

Outcome of Skin Sparing Mastectomy with Dermal Sling for Covering Prepectoral Implant in Ptosed Breast

Original Article

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ABSTRACT

Background: Breast reconstruction after mastectomy significantly improves the quality of life for patients with breast cancer.

Objectives: To assess the oncological safety, early problems, radiation impact, and patient satisfaction with skin-sparing mastectomy using a dermal sling for prepectoral implant implantation.

Methods: A prospective study was conducted at Menoufia University Hospital from February 2023 to January 2025, involving 40 patients diagnosed with invasive breast cancer. Patients were evaluated for tumor characteristics, preoperative health, and surgical outcomes. Skin-sparing mastectomy was performed with a dermal sling for prepectoral implant placement. Early and late postoperative complications, as well as cosmetic outcomes, were recorded.

Results: The patients' average BMI was 30.97kg/m², and their average age was 46.35 years. Invasive ductal carcinoma (IDC) was present in the majority of cases (80%). Seroma (12.5%), erythema (5%), delayed healing (10%), and partial skin necrosis (20%) were among the early sequelae. Reoperation (10%) and capsular contracture (20%) were examples of late complications. The average length of stay in the hospital was 1.85 days, while the average drain time was 10.45 days. With a mean satisfaction score of 35.55 (95% satisfaction rate), a high level of satisfaction was observed.

Conclusion: Although it is linked to certain early and late problems, skin-sparing mastectomy with a dermal sling for prepectoral implant insertion is an efficient and well-tolerated method that shows positive cosmetic results and high patient satisfaction.

Key Words: Breast cancer, capsular contracture, dermal sling, mastectomy, prepectoral implant.

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INTRODUCTION

Breast cancer is the second most common disease diagnosed worldwide, and it affects both high- and low-income countries^[1]. It considered the most common cancer in Egypt among women, accounting for around 38.8% of all cancers and making a substantial contribution to death rates^[2]. Since Halsted established radical mastectomy as the accepted therapy for breast cancer in the early 20th century, a procedure that dominated for over 70 years, breast cancer treatment has undergone substantial change^[3]. Patey and Dyson in (1948) suggested a modified radical mastectomy that minimized cosmetic effects while preserving survival chances by pectoralis major muscle preservation and less skin removal^[4].

Mastectomy often has profound psychological effects on patients, particularly due to the symbolic importance of breasts in femininity and motherhood, which can negatively impact self-esteem and body image^[5]. Immediate breast reconstruction (IBR) has become a critical component

of breast cancer management, offering not only aesthetic benefits but also helping to preserve body image, mitigate psychological distress, and improve overall quality of life^[6]. Advances in detection and primary prevention have further enhanced outcomes, making breast reconstruction a standard part of care. Various techniques, including autologous breast tissue reconstruction, implant-based reconstruction, or hybrid methods, are employed based on individual patient needs^[7].

Implant-based reconstruction accounts about 40-60% of all breast reconstructions in the UK and about 75% in the USA^[8]. Initially, in the (1960) and (1970), implants were placed subcutaneously, but this approach led to complications such as rippling, visible implants, and capsular contracture, prompting the adoption of submuscular placement^[9-11]. While submuscular placement addressed some issues, it introduced new challenges, including inadequate lower pole projection, chest tightness,

muscle spasms, and animation deformities^[8,12]. Recent advancements in tissue expanders, implant design, biologic and synthetic meshes, and fat grafting have popularized pre-pectoral reconstruction^[13].

The use of acellular dermal matrix (ADM) and form-stable implants has significantly reduced the capsular contracture rates and enhanced aesthetic outcomes^[14]. Pre-pectoral reconstruction offers additional advantages, such as avoiding pectoralis muscle elevation, which reduces animation deformities, chest discomfort, postoperative pain, and hospital stays while improving aesthetic results^[15,16]. An alternative to ADM is the dermal sling, which utilizes de-epithelialized skin from the lower mastectomy flap to cover the implant. This technique is particularly useful in skin-reducing mastectomies for large or ptotic breasts with free nipple grafts, providing vascularized coverage without the need for costly foreign materials^[17,18].

This study aims to evaluate skin-sparing mastectomy with dermal sling in Prepectoral implant as regards oncological safety, early complications, effect of radiotherapy on the operation and patient satisfaction within two years.

