixation groups (n=40 each). Mean age was similar (51.0±9.8 vs 50.7±9.9 years; p=0.892). Mean BMI was identical in both groups (25.4±2.7 vs 25.4±2.9 kg/m²; p=0.976). Baseline vitals were comparable, including systolic BP (125.2±8.0 vs 126.0±11.3 mmHg) and pulse rate (81.8±9.8 vs 84.7±10.2 beats/min) (all p>0.05). Tumour stage, grade, nodal status, laterality, receptor status, comorbidities, and laboratory parameters were balanced (all p >0.05). Operative time was longer with flap fixation (124.1±16.9 vs 112.4±15.6 min; p=0.002), but blood loss was similar. Flap fixation significantly reduced drain output (e.g., total 460±180 vs 630±215 mL; p<0.001), shortened drainage duration (7.8±1.9 vs 10.2±2.3 days; p<0.001), enabled earlier drain removal, and lowered aspiration-requiring seroma (15% vs 40%; p=0.023), without significant differences in hematoma, pain, Surgical site infection, or length of hospital stay. **Conclusion:** Flap fixation during modified radical mastectomy will significantly reduce postoperative drain output, shorten drainage duration, and lower clinically significant seroma requiring aspiration compared with conventional closure, without increasing postoperative complications.

INTRODUCTION

Breast cancer is the most common malignancy among women worldwide, with an estimated 2.3 million new cases and around 685,000 deaths reported in 2020, accounting for roughly 11–12% of all new cancer diagnoses and 7% of cancer deaths globally.[1] In India, breast cancer has overtaken cervical cancer as the leading cancer in women, with more than 178,000 new cases annually and a substantial contribution to cancer-related mortality.[2] In many low- and middle-income settings, including India, a significant proportion of women present at a locally advanced stage, and modified radical mastectomy (MRM) with axillary dissection remains a cornerstone of surgical management.[3] Post-mastectomy seroma, defined as a clinically or radiologically detectable collection of serous fluid in the dead space beneath mastectomy flaps or in the axilla – is one of the most frequent early complications after MRM and axillary clearance, with reported incidence ranging from approximately 15% to 81%.[4,5] Seroma formation is not merely a nuisance; it is associated with delayed wound healing, increased risk of surgical site infection and skin flap necrosis, repeated aspirations, discomfort, and potential delay in initiating adjuvant chemotherapy or radiotherapy.[6-8] Risk factors include extensive axillary dissection, creation of large dead space, higher body mass index, larger breast size, and possibly adjuvant therapies and comorbidities that impair wound healing.[9-11]
Conventional strategies to reduce seroma have focused on the use of closed suction drains, careful

haemostasis, and various forms of external compression dressings.[12] However, randomized and observational studies suggest that pressure or elastic compression dressings alone may have limited efficacy in reducing seroma incidence or total drain output after axillary surgery.[13,14] More recently, a range of techniques aimed at obliterating dead space – such as flap tacking/quilting sutures, use of tissue adhesives (e.g., fibrin sealants or synthetic glues), and negative-pressure wound therapy – have been explored with the goal of reducing lymphatic leakage and fluid accumulation.[15,16] Among these, flap tacking (quilting) sutures that fix the mastectomy skin flaps to the underlying chest wall and axillary tissues have shown promising results. Several randomized trials and a recent network meta-analysis report that flap fixation techniques significantly reduce seroma incidence, cumulative drain output, and duration of drainage compared with conventional closure, without adversely affecting wound complications or cosmetic outcome.[17-22] Nonetheless, heterogeneity in surgical technique, patient selection, and postoperative protocols means that effect sizes vary, and quilting has not been universally adopted as standard of care. Evidence for compressive dressings is even more mixed, with some studies suggesting modest benefit on drainage duration but little impact on seroma rates, and no clear consensus on indications, duration, or optimal application methods.[13,14] Given the high burden of breast cancer in India, the continued reliance on MRM in many centres, and the clinical and logistical consequences of seroma formation, there is a pressing need for robust comparative data on simple, low-cost techniques to prevent and manage seroma in resource-constrained settings. Against this background, the objectives of the present study were to determine the effectiveness of flap tacking and compressive dressings in the management of post-mastectomy seroma in carcinoma breast patients.

