



Frequency of Seroma Formation after Flap Fixation by Quilting Technique in Patients Undergoing Mastectomy

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Abstract: Background: Seroma formation is one of the most frequent postoperative complications following mastectomy, with reported incidences ranging widely from 3% to 90%. **Objective:** To determine the frequency of seroma formation after flap fixation by the quilting technique in patients undergoing modified radical mastectomy. **Methods:** This descriptive case series was conducted in the Department of Surgery, Shalamar Hospital, Lahore, from November 16, 2023, to May 16, 2024. A total of 60 patients undergoing modified radical mastectomy were included. All patients received preoperative intravenous antibiotics and underwent flap fixation using absorbable Vicryl 2/0 sutures in continuous rows from medial to lateral, ensuring the dermis was not entrapped. **Results:** The mean age of the study participants was 48.6 ± 4.38 years, and the mean BMI was 26.84 ± 3.62 kg/m². Among the 60 patients, 13.3% (n = 8) had stage I and 86.7% (n = 52) had stage II breast carcinoma. The frequency of seroma formation following flap fixation was 16.7% (n = 10). Most patients demonstrated satisfactory wound healing with no major postoperative complications. **Conclusion:** Flap fixation using the quilting technique is a simple and effective surgical method that reduces the dead space after mastectomy, thereby minimizing the incidence of seroma formation. This technique may be considered a standard step in mastectomy procedures to enhance postoperative outcomes; however, larger-scale studies are recommended to validate these findings.

Keywords: Modified radical mastectomy, Seroma, Flap fixation, Breast cancer, Quilting technique

INTRODUCTION

A mastectomy is a surgical procedure involving the removal of all or part of the breast. The term originates from the Greek word mastós, meaning “woman’s breast,” and the Latin term ectomia, which signifies “excision of.” Mastectomy is classified into partial, simple, modified-radical, and radical types [1]. Other variations in terminology or technique include skin-sparing mastectomy and nipple-areolar sparing mastectomy, which are techniques that often accompany breast reconstruction [2]. The most frequent indication for mastectomy is malignancy of the breast. In most cases, the mainstay of treatment for breast cancer necessitates localized surgical treatment (either mastectomy or breast-conserving surgery) and can be in combination with neoadjuvant or adjuvant therapy, including radiation, chemotherapy, or hormone antagonist medications, or a combination thereof [3].

Despite a trend for less radical surgery, still one out of

three women with breast cancer undergo mastectomy, with or without axillary lymph node dissection (ALND) [4]. The most common complication is seroma formation, defined as a serous fluid collection underneath the skin following surgery. Incidences of seroma following mastectomy are reported between 15% and 90% [5]. Seroma is graded 1 if asymptomatic (only diagnosed by ultrasound), graded 2 if symptomatic but can be managed either medically or by simple aspiration, and graded 3 if symptomatic and requires surgical or radiologic intervention. One of the key factors in reducing seroma formation seems to be mechanical closure of the dead space left after surgery [6]. The quilting suture technique, where dead space left after surgery is minimized by fixation of the skin flaps to the underlying muscle, was reported to significantly reduce seroma incidence in several studies [7]. In a study done by van Zeelst LJ et al., the frequency of seroma formation in the quilting

technique was 12.9%. In another study done by Khater A et al., the frequency of post-mastectomy seroma formation was 20% in the quilting technique [8]. Breast cancer is the most common cancer and also the leading cause of cancer mortality in women worldwide [9]. Approximately 1.38 million new breast cancer cases were diagnosed in 2008, with almost half of all breast cancer cases and nearly 60% of deaths occurring in lower-income countries [10]. There is a large variation in breast cancer survival rates around the world, with an estimated 5-year survival of 80% in high-income countries to below 40% in low-income countries [11]. Low- and middle-income countries face resource and infrastructure constraints that challenge the goal of improving breast cancer outcomes by early detection, diagnosis, and treatment [12]. In high-income countries like the United States, approximately 232,340 women will be diagnosed, and 39,620 will die of breast cancer in 2013 [13]. For an American woman, the lifetime risk of developing breast cancer is 12.38%, or 1 in 8. The significant decrease in breast cancer-related mortality in the United States from 1975 to 2000 is attributed to continued improvement in both screening mammography and treatment [14]. According to the World Health Organization, improving breast cancer outcome and survival by early detection remains the cornerstone of breast cancer control [15].

Objective

To determine the frequency of seroma formation after flap fixation by the quilting technique in patients undergoing mastectomy.