METHODS

This study was conducted prospectively from February 2023 to January 2025 at the Department of General Surgery, Menoufia University Hospital, involving 40 patients diagnosed with invasive breast cancer. The study focused on evaluating skin-sparing mastectomy with a dermal sling for prepectoral implant placement. Eligible patients included those with carcinoma in situ, multi-centric carcinoma, tumors not invading the breast skin, diffuse microcalcifications, or an extensive in situ component. Exclusion criteria comprised distant metastasis, inflammatory carcinoma, and tumors invading the breast skin.

The diagnostic process began with a comprehensive history-taking, including personal, medical, family, and surgical histories, alongside a detailed analysis of the patient's condition. A thorough physical examination was conducted to assess the breast for tumor size, location, skin changes, and muscle fixation, as well as to evaluate the axilla for lymph node involvement and examine the contralateral breast. Investigations included laboratory tests such as complete blood count (CBC), kidney and liver function tests, and coagulation profiles. Radiological assessments involved bilateral digital mammography, chest X-Rays, pelvic and abdominal ultrasounds, contrast-enhanced CT scans of the chest, pelvis, abdomen, and bone scans. Pathological confirmation was obtained through Tru-cut needle core biopsies for all patients.

The surgical technique involved preoperative marking of the inframammary fold, sternal midline, and paramedian line while the patient was standing (Figure 1). If the tumor was palpable, its location was also marked. The procedure was performed under general anesthesia with the patient in a supine position and arms abducted at 90 degrees. An incision was made along the marked lines, and the areola was de-epithelialized for later use as a graft. The skin over the inferior dermal flap was also de-epithelialized (Figure 2) to create a dermal sling for covering and securing the prepectoral implant (Figure 3). A skin-sparing mastectomy was performed, excising all breast tissue and conducting axillary dissection based on sentinel lymph node status (Figure 4). The appropriate implant was placed in the prepectoral space under the dermal sling, followed by hemostasis and insertion of a suction drain (Figure 5). Closure involved subcutaneous and skin suturing in an inverted T shape, with the de-epithelialized areola graft, sutured into place and secured with a tie-over dressing (Figure 6).



Fig. 1: Pre operative marking.



Fig. 2: De-epithelialization of lower flap.



Fig. 3: Dermal sling.



Fig. 4: Glandular resection.



Fig. 5: Implant covering with dermal sling.



Fig. 6: Nipple graft fixation and tie over.

Outcome measures included the quality of resection (assessed by margin status), postoperative morbidity (e.g., flap necrosis, seroma, fat necrosis, and bleeding), and cosmetic outcomes. Cosmetic evaluation focused on breast symmetry, shape, scarring, and overall patient satisfaction. This study provided insights into the efficacy and aesthetic outcomes of prepectoral implant reconstruction using a dermal sling technique.

Ethical considerations:

The Menoufia University Hospital's Institutional Review Board (IRB) granted ethical approval for this investigation. All individuals provided written informed permission before being included in the study. IRB number:

Data analysis:

On an IBM compatible computer, SPSS (statistical package for the social science software). Version 26 was used to tabulate and analyze the acquired data. For qualitative data, the data were presented as numbers and percentages (No and %), whereas for quantitative data, the mean ($\bar{x}$) and standard deviation (SD) and range were used.

RESULTS

The mean age of the patients studied was 46.35 years, with a range from 28 to 66 years. The mean BMI was 30.97kg/m², ranging from 27 to 39kg/m². Regarding comorbidities, 25% of patients had hypertension (HTN) and 25% had diabetes mellitus (DM) (Table 1).

Table 1: Demographic characteristics and comorbidities of studied group:

Variable	Studied group (n= 40)	
	No.	%
Age (years)	Mean±SD	46.35±11.67
	Range	28-66
BMI (kg/m ²)	Mean±SD	30.97±2.91
	Range	27-39
Comorbidities	HTN	10 25.0
	DM	10 25.0

In terms of pathology, invasive ductal carcinoma (IDC) was identified in 80% of patients, followed by invasive lobular carcinoma (ILC) in 7.5% and ductal carcinoma in situ (DCIS) in 12.5%. 32.5% of patients had a positive sentinel lymph node (SLN) status, whereas 67.5% had a negative one. With a range of 360 to 460, the average implant size chosen was 401.25±22.24 (Table 2).

Table 2: Pathological data and implant size of studied group:

Variable	Studied group (n= 40)	
	No.	%
Pathological type	IDC	32 80.0
	DCIS	5 12.5
	ILC	3 7.5
SLN	Positive	13 32.5
	Negative	27 67.5
Implant size	Mean±SD	401.25±22.24
	Range	360-460

12.5% of patients suffered seroma, 5% experienced erythema, 10% experienced delayed healing, 20% experienced partial skin necrosis, and 12.5% experienced nipple-areola complex graft partial necrosis, according to the frequency of early problems (Table 3).