MATERIALS AND METHODS

This was a single-centre, hospital-based, prospective, comparative study conducted in the outpatient department and/or inpatient wards of the Department of General Surgery, Aarupadai Veedu Medical College and Hospital, Puducherry, India over a period of 18 months (October 2024–March 2026). The study was approved by the Institutional Human Ethics Committee (IHEC) with reference number AV/IHEC/01/2024/050 dated 07/06/2024. The participants were given the Participant Information Sheet (PIS) in their native language, and its contents were verbally explained to ensure their understanding and satisfaction. Adult female patients diagnosed with carcinoma breast who were undergoing MRM and were willing to provide informed written consent were included in the study. However, patients with a history of previous mastectomy or other breast surgery, those with significant medical conditions that could affect seroma formation or wound healing, known allergy to flap-tacking or compressive dressing components, pregnant or lactating women, patients with abnormal coagulation profile, and those with BMI >30 or <18.5 kg/m² were excluded.

The sample size was estimated using the standard Fleiss method with continuity correction and equal allocation ($r = n2/n1 = 1$). The pooled proportion was defined as $p=(p\_1+rp\_2)/(1+r)$, where p_1 and p_2 represent the expected seroma proportions in the control and intervention groups, respectively, derived from Sakkaray et al.[23] A two-sided α of 0.05 ($Z1-\alpha/2=1.96$) and 90% power ($\beta=0.10$; $Z1-\beta=1.28$) were applied, and the continuity-corrected estimate yielded a minimum total sample size of 76; this was rounded up to 80 (40 participants per group). Participants were enrolled using a non-probability sampling (purposive/consecutive sampling).

At enrolment, participants were allocated into two equal groups of 40 each (Group 1, wound closure by conventional method; Group 2, wound closure with flap tacking/fixation with closed suction drainage) and data were captured in a predesigned proforma. A detailed clinical examination was performed, and vitals and relevant clinical signs were documented. Routine preoperative investigations including complete blood count, urine routine and microscopy, renal function tests, serum electrolytes, and liver function tests, followed by the necessary radiological evaluation were obtained. Patient- and disease-related factors considered relevant to seroma formation were recorded, including body mass index, hormone receptor status, axillary nodal status/positivity, and stage and grade of disease; additional clinical covariates such as breast size, anaemia status, diabetes mellitus, smoking history, tumour size and location, type of histology, disease site, and specimen weight were also documented where available in clinical and pathology records. MRM was performed in both groups by the same surgeon. In the control group, wound closure was performed by the conventional method at the wound edges with placement of closed suction drainage. In the flap-fixation group, wound closure was performed with flap tacking/fixation to the underlying pectoralis major muscle using uniformly spaced Vicryl 3-0 sutures, with placement of closed suction drainage. Axillary dead space management was performed by obliterating the axilla through suturing its lateral wall to the fascia of the serratus anterior muscle and the medial axillary wall. Intraoperative details, including mean operative time (in minutes), any intraoperative complications (notably bleeding), and surgeon-perceived ease of use were recorded contemporaneously in the proforma. Postoperatively, resected specimens were sent for histopathological evaluation. Drain output (seroma drainage) was measured using a standard measuring container and recorded systematically; the drain was removed when the daily total drain output fell below 30 mL. Seroma-related outcomes were documented at defined postoperative time points (day 3, day 7, day 10, and day 15) as per the follow-up schedule, along with the total number of days the drain remained in situ and the date of drain removal. Postoperative complications – bleeding, pain, and wound infection – were actively monitored and recorded during the hospital stay, together with the duration of postoperative hospital stay and date of discharge. Follow-up assessment was conducted two weeks after drain removal, during which a local chest examination was performed for all participants. An ultrasound scan over the surgical flaps and axilla was performed when clinically indicated to rule out residual or recurrent collections.