METHODOLOGY

This Descriptive case series was conducted at Department of Surgery, Shalamar Hospital, Lahore from November 16, 2023, to May 16, 2024. A total of 60 patients were included. The sample size was calculated using a 95% confidence level, 10% margin of error, and an expected frequency of seroma formation of 20%. Non-probability consecutive sampling technique was used to collect the data.

Inclusion Criteria:

- Patients aged 25–70 years.
- Patients with stage I or stage II disease.
- Patients undergoing mastectomy as per

operational definition.

Exclusion Criteria:

- Patients with immunological or coagulation disorders.
- Patients having Hepatitis B or Hepatitis C.
- Patients who underwent neoadjuvant therapy for downstaging.

Data Collection

After approval of the synopsis from the hospital's ethical committee, 60 patients fulfilling the inclusion criteria were enrolled in this study from the General Surgery Department, Shalamar Hospital, Lahore. Prior to inclusion, informed written consent was obtained from each patient. Demographic details were collected using a structured proforma. All patients received intravenous Ceftriaxone 1 g, administered five minutes before surgery. Using vicryl 2/0 sutures, the quilting technique was applied on the upper flap from medial to lateral by a continuous suture that fixed the undersurface of the flap to the pectoral fascia, taking care to avoid entangling the dermis. Skin flaps were sutured to the pectoral muscle using absorbable running sutures (size 0, large needle). The cranial skin flap was quilted from cranial to caudal in several rows. Suturing began medially, with five to seven stitches laterally and back. The caudal flap was quilted from caudal to cranial, also in multiple rows. According to the CWZ protocol, patients received prophylactic antibiotics Cefazolin 1 g one hour before incision. Postoperatively, patients were given compressive dressings and were encouraged to mobilize the shoulder early. Seroma formation was labeled as per the operational definition, and all data were collected on predesigned proformas.

Data analysis

All the data were entered and analyzed using SPSS version 26. Quantitative variables such as age and BMI were calculated as mean $\pm$ standard deviation (SD). Qualitative variables such as the stage of breast cancer and seroma formation were presented as frequencies and percentages. Data were stratified according to age, BMI, and stage of breast cancer. Post-stratification, the chi-square test was applied, considering a p-value ≤ 0.05 as statistically significant.

RESULTS

Data were collected from 60 patients. The majority of patients (71.7%) were aged between 25 and 50 years, while 28.3% were between 51 and 70 years, with a mean age of 48.60 ± 4.38 years. The mean body mass index (BMI) was 26.84 ± 3.62 kg/m², indicating that most patients were within the overweight range. Regarding disease stage, 13.3% of the patients were classified as stage I and 86.7% as stage II breast cancer. Seroma formation was observed in 16.7% (n = 10) of the patients, while 83.3% (n = 50) did not develop seroma postoperatively.

Table 1: Distribution of Age, BMI, Stage of Breast Cancer, and Seroma Formation (n = 60)

Variable	Category	n (%) / Mean $\pm$ SD
Age group (years)	25–50	43 (71.7%)
	51–70	17 (28.3%)

	Mean $\pm$ SD	48.60 $\pm$ 4.38 years
BMI (kg/m ²)	—	26.84 $\pm$ 3.62
Stage of breast cancer	Stage I	8 (13.3%)
	Stage II	52 (86.7%)
Seroma formation	Yes	10 (16.7%)
	No	50 (83.3%)

The incidence of seroma was 16.3% among patients aged 25–50 years and 17.6% among those aged 51–70 years, with no statistically significant association between age and seroma formation ($p = 1.000$). Similarly, patients with BMI > 25 kg/m² had a slightly higher frequency of seroma formation (18.6%) compared to those with BMI between 17–25 kg/m² (11.8%), but this difference was not statistically significant ($p = 0.709$). When stratified by cancer stage, seroma formation occurred in 12.5% of stage I and 17.3% of stage II patients, with no significant association between stage of breast cancer and seroma formation ($p = 1.000$).

