Feasibility of Skin-Reducing Mastectomy and Immediate Reconstruction in Breast Cancer Patients with Large Breast Volume

Original Article

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ABSTRACT

Background: Skin-reducing mastectomy (SRM) enables immediate breast reconstruction using a silicone implant or Lattissimus Dorsi muscle flap (LDF) after mastectomy in large-breasted women with breast cancer. Additionally, it reduces the occurrence of implant extrusion through providing adequate implant coverage by LDF muscle and/or a de-epithelialized dermal flap, with a good inframammary contour.

Aim: The study aims to assess the aesthetic, surgical, and oncological outcome of SRM with immediate reconstruction.

Patients and Methods: A total of 25 patients with large breast size (cup C and D) who are unfit for conservative breast surgery were included in a prospective feasibility study. Nine (36%) patients had Silicon implant reconstruction, while sixteen (64%) patients had LDF reconstruction. Eight patients had SRM and reconstruction with immediate contralateral symmetrization. Seventeen patients underwent total breast reconstruction using LDF or silicone implant after unilateral SRM without contralateral symmetrization.

Results: As regards complications, five patients had a breast wound gap. Patients with a higher pathological stage had a higher adverse event rate. There was no significant difference between the incidence of complications and symmetrization, ptosis, or operative characteristics of the studied cases. 17 patients were selected to undergo immediate reconstruction without contralateral breast symmetrization. There was a significant difference between symmetrization surgery and intraoperative blood loss.

Conclusion: Skin-reducing mastectomy with immediate reconstruction using autologous flap as LDF or Silicon implant is a safe, feasible technique with acceptable surgical, oncological, and aesthetic outcomes. Patient selection is an essential factor in decreasing the rate of complications.

Key Words: Immediate reconstruction, Latissimus dorsi muscle flap, Silicone implant, Skin-reducing mastectomy.

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INTRODUCTION

Although breast-conserving surgery has been the most desired surgical intervention for early breast cancer, some patients are unfit oncologically for a wider local excision and still in need of radical resection in the form of mastectomy. Aiming to decrease the psychological impact in such situations, Skin and nipple sparing mastectomies followed by immediate reconstruction (IBR) using autogenous tissue and/or silicone implants have been traditionally advocated as effective and safe surgical options[1,2] to improve patient satisfaction and body image[3]. Generally, Deep Inferior Epigastric Perforator Flap in highly equipped centers can achieve satisfactory aesthetic in selected patients. Free flap techniques have the risk of serious complications and are contraindicated in certain comorbidities. On the other side, Pedicled flaps such as pedicled TRAM remain a popular option among surgeons in small or medium volume centers[4]. Latissimus Dorsi (LD) muscle flap is a suitable option for autologous total breast reconstruction due to easy harvest and reliable vascularity[5] with a high rate of good aesthetic results and with a lower risk of complications[6].

The introduction of skin-sparing mastectomy (SSM) indicates preoperative planning of mastectomy incisions

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aiming to maximize skin preservation. Moreover, preserving the inframammary fold and the native skin envelope markedly enhanced the cosmetic outcome with minimal need for a contralateral symmetrizing intervention[7]. The first description of SSM as a safe oncological procedure was by Toth and Lappert, Kroll *et al.,*[8,9]. In 2006, Nava and colleagues described "skin-reducing mastectomy" (SRM) overcomes the technical difficulty of SSM in breast cancer patients with large breasts and unfit for breast conservation and is considered as the last ultimate option for better filling of the breast envelope when total reconstruction is needed. SRM is a technical procedure derived from a type IV breast reduction incision pattern that enables immediate subpectoral implant placement or Lattissimus Dorsi muscle flap (LDF) after breast envelop reduction with adequate implant coverage using muscle and a de-epithelialized dermal flap[10].