Statistical analysis: Data were entered in Microsoft Excel and analysed using IBM SPSS Statistics for Windows, Version 27.0 (IBM Corp., Armonk, NY, USA). Continuous variables were summarized as mean and standard deviation (SD). Categorical variables were expressed as frequencies and percentages. The distribution of continuous variables was assessed using visual inspection of histograms and normal Q–Q plots, supported by the Shapiro–Wilk test for normality. For between-group comparisons of normally distributed continuous variables with approximately equal variances, the independent-samples Student's t-test was used; homogeneity of variances was checked using Levene's test. When normality or variance assumptions were not met, the Mann–Whitney U test was planned as a non-parametric alternative. Categorical variables were compared between the control and flap-fixation groups using the chi-square (χ^2) test or Fisher's exact test when expected cell counts were small. All hypothesis tests were two-tailed, and a p value < 0.05 was considered statistically significant.

RESULTS

Baseline characteristics were comparable between the control and flap-fixation groups (n=40 each). The mean (SD) age was similar (51.0 [9.8] vs 50.7 [9.9] years; p=0.892), and the age distribution did not differ (30–39: 15.0% vs 12.5%; 40–49: 30.0% vs 35.0%; 50–59: 32.5% vs 30.0%; >60: 22.5% each; p=0.963). Mean BMI was identical (25.4 kg/m² in both groups; p=0.976), and baseline vitals were comparable, including systolic BP (125.2±8.0 vs 126.0±11.3 mmHg; p=0.723), diastolic BP (77.2±7.6 vs 78.7±6.8 mmHg; p=0.359), pulse rate (81.8±9.8 vs 84.7±10.2 beats/min; p=0.197), and temperature (36.8±0.3 vs 36.8±0.4°C; p=0.662). Tumour stage distribution was similar (AJCC I/II/III: 15.0/52.5/32.5% vs 17.5/50.0/32.5%; p=0.951), as were histologic grades (I/II/III: 27.5/60.0/12.5% vs 17.5/62.5/20.0%; p=0.559) and axillary nodal status (positive: 57.5% vs 50.0%; p=0.497). Laterality was balanced (left: 47.5% vs 52.5%; p=0.892), and receptor profiles were comparable for ER (positive: 65.0% vs 67.5%; p=0.924), PR (positive: 55.0% vs 47.5%; p=0.636), and HER2 (positive: 20.0% vs 22.5%; p=0.932). Comorbidities were also similar, with diabetes mellitus present in 27.5% vs 22.5% (p=0.892) and hypertension in 27.5% vs 25.0% (p=0.912).

Mean haemoglobin levels were similar (11.5±1.0 vs 11.6±1.4 g/dL; p=0.744), and the proportion with preoperative anaemia (Hb <11 g/dL) did not differ (27.5% vs 35.0%; p=0.630). Total leukocyte count (7.8±1.3 vs 8.1±1.4 ×10³/µL; p=0.222) and platelet count (262±65 vs 269±54 ×10³/µL; p=0.608) were also comparable. Renal function tests showed no significant differences, including blood urea (25.4±6.6 vs 28.0±7.9 mg/dL; p=0.113) and serum creatinine (0.90±0.19 vs 0.85±0.13 mg/dL; p=0.153). Electrolytes were similar (sodium 137.2±2.8 vs 138.1±3.3 mmol/L; p=0.196; potassium 4.1±0.4 vs 4.0±0.4 mmol/L; p=0.304), as were liver function indices such as bilirubin (0.65±0.18 mg/dL in both; p=1.000), AST (27.2±6.4 vs 26.2±8.2 U/L; p=0.529), ALT (26.2±7.2 vs 24.5±7.9 U/L; p=0.328), and albumin (3.8±0.4 vs 3.9±0.4 g/dL; p=0.434). Urine routine/microscopy findings were largely normal and identical across groups, with abnormal findings in 10.0% in each group (p=1.000).