2.5% of patients had rejection, 7.5% developed cellulitis, 20% developed capsular contracture, and 10% required reoperation as a result of late complications (Table 3).

Table 3: Early and Late complications of studied group:

Early Complications		Studied group (n= 40)	
		No.	%
Seroma	Yes	5	12.5
	No	35	87.5
Erythema	Yes	2	5.0
	No	38	95.0
Delayed healing	Yes	4	10.0
	No	36	90.0
Partial skin necrosis	Yes	8	20.0
	No	32	80.0
Partial necrosis in nipple areola complex graft	Yes	5	12.5
	No	35	87.5

Late Complications		Studied group (n= 40)	
		No.	%
Rejection	Yes	1	2.5
	No	37	97.5
Cellulitis	Yes	3	7.5
	No	37	92.5
Capsular contracture	Yes	8	20.0
	No	32	80.0
Reoperation	Yes	4	10.0
	No	36	90.0

With a range of 9 to 45, the mean satisfaction score was 35.55. The majority of patients (95%) expressed satisfaction with the procedure's results (Table 4).

Table 4: Satisfaction rate among studied group:

Variable	Studied group (n= 40)	
	No.	%
Satisfaction score	Mean ±SD	35.55±7.68
	Range	9-45
Satisfied	Yes	38 95.0
	No	2 5.0

DISCUSSION

A mastectomy is frequently necessary as part of treatment of breast cancer, an illness that is common around the world. Following a mastectomy, breast reconstruction is essential to regaining one's physical and mental health. Because of its ease of usage and quicker recovery period,

implant-based reconstruction—which makes use of prosthetic implants positioned beneath the skin or chest muscle—is a popular choice. Seroma, infection, and capsular contracture are among the possible side effects that might compromise patient satisfaction and cosmetic outcomes.

While numerous studies have examined the complications associated with implant-based reconstruction^[19-21], there is limited understanding of how patient characteristics (as age, BMI, and comorbidities) influence surgical outcomes and satisfaction. This study aims for evaluation the clinical outcomes, complications, and patient satisfaction following the implant-based breast reconstruction, providing insights into factors that may contribute to successful outcomes and guiding future practices in breast reconstruction.

This prospective study, conducted from February 2023 to January 2025 at Menoufia University Hospital, involved 40 patients with invasive breast cancer undergoing skin-sparing mastectomy with a dermal sling for prepectoral implant placement. Patients with carcinoma in situ, multicentric carcinoma, and tumors not invading the breast skin were included, while those with distant metastasis or inflammatory carcinoma were excluded. The study assessed preoperative evaluation, surgical technique, and postoperative outcomes, including margin status, complications (e.g., flap necrosis, seroma), and cosmetic results such as symmetry, shape, and patient satisfaction. The aim was to evaluate the effectiveness of the dermal sling technique in prepectoral implant reconstruction.

The patients' mean BMI ranged from 27 to 39 kg/m², and their mean age was 46.35 years, with a range of 28 to 66 years. These demographic characteristics are consistent with those reported in previous studies, which often describe similar age and BMI ranges in breast reconstruction cohorts^[22]. However, Prevalence of comorbidities such as hypertension was (25%) and diabetes mellitus was (25%) did not significantly correlate with complication rates in our study. This contrasts with some literature that suggests these comorbidities are associated with increased postoperative complications^[23]. The disparity could result from our cohort's successful perioperative treatment of comorbidities or from the small sample size, which might have made it more difficult to identify meaningful correlations.

Regarding pathology, the majority of patients (80%) were diagnosed invasive ductal carcinoma (IDC), followed by ductal carcinoma in situ (DCIS) (12.5%), and invasive lobular carcinoma (ILC) (7.5%). These findings align with the literature, where IDC is consistently reported as the most common breast cancer subtype^[24]. Similarly, the sentinel lymph node (SLN) positivity rate of 32.5% in our study is consistent with rates reported in other studies, which typically range from 25% to 35%^[25].