To the best of our knowledge, a little accumulating evidence researched the technique outcomes and complications. Our recent study assessed a very useful, uncommon oncoplastic technique which is deployed to avoid mastectomy as the last ultimate option for breast patients with large breast and unfit for conservation. The study aimed to assess the aesthetic, surgical, and oncological outcome of skin-reducing mastectomy and breast reconstruction. Aesthetic outcome and patient satisfaction are considered as the primary outcome, while operative time, flap loss, blood loss, hospital stay, wound complications, flap-related complications, donor-site related complications, and oncological outcome were considered as the secondary outcomes.

PATIENTS AND METHODS:

In a single-arm prospective study, of 30 patients, 25 cases with breast cancer in large-breasted women (cup C and D), who are not candidates for conservative breast surgery were included. After institutional review board approval and public registration by the Faculty of Medicine, Mansoura University, a SRM followed by immediate breast reconstruction was planned for the selected patients within a 2-years duration at the Surgical Oncology Department, Oncology Center, Mansoura University.

Inclusion criteria: After multidisciplinary team (MDT) discussion, The selection process included patients with breast cancer with multicentric disease that cannot be excised with adequate safety margins, with diffuse suspicious or malignant microcalcifications, with inability to attain negative safety margins, with contraindications to postoperative radiation therapy, with significant pre-existing lung disease or cardiomyopathy, and females with active connective tissue disorder (SLE or scleroderma).

Exclusion criteria: Patients with ASA score 3 or more, with metastatic breast cancer, with locally advanced breast cancer and mastitis carcinomatosis, with uncontrolled DM or heavy smokers, with previous radiotherapy, and unwilling patients were excluded.

Surgical options were discussed with the selected patients after multidisciplinary team consultation, including the possibility of mastectomy with or without nipple preservation and reconstruction. All available options for reconstructions, including immediate versus delayed reconstruction and the type of reconstruction, were discussed. Written consent was obtained after discussion for medico-legal aspects.

After full radiologic and laboratory investigations, the collected data chart included basic demographics, comorbidities, cup size, and breast ptosis, tumor characteristics as location, size, grade, biological subtype, and nodal status, surgical outcome as type of mastectomy and reconstruction, complication rate and length of hospital stay, oncological outcomes, aesthetic outcome and patient satisfaction. The grade of breast ptosis was assessed by using the Regnault classification[11], according to the relative position of the nipple to the inframammary fold.

Surgical technique

Included patients underwent unilateral mastectomy and immediate breast reconstruction in patients desiring symmetrization using either autologous tissue alone LDF or silicone implant. Of the 25 patients, 17 underwent total breast reconstruction using LDF or silicone implant without contralateral symmetrization surgery. Nine (36%) patients had Silicon implant reconstruction, while 16(64%) patients had LDF reconstruction. Regarding breast symmetrization, eight patients underwent immediate contralateral breast symmetrization, one patient had right breast superomedial pedicled reduction mammoplasty, seven patients had inferior pedicled reduction mammoplasty.

Patient position

Mastectomy was performed in the supine position with both arms abducted 90º. Skin preparation and exposure must include both breasts to check symmetry during surgery. Flap harvest was done after repositioning the patient into the lateral position. The back wound was closed after flap harvest and the patient was positioned again into the supine position for flap inset and mastectomy wound closure.

Mastectomy phase

Different mastectomy techniques were employed according to the clinical situation. Contraindications to nipple sparing included bloody nipple discharge with suspected intraductal extension and direct invasion of the NAC. Frozen section was performed from the retroareolar tissue to exclude NAC infiltration. Care was taken to delay complete de-epithelialization of the skin paddle after frozen section result to use the skin paddle for areola replacement if the retroareolar tissue was infiltrated by the tumor tissue. A full-thickness skin incision was planned in an inverted T manner.