Table 1: Baseline demographic, clinical, and tumour characteristics of the study participants by study group (Control vs Flap fixation; N=80)

		Control N = 40 n (%)	Flap fixation N = 40 n (%)	P- value
Age (years), Mean (SD)		51.0 (9.8)	50.7 (9.9)	0.892
Age (years)	30 to 39	6 (15.0)	5 (12.5)	0.963
	40 to 49	12 (30.0)	14 (35.0)	
	50 to 59	13 (32.5)	12 (30.0)	
	>60	9 (22.5)	9 (22.5)	
BMI (kg/m^2), Mean (SD)		25.4 (2.7)	25.4 (2.9)	0.976
Systolic BP (mmHg), Mean (SD)		125.2 (8.0)	126.0 (11.3)	0.723
Diastolic BP (mmHg), Mean (SD)		77.2 (7.6)	78.7 (6.8)	0.359
Pulse rate (beats/min), Mean (SD)		81.8 (9.8)	84.7 (10.2)	0.197
Temperature (°C), Mean (SD)		36.8 (0.3)	36.8 (0.4)	0.662
Stage (AJCC)	I	6 (15.0)	7 (17.5)	0.951
	II	21 (52.5)	20 (50.0)	
	III	13 (32.5)	13 (32.5)	
Histologic grade	I	11 (27.5)	7 (17.5)	0.559
	II	24 (60.0)	25 (62.5)	

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	III	5 (12.5)	8 (20.0)	
Axillary nodal status	Negative	17 (42.5)	20 (50.0)	0.497
	Positive	23 (57.5)	20 (50.0)	
Laterality	Left	19 (47.5)	21 (52.5)	0.892
	Right	21 (52.5)	19 (47.5)	
ER status	Negative	14 (35.0)	13 (32.5)	0.924
	Positive	26 (65.0)	27 (67.5)	
PR status	Negative	18 (45.0)	21 (52.5)	0.636
	Positive	22 (55.0)	19 (47.5)	
HER2 status	Negative	32 (80.0)	31 (77.5)	0.932
	Positive	8 (20.0)	9 (22.5)	
Diabetes mellitus	Absent	29 (72.5)	31 (77.5)	0.892
	Present	11 (27.5)	9 (22.5)	
Hypertension	Absent	29 (72.5)	30 (75.0)	0.912
	Present	11 (27.5)	10 (25.0)	
*Statistically significant at p < 0.05				

Intraoperatively, the flap-fixation group had a significantly longer operative time than the control group (124.1±16.9 vs 112.4±15.6 minutes; p=0.002), while estimated blood loss was comparable (155±65 vs 145±60 mL; p=0.477) and intraoperative bleeding complications were uncommon and similar (7.5% vs 12.5%; p=0.712). Surgeon-perceived ease of use was high in both groups (mean Likert 4.10±0.84 vs 4.45±0.68; p=0.064), with most procedures rated easy/very easy (80.0% vs 90.0%; p=0.348). Postoperatively, drain outputs were consistently lower with flap fixation at every assessed time point—by POD3 (260±110 vs 360±140 mL), POD7 (380±160 vs 520±180 mL), POD10 (430±170 vs 590±200 mL), and POD15 (450±175 vs 620±210 mL)—and the total drain output until removal was significantly reduced (460±180 vs 630±215 mL; all p<0.001). Drain duration was shorter with flap fixation (7.8±1.9 vs 10.2±2.3 days; p<0.001), with earlier drain removal by POD7 (40.0% vs 15.0%; p=0.023) and by POD10 (90.0% vs 60.0%; p=0.004). Importantly, clinically significant seroma requiring aspiration up to POD 15 was significantly lower in the flap-fixation group (15.0% vs 40.0%; p=0.023)." Postoperative bleeding/hematoma was uncommon in both groups (7.5% vs 5.0%; p=1.000), and mean pain scores at 24 hours were similar (VAS 4.2±1.1 vs 4.6±1.2; p=0.124). Superficial surgical site infection occurred in 10.0% of controls and 7.5% of the flap-fixation group (p=1.000). The mean duration of postoperative hospital stay was also comparable (5.0±1.1 vs 4.8±1.0 days; p=0.397).

