Extended dermal sling for implant-based immediate prepectoral breast reconstruction in large ptotic breasts without using a mesh in early breast cancer

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Background
The rate of immediate breast reconstruction after mastectomy for early breast cancer has recently increased owing to the technological advancements in tissue expanders and implant designs, acellular dermal matrices, and fat grafting. The use of an extended dermal sling to cover the implant in patients with large ptotic breast allows prepectoral breast reconstruction, avoiding the complications and pitfalls of pectoralis muscle elevation and evading the use of the acellular dermal matrices with its high cost and being a foreign material.

Patients and methods
A total of 22 patients underwent mastectomy through a Wise pattern incision. The de-epithelialized extended dermal sling was used to create a prepectoral pocket for the implant and sutured to the pectoralis fascia.

Results
The median BMI was 31.5 kg/m^2 (range, 28–39). The median distance between the areola and the inframammary fold was 20.3 cm (range, 18–26). A total of 13 patients had permanent implant and nipple graft, whereas nine patients had a tissue expander. The average implant size was 375 ml (range, 325–450). Three patients developed seroma around the implant. One patient had mild erythema and two patients had delayed wound healing. Two patients developed partial nipple necrosis. One patient experienced infection and wound dehiscence mainly at the T-junction, and the vertical limb, which was managed by a re-do surgery, removal of the implant, and insertion of a tissue expander. The average follow-up was 14 months (range, 8–24).

Conclusion
Extended dermal sling is a safe, reliable, and effective option for immediate prepectoral breast reconstruction after mastectomy for patients with early breast cancer who have a large ptotic breast. It has a great advantage of being an autologous tissue with minimal complications and good esthetic results.

Keywords:
dermal sling, immediate breast reconstruction, prepectoral implant

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Introduction

Breast cancer overtook lung cancer as the leading cause of global cancer incidence in 2020, with an estimated 2.3 million new cases, representing 11.7% of all cancer cases. It is the fifth leading cause of cancer mortality worldwide, with 685 000 deaths [1].

Immediate breast reconstruction is considered an integral step in the management of breast cancer. It not only gives good esthetic results but also maintains a proper body image. Moreover, it alleviates the psychological effect of mastectomy and helps to keep a sense of self-esteem and a good quality of life [2–9].

The rate of immediate breast reconstruction has increased since skin-sparing and nipple-sparing mastectomy have been introduced and proved to have safe oncological outcomes [10,11]. It can be either done with autologous flaps with or without expander/implant or with a prosthetic implant.

Implant-based reconstructions represent 40–60% of all breast reconstructions performed in the UK and almost 75% in the USA [12]. In the 1960s and 1970s, implant reconstructions were initially described to be done subcutaneously [13], but owing to some postoperative complications such as rippling, implant visibility, and capsular contracture, submuscular implant placement was introduced [14,15]. Although submuscular technique improved these issues, other complications were reported, for

example, inadequate lower pole projection, chest tightness, muscle spasm, and animation [16,17].

The prepectoral reconstruction has become a more frequently performed procedure owing to the recent technologic advancement in the tissue expanders and implant designs, biologic and synthetic matrices/meshes, and adjunctive fat grafting [18].

The uses of the acellular dermal matrix (ADM) and form-stable implants have significantly reduced the rate of capsular contraction and improved the esthetic outcomes [19].

The advantage of prepectoral reconstruction is to avoid the elevation of the pectoralis muscle and subsequent animation deformity and chest discomfort. It also helps to reduce the postoperative pain and hospital stay and to improve the esthetic results [20–27].

Dermal sling is a de-epithelialized skin of the lower mastectomy flap. It was described to cover the implant in the prepectoral setting to avoid using the ADM with its high cost and being foreign material. The sling covers the implant with two vascularized layers after skin-reducing mastectomy in large and ptotic breast with a free nipple graft [28,29]. The aim of this study was to evaluate our early experience in using dermal sling only for immediate prepectoral breast reconstruction in large and ptotic breasts.