Wang *et al.*, investigated the association among the number of metastatic sentinel lymph nodes (SLNs) per total number of SLNs per patient (i.e., SLN positive rate or SLN-PR) and non-SLN metastasis in breast cancer. And found that among these, 627(27.87%) had at least one positive SLN. Of these, 283 patients underwent axillary lymph node (ALN) dissection and formed the test group. Methylene blue and indocyanine green were used for the SLN mappings, and patients with and without non-SLN metastases were compared based on pathological features, lymph node ultrasonography, and SLN-PR. Receiver operating characteristic (ROC) curves were used for determine a threshold value for SLN-PR, and multivariate logistic regression analysis was used to investigate correlations with non-SLN metastasis. According to the results, SLN-PR>0.333 was found to be a significant risk factor for non-SLN positivity (area under the ROC curve= 0.726; $P<0.001$), and patients with positive non-SLNs (44.52%) had a median of two positive nodes. An outside party verified these findings. A greater probability of non-SLN metastasis was linked to an SLN-PR>0.333, which might help guide choices about adjuvant therapy approaches and ALN dissection^[26].

Seroma (12.5%), erythema (5%), delayed healing (10%), partial skin necrosis (20%), and nipple-areola complex graft partial necrosis (12.5%) were among the early problems in our research. The nipple-areola complex graft necrosis and partial skin necrosis rates were greater than those found in other studies, which usually report skin necrosis rates between 10% and 15%^[27]. Given that obesity is a known risk factor for poor wound healing, this discrepancy could be explained by our cohort's higher mean BMI (30.97 kg/m²)^[28].

Sue *et al.*, discovered variables linked to skin necrosis following mastectomy. 471 of the 293 patients who had implant-based restoration had their breasts restored. 8.1% of breasts had mastectomy skin necrosis; the incidence was higher in smokers patients (17.9% vs. 5.0%, $P<0.001$), people with high BMIs (11.4% vs. 6.1%, $P= 0.05$), those who had immediate breast reconstruction (9.6% vs. 0%, $P= 0.004$), and those who had expanders placed under acellular dermal matrix (12.0% vs. 5.2%, $P= 0.02$). Necrosis was treated with operational debridement for larger regions (43%) and clinic debridement for mild instances (55%). Adjuvant therapy was not postponed by treatment, and the median size of necrosis was 8 cm²^[29].

The same team performed a comparative analysis on the complication between patients undergoing autologous breast reconstruction and patients undergoing 2-stage expander implant breast reconstruction and reported that the incidence of mastectomy skin necrosis was significantly higher in the autologous group (30.4%) compared to the tissue expander group (10.6%) ($P<0.001$). Treatment approaches for skin necrosis also differed between the 2 groups. Local wound care was used successfully in 37.1%

of autologous reconstructions, but only 3.2% of implant-based reconstructions were managed this way ($P<0.001$). Fewer patients in the autologous group required operative interventions (29.0%) compared to the implant-based group (41.9%) ($P=0.25$)^[30].

Late complications in our study included implant rejection (2.5%), cellulitis (7.5%), capsular contracture (20%), and reoperation (10%). The rate of capsular contracture aligns with previous reports, which range from 15% to 25%^[31].

The effects of implant surface, implant type, and implant placement plane on capsular contracture rates following the implant-based breast reconstruction were assessed in recent systematic review and meta-analysis. Found no discernible variations in capsular contracture rates between the prepectoral and subpectoral implant location (OR, 1.21; 95% CI, 0.75–1.95). There were no appreciable variations in the capsular contracture rates between smooth and textured implants in five investigations (OR, 0.99; 95% CI, 0.50–1.93). Patients who had saline implants had considerably lower rates of capsular contracture than those who received silicone implants, according to two trials comparing the two types of implants for capsular contracture (OR, 0.19; 95% CI, 0.08–0.43)^[31].

The average drain duration was 10.45 days (range 8–14 days), while the average hospital stay was 1.85 days (range 1–3 days). These results agree with earlier research that found that individuals undergoing breast reconstruction had comparable hospital stays and drain times^[32]. Our study's high satisfaction rate (95%) and mean satisfaction score of 35.55 (range 9–45) are also consistent with previous research that highlights the psychological and cosmetic advantages of breast reconstruction^[33]. This high degree of satisfaction emphasizes how crucial patient-centered treatment is to getting positive results.

CONCLUSION

Skin-sparing mastectomy with a dermal sling for prepectoral implant placement offers a promising technique in breast cancer reconstruction, demonstrating good aesthetic outcomes and patient satisfaction. While early complications were observed, most patients experienced positive results with high satisfaction rates, highlighting the effectiveness of this technique in improving both oncological and cosmetic outcomes.

CONFLICT OF INTERESTS

There is no conflict of interests.

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