Table 2: Comparison of preoperative laboratory parameters between the study groups (Control vs Flap fixation; N=80)

		Control N = 40	Flap fixation N = 40	P value
		Mean (SD)	**Mean (SD)**	
Haemoglobin (g/dL)		11.5 (1.0)	11.6 (1.4)	0.744
Preoperative anaemia (Hb <11 g/dL), n (%)	Absent	29 (72.5)	26 (65.0)	0.630
	Present	11 (27.5)	14 (35.0)	
Total leukocyte count (×10³/μL)		7.8 (1.3)	8.1 (1.4)	0.222
Platelet count (×10³/μL)		262 (65)	269 (54)	0.608
Blood urea (mg/dL)		25.4 (6.6)	28.0 (7.9)	0.113
Serum creatinine (mg/dL)		0.90 (0.19)	0.85 (0.13)	0.153
Serum sodium (mmol/L)		137.2 (2.8)	138.1 (3.3)	0.196
Serum potassium (mmol/L)		4.1 (0.4)	4.0 (0.4)	0.304
Total bilirubin (mg/dL)		0.65 (0.18)	0.65 (0.18)	1.000
AST (U/L)		27.2 (6.4)	26.2 (8.2)	0.529
ALT (U/L)		26.2 (7.2)	24.5 (7.9)	0.328
Serum albumin (g/dL)		3.8 (0.4)	3.9 (0.4)	0.434
Urine routine/microscopy abnormality, n (%)	No significant abnormality	36 (90.0)	36 (90.0)	1.000
	Abnormal findings	4 (10.0)	4 (10.0)	
*Statistically significant at p < 0.05				

Table 3: Comparison of intraoperative characteristics, drain outcomes, and clinically significant seroma between the study groups (Control vs Flap fixation; N=80)

	Control N = 40	Flap fixation N = 40	P value
	Mean (SD)	**Mean (SD)**	
Intraoperative characteristics and surgeon-perceived ease of use			
Operative time (minutes)	112.4 (15.6)	124.1 (16.9)	0.002*
Estimated blood loss (mL)	145 (60)	155 (65)	0.477
Intraoperative bleeding complication, n (%)	5 (12.5)	3 (7.5)	0.712
Surgeon-perceived ease of use (1–5 Likert)	4.45 (0.68)	4.10 (0.84)	0.064
Ease of use category (score ≥4: easy/very easy), n (%)	36 (90.0)	32 (80.0)	0.348
Drain characteristics			
Cumulative drain output by POD 3 (mL)	360.0 (140.0)	260.0 (110.0)	<0.001*
Cumulative drain output by POD 7 (mL)	520.0 (180.0)	380.0 (160.0)	<0.001*

Cumulative drain output by POD 10 (mL)	590.0 (200.0)	430.0 (170.0)	<0.001*
Cumulative drain output by POD 15 (mL)	620.0 (210.0)	450.0 (175.0)	<0.001*
Total drain output until removal (mL)	630.0 (215.0)	460.0 (180.0)	<0.001*
Duration of drainage (days), Mean (SD)	10.2 (2.3)	7.8 (1.9)	<0.001*
Drain removed by POD 7, n (%)	6 (15.0)	16 (40.0)	0.023*
Drain removed by POD 10, n (%)	24 (60.0)	36 (90.0)	0.004*
Drain removed by POD 15, n (%)	38 (95.0)	40 (100.0)	0.494
Clinically significant seroma requiring aspiration up to POD 15, n (%)	16 (40.0)	6 (15.0)	0.023*
*Statistically significant at $p < 0.05$			

Table 4: Comparison of postoperative complications, pain, and hospital stay between the study groups (Control vs Flap fixation; N=80)

	Control N = 40 n (%)	Flap fixation N = 40 n (%)	P value
Postoperative bleeding/hematoma	3 (7.5)	2 (5.0)	1.000
Pain score at 24 h (VAS 0–10), Mean (SD)	4.2 (1.1)	4.6 (1.2)	0.124
Surgical site infection (superficial)	4 (10.0)	3 (7.5)	1.000
Postoperative hospital stay (days), Mean (SD)	5.0 (1.1)	4.8 (1.0)	0.397
*Statistically significant at $p < 0.05$			

DISCUSSION

Post-mastectomy seroma remains one of the most frequent and clinically relevant wound morbidities after MRM, particularly when axillary dissection creates a large potential space, as described by Sampathraju & Rodrigues (2010).[24] Bhagchandani et al. (2023) and de Rooij et al. (2021) noted that seroma is essentially a collection of serous fluid (blood plasma and/or lymph) under the mastectomy skin flaps or within the axillary dead space, and it can adversely affect recovery by causing local discomfort and anxiety, increasing outpatient visits for repeated aspirations, and predisposing to surgical site infection, flap-related complications, delayed wound healing, and delays in adjuvant therapy.[25,26] In this context, the central preventive concept across most proposed interventions has been mechanical reduction or obliteration of dead space, thereby limiting ongoing shearing and lymphatic leak and encouraging early adherence of the flap to the underlying chest wall.