Patients and methods

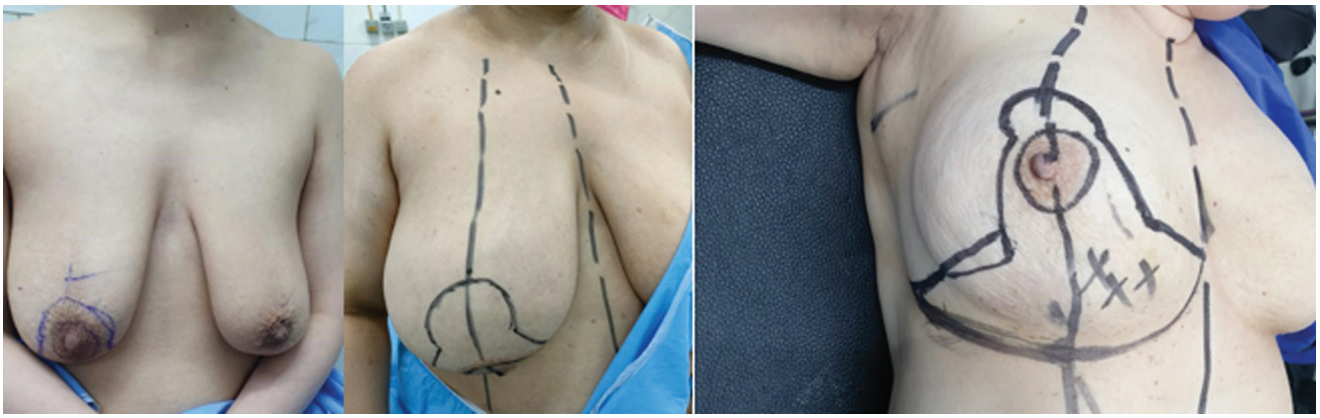
This study included 22 patients who were diagnosed with early breast cancer in the period from June 2017 to December 2021 at Menoufia University Hospitals. All patients have large ptotic breasts. They have been discussed in the breast multidisciplinary team meeting with the recommendation of mastectomy and axillary surgery. Different reconstruction options have been discussed with the patients, and the agreement was to have mastectomy and implant-based reconstruction. We start by marking of the patient's midline, breast paramedian, inframammary fold (IMF), and Wise pattern design. The upper edge of the lower flap is drawn just at the lower edge of the areola. The apex of the V is determined at the same level of the IMF, and two vertical lines are drawn just close to the areola (Fig. 1).

Informed written informed consent was obtained from all participants. It was approved by the ethical and research committees in Faculty of Medicine, Menoufia University, Egypt. All samples and data used were fully anonymized

The distance between the lower edge of the areola and IMF is an important measurement that determines whether to proceed with permanent implant or tissue expander. If the distance is more than or equal to 20 cm, this allows using the implant as a one-stage immediate reconstruction and doing free nipple grafting in the same setting. However, it is preferred to use tissue expander if the distance is less than 20 cm to avoid any tension created to the flaps. In this situation, exchange of the expander to permanent implant after complete healing and full expansion of the tissue expander is performed. Nipple reconstruction is usually done in the second stage in these patients.

De-epithelialization of the lower flap is done using scalpels and then we proceed to the mastectomy in the usual subcutaneous plane for the upper flaps and the lower dermal flap. At this stage and in selected cases where a permanent implant will be used, the nipple is

Figure 1



Preoperative marking.

harvested as full thickness. We prefer to harvest the nipple graft after doing the de-epithelialization and raised the mastectomy flaps to avoid much more time between the time of harvesting and the time of its grafting. Then, we start removal of the breast tissue from the pectoralis fascia. Measuring the breast footprint is done using a ruler to determine the volume of the implant, and then rounded breast implants were used (Figs 2 and 3).

One 10-F suction drain is placed under the dermal flap. Appropriate implant/expander is placed and covered by the dermal sling, which has been fixed to the pectoral fascia superiorly and to the serratus anterior muscle laterally (Figs 4 and 5).

In selected cases for free nipple grafting, the graft is prepared, and multiple samples are taken and sent for histology. Marking of the site of the new nipple is done and then de-epithelialization is completed. Fixation of the nipple graft is done using interrupted nonabsorbable sutures and tie-over dressing, which is left for 10 days (Fig. 6). Postoperative follow-up is done for the wound and to detect any postoperative complications (Fig. 7). Drains are removed when the output is less than 30 mm in two consecutive days. Oral antibiotic is prescribed for 2 weeks. All patients have been offered a symmetrization surgery after completing the adjuvant treatment.

Figure 2

De-epithelialization of the lower dermal flap.

Figure 3

Lower dermal flap.

Figure 4

The dermal sling covering the implant.

Figure 5

Postoperative without nipple graft.

Figure 6

Postoperative after nipple graft.

Figure 7

Six months postoperatively after radiotherapy.

Results

A total of 22 patients underwent mastectomy and axillary staging according to axillary status in form of sentinel lymph node biopsy, axillary sample, and axillary node clearance as a treatment of their early breast cancer with implant-based prepectoral immediate reconstruction using extended inferior dermal sling in the period between June 2017 and December 2021. The median age was 46 years (range, 38–59). The median BMI was 31.5 kg/m^2 (range, 28–39). The median distance between the areola and IMF was 20.3 cm (range, 18–26). A total of 13 patients had permanent implant and nipple graft, whereas nine patients had tissue expander. The average implant size was 375 ml (range, 325–450). Overall, 11 (50%) patients had invasive ductal carcinoma, two (9.1%) patients had invasive lobular carcinoma, three patients had tumors with mixed features, and six patients had ductal carcinoma *in situ*. The average tumor size was 28 mm (range, 18–72). There were some complications; three patients developed seroma

Table 1 Clinicopathological details and postoperative complications for 22 patients who underwent immediate reconstruction using the extended dermal sling