Figure (1) The epidermis was incised at the inframammary fold then de-epithelialization of the area below the NAC and over the inframammary and a 1cm-thick dermal flap is preserved. In some cases, hydro-dissection technique was used where a tumescent fluid (0.9% saline solution containing epinephrine and lidocaine) was injected into the subcutaneous tissue to facilitate mastectomy, decrease intraoperative anesthesia requirements, and decrease bleeding. Mastectomy was then performed with dissection along the subcutaneous tissue plane. After removal of all breast tissue with care to protect the subdermal vasculature, axillary sentinel node biopsy or dissection was performed through the same incision avoiding inadvertent injury to the thoracodorsal vessels. Either LDF or a silicone implant was used according to the patient's desire. In case of LDF, the skin envelope dermal flap of lower breast skin could be omitted, while in case of implant-based reconstruction, a synthetic Vicryl mesh was used and sutured to the upper edge of the dermal flap to create a prepectoral pocket. The contralateral breast was symmetrized by inverted T reduction mammoplasty, either synchronous or delayed according to the patient's desire.

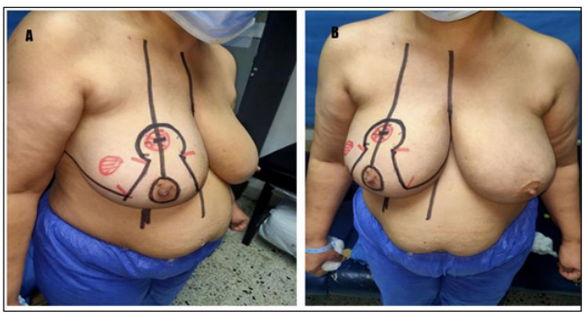

Figure 1: Preoperative drawing of SRM (A): Design of right skin-reducing mastectomy, lateral view; (B): Design of right skin-reducing mastectomy, anterior view.

Reconstruction phase

LD flap reconstruction markings were performed preoperatively planned (Figure 2). The patient was placed in the lateral decubitus position. Dissection was carried out leaving the deep fat attached to the back skin flaps. LD muscle was separated from the serratus anterior muscle, from the paraspinous muscle fascia, from the trapezius muscle fibers, and from the teres major muscle fibers. With cautious preservation of the thoracodorsal pedicle, LD tendon was divided near the humerus. A subcutaneous tunnel is created and the myocutaneous or myofascial LDF is then transferred to the mastectomy defect and fixed to the pectoralis major muscle. Hemostasis is secured and drains were inserted. Back wound was closed using interrupted Vicryl 2–0 sutures in the deep dermis and Prolene 3/0 subcuticular sutures. The flap was then flipped or rotated into the breast cavity. After patient repositioning into supine position, LDF was sutured into the pectoralis major muscle and the mastectomy wound was closed preferably with Monocryl 3/0 subcuticular sutures.

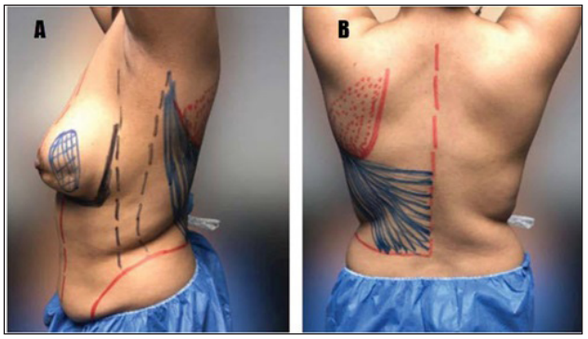

Figure 2: A 37-year-old females patient with breast cancer with preoperative planning marks for LDF-based reconstruction; (a) Lateral view, (b) Back view.

Follow-up

Postoperatively, patients were prescribed analgesics only. Antibiotics were not given routinely. Prophylactic anticoagulants were prescribed in some patients for 24–48h due to the presence of thrombo-embolic risk factors. Drains were used till the output was less than 50 cc. Patients were advised to start shoulder exercise in the first postoperative day if LD flap reconstruction was done. Patients were also advised to wear a supportive sporting bra immediately after recovery onwards for 1 month at least to support the breast and help remodeling of the breast mound.

Outcomes

The patients were photographed before surgery and during postoperative follow-up at 2, 6, and 12 months to evaluate the aesthetic and cosmetic outcomes. Frontal and lateral side views were recorded and assessed and the mean scores for grade of symmetry and Surgical complications were determined (Figure 3).