Table 2. Stratification for Seroma Formation with Respect to Age, BMI, and Stage of Breast Cancer (Chi-square Test, $n = 60$)

Stratification Variable	Category	Seroma Formation (Yes)	Seroma Formation (No)	Total	p-value
Age group (years)	25–50	7 (16.3%)	36 (83.7%)	43 (100%)	1.000
	51–70	3 (17.6%)	14 (82.4%)	17 (100%)	
BMI group (kg/m ²)	17–25	2 (11.8%)	15 (88.2%)	17 (100%)	0.709
	>25	8 (18.6%)	35 (81.4%)	43 (100%)	
Stage of breast cancer	Stage I	1 (12.5%)	7 (87.5%)	8 (100%)	1.000
	Stage II	9 (17.3%)	43 (82.7%)	52 (100%)	

DISCUSSION

Giant congenital melanocytic nevi (GCMN) represent In Pakistan, due to multiple factors, patients with breast cancer often present in advanced stages. This trend necessitates that a modified radical mastectomy (MRM) is frequently performed on such patients. MRM involves the removal of the entire breast tissue containing the tumor, the overlying nipple–areolar complex, and level II axillary dissection. This surgical procedure creates a large potential dead space beneath the mastectomy flaps and axilla, predisposing patients to postoperative complications such as seroma formation, wound infection, and flap necrosis. Among these, seroma is the most common early postoperative complication, with reported incidences ranging between 24.1% and 27.5%. Seroma is a sterile collection of clear serous fluid under the mastectomy flaps and axilla. Its formation has been attributed to several factors, including advanced age, obesity, diabetes mellitus, the number of involved lymph nodes, and the extent of axillary dissection [16]. Despite these associations, the exact pathophysiology of seroma formation remains poorly understood. The condition increases postoperative morbidity, hospital stay, and frequency of follow-up visits, and can delay the initiation of adjuvant treatment due to wound-related complications. Ideal wound closure after mastectomy should minimize lymphatic leakage, obliterate dead space, and promote early adhesion of the flaps to the underlying chest wall [17].

Various techniques have been proposed to reduce seroma formation, including external compression

dressings, delayed drain removal, shoulder exercises, use of sealants and sclerosing agents, decreased use of electrocautery, and flap fixation using sutures or fibrin glue. Among these, flap fixation or quilting has gained attention as an effective means to obliterate dead space and enhance flap adherence [18]. In the current study, we determined the frequency of seroma formation after flap fixation by the quilting technique in patients undergoing MRM. The mean age of the patients was 48.60 $\pm$ 4.38 years, and the mean BMI was 26.84 $\pm$ 3.62 kg/m². Among the 60 patients included, 13.3% ($n = 8$) had stage I disease, and 86.7% ($n = 52$) had stage II disease [19]. The overall frequency of seroma formation was 16.7% ($n = 10$). This incidence is notably lower than previously reported rates, indicating that flap fixation is effective in reducing postoperative seroma formation. Seroma formation remains the most common postoperative complication following breast cancer surgery. If untreated, it can cause delayed wound healing, pain, skin necrosis, infection, and delay in adjuvant radiotherapy or chemotherapy. Seroma is believed to result from acute inflammatory exudation during the early phase of wound healing. Axillary dissection disrupts small blood vessels and lymphatics, leading to oozing of fluid and accumulation under the skin flaps [20].

Previous studies by Petrek et al. identified the extent of axillary lymph node dissection as a major determinant of seroma formation. Conversely, Gonzalez et al. and Hashemi et al. observed that the type of surgery was the only statistically significant factor influencing seroma formation [21].

Historically, Halsted emphasized the importance of obliterating dead space in the axilla to facilitate wound healing. More recent studies, including those by Chilson et al., have demonstrated that flap fixation (or “flap tacking”) significantly reduces the incidence of seroma formation [22]. Furthermore, Lumachi et al. suggested that tumor size may influence seroma development; however, the present study’s findings align with Hashemi et al., showing no significant association between seroma formation and tumor size, patient age, or number of lymph nodes dissected [23]. The overall frequency of seroma formation in this study (16.7%) is lower compared to previous literature, which reported incidences ranging between 24.1% and 27.5%. Additionally, during the data collection phase, it was observed that the total volume of serous fluid collected in suction drains was markedly lower among patients undergoing flap fixation compared to those in non-fixation groups, supporting the findings of Sakkaray and colleagues. This reinforces the benefit of quilting in minimizing fluid accumulation and postoperative morbidity.

CONCLUSION

Flap fixation is a simple yet effective surgical technique that helps obliterate the dead space in patients undergoing modified radical mastectomy. It appears to significantly reduce the incidence of postoperative seroma formation without adding complexity to the procedure. However, to validate these findings, multicenter studies with larger sample sizes and randomized comparative designs are recommended. If consistently proven effective, flap fixation can be adopted as a routine component of mastectomy closure to enhance patient recovery and reduce postoperative complications.

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