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Evaluating the Role of Flap Fixation Techniques in Reducing Seroma Formation After Mastectomy

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Abstract

Seroma remains the most common complication following mastectomy, often prolonging hospital stay, delaying adjuvant therapies, and increasing morbidity. This study aimed to evaluate the role of flap fixation techniques in reducing seroma formation compared to conventional closure. A prospective randomized controlled trial was conducted including 120 female patients undergoing modified radical mastectomy for breast cancer. Patients were allocated into two groups: Group A with conventional flap closure without fixation, and Group B with flap fixation using multiple sutures to obliterate dead space. The primary outcome was seroma formation, assessed clinically and through ultrasonography during follow-up. Secondary outcomes included drain output, duration of drain placement, wound complications, and length of hospital stay. Results showed a statistically significant reduction in seroma incidence in the flap fixation group (18.3%) compared with the conventional group (43.3%, $p<0.01$). Mean drain output and duration of drainage were also significantly lower in Group B ($p<0.05$). No increase in wound complications was observed with fixation. The findings suggest that flap fixation is an effective and safe technique to minimize seroma formation, thereby improving postoperative recovery. This study highlights the clinical value of incorporating flap fixation as a routine step in mastectomy closure.

Keywords: Mastectomy, Seroma, Flap Fixation

Introduction

Methodology

This prospective randomized controlled study was conducted at Central Park Medical College, Lahore. A total of 120 female patients undergoing modified radical mastectomy for operable breast carcinoma were enrolled. Sample size was calculated using Epi Info software, assuming a 40% seroma rate in conventional closure and a 15% rate with flap fixation, with 80% power and 5% significance, resulting in 60 patients per group.

Patients were randomized into two groups using computer-generated random numbers. Group A underwent conventional closure with suction drains, while Group B underwent flap fixation with multiple absorbable sutures placed between skin flaps and the underlying pectoral fascia, along with suction drains. All procedures were performed by experienced breast surgeons under standardized operative and anesthetic protocols.

Inclusion criteria included patients aged 18–70 years with operable breast cancer scheduled for mastectomy. Exclusion criteria were prior chest irradiation, previous breast or axillary surgery, coagulation disorders, uncontrolled diabetes, and active infection. Written informed consent was obtained from all participants.

Outcomes measured included incidence of clinically or ultrasonographically detected seroma, total drain output, duration of drain placement, wound complications (infection, flap necrosis, hematoma), and hospital stay. Patients were followed up at 7, 14, and 30 days postoperatively. Statistical analysis was performed using SPSS version 26. Continuous variables were expressed as mean ± standard deviation and compared using independent t-test. Categorical variables were analyzed with Chi-square test. A p-value of <0.05 was considered statistically significant.

Results

Table 1. Demographic and Clinical Characteristics of Patients

Variable	Group A (Conventional, n=60)	Group B (Fixation, n=60)	p-value
Mean Age (years)	51.2 ± 8.4	50.6 ± 9.1	0.72
BMI (kg/m²)	27.1 ± 3.2	26.8 ± 3.5	0.64
Tumor size (cm)	3.8 ± 1.2	3.6 ± 1.4	0.48
Nodal status (%)	55% positive	53.3% positive	0.82

Both groups were comparable in baseline demographic and oncological characteristics, eliminating confounding bias.

Table 2. Postoperative Outcomes

Outcome	Group A (Conventional)	Group B (Fixation)	p-value
Seroma incidence (%)	43.3%	18.3%	<0.01
Mean drain output (mL)	465 ± 120	310 ± 95	<0.01
Duration of drain (days)	8.2 ± 2.1	5.6 ± 1.8	<0.01
Wound infection (%)	8.3%	6.6%	0.72
Flap necrosis (%)	3.3%	1.6%	0.56

Flap fixation demonstrated a significant reduction in seroma formation, drain output, and duration without an increase in complications.

Table 3. Hospital Stay and Recovery Parameters

Variable	Group A (Conventional)	Group B (Fixation)	p-value
Hospital stay (days)	9.1 ± 2.3	6.7 ± 1.9	<0.01
Early return to activity	65%	83.3%	0.03

Patients undergoing flap fixation had a significantly shorter hospital stay and faster return to daily activities.

Discussion

This study provides strong evidence that flap fixation techniques significantly reduce the incidence of postoperative seroma formation in patients undergoing mastectomy. The incidence of seroma in the fixation group was less than half that observed in the conventional closure group, highlighting the clinical efficacy of dead space obliteration through flap fixation. Importantly, this reduction was achieved without increasing wound complications, supporting the safety of the technique.11-13

The results align with the evolving understanding that seroma is not merely a drain-dependent complication but a multifactorial process strongly influenced by mechanical dead space and shearing forces. Flap fixation directly addresses these pathophysiological contributors, promoting adherence of flaps and reducing lymphatic leakage. The statistically significant reduction in drain output and duration observed in this study further supports this mechanism.14-16

One of the concerns raised in prior reports was the potential increase in flap necrosis due to additional suture placement. However, our findings demonstrate no significant difference in flap necrosis between groups, suggesting that meticulous surgical technique mitigates this risk. Furthermore, the modest increase in operative time associated with flap fixation is outweighed by the benefits of reduced seroma formation and shortened hospitalization.17-18

The improved early return to activity in the fixation group underscores the broader impact on postoperative recovery and quality of life. Faster mobilization and reduced dependence on drains may contribute to enhanced psychological well-being, reduced healthcare burden, and earlier initiation of adjuvant therapies—critical considerations in the multidisciplinary management of breast cancer.19-20

This study also contributes new insights by combining clinical evaluation with ultrasonographic assessment of seroma, thus improving diagnostic accuracy and avoiding underestimation of subclinical collections. By confirming that flap fixation does not increase postoperative morbidity, the findings strongly advocate for its integration into routine surgical practice.

Nonetheless, this study acknowledges certain limitations, including its single-center design and relatively short follow-up, which precludes assessment of long-term oncological or reconstructive

outcomes. Future multicenter trials with larger cohorts and cost-effectiveness analyses will be necessary to further validate and standardize flap fixation in mastectomy procedures.

Conclusion

Flap fixation significantly reduces seroma formation, drain duration, and hospital stay after mastectomy without increasing complications. The technique offers a safe, effective, and reproducible modification to conventional closure. Incorporating flap fixation into standard surgical protocols may enhance postoperative outcomes and reduce healthcare burden.

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