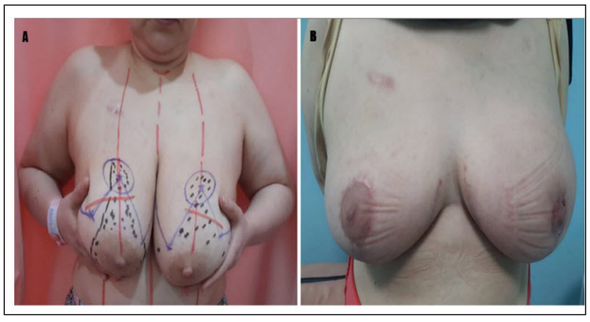

Figure 3: Postoperative outcome of skin reducing mastectomy and contralateral symmetrization; (A): Preoperative bilateral drawing of the breasts; (B): Postoperative outcome.

The subjective cosmetic result was evaluated by asking the patients to provide their feedback using the BREAST-Q questionnaire with Arabic translation (Table 1) which is one of the most commonly used Patient-Reported Outcome Measures at 3–12 months after the operation. The postoperative scales included satisfaction with breast shape, psychosocial satisfaction, sexual satisfaction, and satisfaction with the surgeon.

بخصوص منطقه الثدي لديك: خلال الأسبوع الماضي- كم من المرات شعرتي بالاتي

Table 1: Arabic translation of the Breast-Q questionnaire for assessment of patient satisfaction: Psychosocial well-being module (Arabic translation):

	ولا مره	مرات قليله جدا	بعض المرات	مرات كثيره	كل الوقت
واثقه في المواقف الاجتماعيه؟	١	٢	٣	٤	٥
قادره من الناحيه العاطفيه (النفسيه) على القيام بالاعمال التي ترغبين فيها؟	١	٢	٣	٤	٥
مرتاحه من الناحيه العاطفيه (النفسيه)؟	١	٢	٣	٤	٥
مساويه للنساء الاخريات؟	١	٢	٣	٤	٥
واثقه من نفسك؟	١	٢	٣	٤	٥
بانك أنتي في ملابسك	١	٢	٣	٤	٥
راضيه عن جسدك؟	١	٢	٣	٤	٥
عاديه؟	١	٢	٣	٤	٥
مثل النساء الاخريات؟	١	٢	٣	٤	٥
جذابه؟	١	٢	٣	٤	٥

Ethical consideration

After IRB approval and the approval of the healthcare facilities managers, the study was carried out. Informed verbal consent was obtained from all participants. Confidentiality and personal privacy were respected.

Statistical analysis

Data was extracted from the prerecorded electronic databases in the oncology center and appropriate local hospital approvals. Data was analyzed using the statistical software IBM SPSS Sta tistics 22 TM. Descriptive statistics for each variable included counts and percentages of categorical data whilst mean, median, standard deviation and range were ascertained for the continuous data. Statistical tests used were Independent *T*-test for parametric data, Mann–Whitney *U* test for nonparametric data and χ^2/Fisher's exact test for categorical data.

RESULTS:

Demographic data and tumor characteristics are shown in Table (2). Type of reconstruction, intraoperative blood loss and operative time among the studied cases and complications are shown in Table (3). There was no statistical difference between incidence of complications and patients' demographics or preoperative tumor data. There was no significant statistical difference between incidence of complications and postoperative tumor data except for stage of the tumor (P= 0.014). Patients with a higher stage than stage-IA had higher significant rate of complications. There was no significant difference between incidence of complications and symmetrization, ptosis or operative characteristics of the studied cases. There was no significant difference between Symmetrization and patients' demographics. There was no significant difference between symmetrization and oncologic data. There was a significant difference (P= 0.001) between symmetrization and blood loss intraoperative, with average 500±46.29 for symmetrization and 355.88±42.87 for no symmetrization. Postoperative patient satisfaction was retrieved from 25 patients. Satisfaction and well-being scores are shown in Table (4).