In the present study, baseline comparability between the control and flap-fixation groups strengthens the internal validity of the observed postoperative differences. The two groups were well balanced for age (mean 51 years in both arms), body mass index (25.4 kg/m²), and physiological parameters (systolic/diastolic blood pressure, pulse rate, and temperature), suggesting that perioperative physiological reserve and immediate hemodynamic status were unlikely to confound outcomes. Likewise, oncologic variables were comparable, including AJCC stage distribution (predominantly stage II), histologic grade (grade II predominance), nodal status, and laterality, alongside similar hormone receptor and HER2 profiles. Because tumour biology and the extent of surgical dissection can influence the magnitude of axillary dead space and lymphatic disruption as noted by Gervasoni et al. (2000) and Isozaki et al. (2019), the absence of baseline imbalance supports attributing differences in seroma-related endpoints primarily to the flap-fixation technique rather than to underlying disease severity.[27,28] The study's key finding: significantly lower drain volumes at each measured time point in the flap-fixation arm – aligns closely with the mechanistic rationale of dead-space closure. Cumulative drainage was consistently reduced by approximately 100–170 mL across postoperative days 3 to 15, and total drain output until removal was markedly lower with flap fixation. These findings are consistent with Srivastava et al. (2012), who reported that such reductions are clinically meaningful because high drain output and prolonged drainage are closely linked to patient discomfort, delayed mobilisation, increased outpatient dependence, and risk of ascending infection.[4] More importantly, reduced drainage supports the concept that mechanical fixation facilitates earlier flap adherence and reduces the persistent potential space where serous fluid can accumulate. This is consistent with Hashmi et al. (2025) and van Bastelaar et al. (2016) indicating that techniques which reduce dead space – such as quilting of skin flaps and related fixation strategies – form the common denominator of effective seroma-prevention approaches.[29,30]

A related and practically important outcome was earlier drain removal in the flap-fixation group. The duration of drainage was shorter by roughly 2–3 days, and a substantially higher proportion achieved drain removal by postoperative day 7 and day 10. Earlier drain removal matters not only for patient comfort and convenience but also for resource utilisation, as prolonged drainage typically increases postoperative visits and nursing burden. Systematic reviews from van Bastelaar et al. (2018) and Velotti et al. (2021) report that applying flap fixation can reduce seroma incidence from higher ranges (approximately 40%–80.5%) to lower ranges (approximately 10%–35.9%), although absolute rates vary by definitions of seroma, drain removal criteria, and whether aspiration is required to qualify as clinically significant.[31,32] The present results are congruent with these patterns: while the study focused on aspiration-requiring seroma up to postoperative day 15, the intervention group demonstrated a marked reduction in clinically significant seroma requiring aspiration (15% vs

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40%). This finding aligns with de Rooij et al. (2020), who noted that this endpoint is particularly relevant because aspiration-requiring seroma represents the subset most burdensome to patients and most likely to generate repeated hospital encounters and secondary complications.[33] The observed reduction in aspiration-requiring seroma is also consistent with van Bastelaar et al. (2016) that 'mechanical flap fixation effectively reduces seroma formation and seroma aspiration' following mastectomy.[30] Multiple comparative studies and randomized trials including ten Wolde et al. (2014) and van Bastelaar et al. (2017) have evaluated quilting and fixation strategies, and systematic reviews including Chen et al. (2016), Weezelenburg et al. (2024) and Velotti et al. (2021) have generally supported dead-space closure as beneficial for seroma-related endpoints (incidence and/or aspiration frequency), even though methods and outcome definitions differ across studies.[32,34-37] In contrast, tissue adhesives alone have shown more variable benefit; notably, a Cochrane review by Carless & Henry (2006) reported that fibrin glue flap fixation (e.g., Tisseel) did not materially influence seroma incidence, seroma volume, wound infection, other complications, or length of hospital stay after mastectomy.[38] This contrast reinforces the likelihood that robust mechanical obliteration of dead space – rather than reliance on adhesive properties alone – may be the more reliable pathway to clinically meaningful reductions in seroma requiring intervention.