Parameters	Median	Range
Age (years)	46.65	38–59
BMI (kg/m^2)	31.5	28–39
Distance between areola and IMF (cm)	20.3	18–26
Implant size (ml)	375	325–450
Drain (days)	10	8–14
Hospital stay (days)	2	1–3
Pathology	*n* (%)	
IDC	11 (50)	
ILC	2 (9.1)	
Mixed	3 (13.6)	
DCIS	6 (27.3)	
Complications	*n* (%)	
Seroma	3 (13.6)	
Erythema	1 (4.5)	
Delayed wound healing at T-junction and superficial infection	2 (9.1)	
Partial skin necrosis	2 (9.1)	
Re-do surgery	1 (4.5)	

DCIS, ductal carcinoma in situ; IDC, invasive ductal carcinoma; ILC, invasive lobular carcinoma; IMF, inframammary fold.

around the implant, which was managed by repeated aspiration. One patient had mild erythema, and two patients had delayed wound healing at the T-junction with superficial infection. Those patients received antibiotics and were managed conservatively. Two patients developed partial nipple necrosis. One patient experienced infection and wound dehiscence, mainly at the T-junction and the vertical limb; she went to the operating theater to have re-do surgery and removal of the implant and insertion of tissue expander. Drain stayed in place for an average of 10 days (range, 8–14).

All margins were clear. Three patients had positive lymph nodes and all retro-areolar biopsies were negative. Chemotherapy was offered for four patients. Two patients had radiotherapy and one patient refused to have it. A total of 17 patients were offered endocrine therapy. The average follow-up was 14 months (range, 8–24) (Table 1).

Discussion

The first ones who described breast tumors were the Ancient Egyptians at nearly 3500 BCD; the Edwin Smith Surgical Papyrus and the Ebers Papyrus in two very special papyri documented this in the Origins of Medical Papyri [30,31]. Breast is extremely invaluable to each woman and is considered as the symbol of motherhood and femininity in the past and continues to be in today's modern life. A very fluent and inclusive description of it as both life giving and life destroying was very accurate, as its absence due to mastectomy has a very negative effect on physical, psychological, and sexual life of women. Here, the breast-reconstructive and breast-conserving surgeries are the best solutions to compensate and overcome these problems; this gives the essence for why breast surgeons must have a keen sense of blending science and art [6,32].

Large ptotic breasts present challenges for the surgeons, and their immediate reconstruction after mastectomy is usually difficult where the tissue expansion option also usually has a poor cosmetic result. The use of autologous tissue also may not be a good option owing to either patient choice or clinical unsuitability [33]. There are many biological and synthetic meshes present in the market for this purpose, but they all have the risk of being a foreign body, and also, they are mostly expensive [34]. Here the use of the inferior dermal flap over an implant will give adequate lower pole fullness and give good results in large ptotic breast reconstruction with the benefit of being a one-stage procedure [33–38]. Bertozzi *et al.* [35] documented that many surgeons may need to use ADMs to help in implant coverage to avoid muscle elevation in immediate reconstruction with varying degrees of ptosis. The study by Sisti *et al.* [36] is an example of this in their case report. On the contrary, some other authors like King *et al.* [37] did not document its use. In this study, we also did not use any ADMs or artificial material.

The breast reconstruction can be done in one or two stages. Bertozzi *et al.* [35] discussed in their study the pros and cons of each method, mentioning that most disadvantages of immediate single-stage reconstruction can be minimized to a great extent if a well-vascularized mastectomy skin flap with an at least one cm thickness of subcutaneous layer is used. This also was documented by Clemens and Kronowitz [39] and Agusti *et al.* [40]. In our study, we performed one-stage reconstruction if the length between the lower edge of the areola and IMF was 20 cm or more. This was done in 13 (60%) patients with immediate implant insertion. However, the remaining nine (40%) patients where the length was less than 20 cm, we adopted two-stage reconstruction with putting tissue expander first. In another study [33], the author documented that 15-cm distance between the lower edge of the areola and IMF is acceptable to do one-stage reconstruction. In his study, a single-stage reconstruction was performed in all the 20 prophylactic mastectomies on 10 patients where the distance ranged from 15 to 26 cm, which was very close to our results, which ranged from 18 to 26 cm.The demographic data, BMI, implant size, hospital stay, time till drain removal, and complications were very comparable and similar to most studies [33,35–38].

In this study, we intentionally did not use any artificial material, which in turn decreased the cost, operative time, and the complication rate. Our results and experience with extended dermal sling for implant-based prepectoral breast reconstruction in large ptotic breasts show that it is a simple, reliable, and rapid surgical technique, with a relatively low complication rate in keeping with most authors [33–38].

Conclusions

Extended dermal sling is a safe, reliable, and effective option for immediate prepectoral breast reconstruction after mastectomy for patients who developed early breast cancer in large ptotic breasts. It also avoids muscle elevation and using ADM. Careful selection of the patients who will be suitable for this autologous tissue option will give good esthetic results with minimal complications.

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Conflicts of interest

There are no conflicts of interest.

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