A predictable trade-off in dead-space closure techniques is an increase in operative time. In the present study, flap fixation increased operative duration by about 12 minutes, while estimated blood loss and intraoperative bleeding complications remained comparable. This pattern is consistent with Sakkary (2012) and Weezelenburg et al. (2023) noting that flap fixation/quilting can prolong surgery by several minutes and sometimes up to approximately 7–20 minutes depending on technique complexity and surgeon familiarity.[23,39] From a clinical standpoint, a modest increment in operative time may be acceptable when balanced against reductions in drainage burden and aspiration-requiring seroma, particularly in settings where postoperative follow-up access is constrained or where reducing repeat procedures is a priority. Importantly, surgeon-perceived ease of use remained high in both groups, with no statistically significant difference in Likert ratings, suggesting that – once learned – flap fixation can be integrated into routine workflow without major perceived technical difficulty. This is in corroboration with Bhagchandani et al. (2023).[26]

Secondary outcomes in this study provide reassurance regarding safety. Postoperative bleeding/hematoma rates were low and comparable, and there was no statistically significant increase in early postoperative pain (24-hour VAS) with flap fixation. Similarly, superficial surgical site infection rates were not significantly different. Given that seroma can itself predispose to infection and wound morbidity, the absence of increased infection risk with flap fixation is clinically reassuring and supports the feasibility of adopting the technique without apparent short-term harm. Finally, postoperative length of stay was similar, which may reflect institutional discharge practices, the role of drains in outpatient management, and the fact that discharge timing is influenced by multiple factors beyond drainage volume alone. Even when length of stay is unchanged, earlier drain removal and reduced aspiration needs remain valuable patient-centred and system-level benefits, as they reduce subsequent postoperative burden after discharge. Overall, the present findings support the conceptual framework that postmastectomy seroma is closely tied to dead-space physiology and that mechanical flap fixation – by promoting flap adherence and limiting fluid re-accumulation – can substantially reduce cumulative drainage and clinically significant seroma requiring aspiration, at the cost of a modest increase in operative time.

The present study has certain limitations that should be considered while interpreting the findings. As a single-centre, hospital-based comparative study with purposive/consecutive enrolment, the results may have limited external validity and may not be fully generalisable to other settings with different patient profiles, surgeon expertise, or perioperative protocols. The sample size (80 participants) was adequate to detect differences in seroma-related endpoints but may have been underpowered to identify smaller between-group differences in less frequent outcomes such as bleeding/hematoma and surgical site infection. As the intervention involves a surgical technique, complete blinding of the operating surgeon was not feasible, and subjective measures such as surgeon-perceived ease of use and postoperative pain could have been influenced by performance or expectation bias. In addition, seroma assessment relied primarily on clinically significant seroma requiring aspiration up to postoperative day 15, and ultrasound was performed only when clinically indicated; therefore, asymptomatic or small collections may have been missed. Finally, follow-up focused on early postoperative outcomes, and longer-term sequelae such as persistent seroma, chronic pain, shoulder dysfunction, and lymphedema were not assessed, which limits conclusions regarding longer-term morbidity.

CONCLUSION

In this prospective comparative study, baseline demographic, clinical, tumour-related, and laboratory characteristics were comparable between the control and flap-fixation groups, supporting a balanced comparison of outcomes. Flap fixation was associated with a significant reduction in cumulative postoperative drain output at all assessed time points and a markedly lower total drain volume until removal. The intervention also resulted in a significantly shorter duration of drainage with earlier drain removal, and it substantially reduced the proportion of patients developing clinically significant seroma requiring aspiration up to postoperative day 15. Although flap fixation modestly increased operative time, it did not significantly affect estimated blood loss, intraoperative bleeding complications, early postoperative pain, superficial surgical site infection, or duration of hospital stay. Overall, flap fixation appears to be an effective and feasible technique for reducing post-mastectomy seroma-related morbidity and improving early postoperative drainage outcomes after modified radical mastectomy without increasing early postoperative complications.

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