Table 2: Demographic data and tumor characteristics, type of reconstruction, intraoperative blood loss and operative time among the studied cases are shown in (Table 2):

	***N*(%)**
Medical history	
Free	24(96.0)
Hypertension	1(4.0)
Cup size	
C	19(76.0)
D	6(24.0)
Ptosis	
Grade II	11(44.0)
Grade III	14(56.0)

	***N*(%)**
Age/years	
Mean±SD (min–max)	40.60±6.16(31–55)
BMI (kg/m^2)	
Mean±SD (min–max)	32.92±2.83(28–38)
Indications	
Multicentric	25(100)
molecular type	
Luminal A	7(28.0)
Luminal B	15(60.0)
Triple negative	1(4.0)
HER2 enriched	2(8.0)
Chemotherapy status	
Pre	10(40.0)
Post	15(60.0)
Pathologic types	
Mixed IDC/ILC	1 (4.0)
GII IDC	13 (52.0)
GIII IDC	3(12.0)
IDC+DCIS	8(32.0)
Stage	
Stage-IA	8(32.0)
Stage IIA	7(28.0)
Stage IIIA	9(36.0)
Stage IIIC	1(4.0)
Tumor size	Median (min–max)
Length	4(2–7)
Width	3(1.4–6.8)

Table 3: Surgical procedure and outcome:

	***n*= 25(%)**
Types of reconstruction	
Silicon	9(36.0)
LDF	16(64.0)
Axillary surgery	
SLNB	7(28)
ALND	18(72)
Blood loss intraoperative	
Mean±SD (min–max)	402±80.98(300–550)
Operative time(h)	
Mean±SD (min–max)	3.94±0.31(3.5–4.5)
Symmetrization	
Asymmetry (Patient refusal)	17(68.0)
Superomedial pedicled reduction	1(4.0)
Inferior pedicled reduction	7(28.0)
Complications	
No	11(44.0)
Wound infection	2(8.0)
Breast wound gap	5(20.0)
Breast wound ischemia	1(4.0)

	n= 25(%)
Back seroma	4(16.0)
Partial areola necrosis	1(4.0)
Areola congestion and Stitches removal	1(4.0)

Table 4: Breast-Q questionnaire score: Score from 0 (worst) to 100 (best):

1	63	52	70
2	55	62	74
3	68	74	76
4	58	62	64
5	72	54	78
6	60	62	56
7	78	65	72
8	72	55	74
9	64	72	80
10	74	74	76
11	82	76	90
12	85	68	70
13	76	80	82
14	78	84	84
15	90	56	94
16	88	74	90
17	86	82	88
18	94	60	90
19	66	68	70
20	84	66	80
21	92	84	84
22	76	64	78
23	78	82	80
24	80	74	84
25	90	82	84
Average	76.36	69.28	78.72

DISCUSSION

Preserving normal body image in the treatment process of breast cancer has a significant positive psychological impact[12]. Radical mastectomy has been replaced by wider local excision techniques or mastectomy followed by immediate or delayed replacement[7]. Postmastectomy reconstruction rates have been progressed significantly in the last 20 years. Consequently, the techniques utilized for reconstruction has been substantially improved[13]. Skin preservation during mastectomy has been proved to be an oncologically safe surgical procedure[14]. Our study aimed to evaluate of feasibility and the surgical and aesthetic outcomes of SRM with immediate reconstruction. The method of reconstruction varied between autologous LDF and silicone implant. Nine (36%) patients had Silicon implant reconstruction, while 16(64%) patients had LDF reconstruction. The mean intraoperative blood loss was 402ml, while the mean operative time was 3.94h. In our study, regarding breast symmetrization, 17 patients refused immediate contralateral breast symmetrization, one patient had right breast superomedial pedicled reduction mammoplasty, four patients had right inferior pedicled reduction mammoplasty and three patients had left inferior pedicled reduction mammoplasty. Regarding postoperative complications, 14 patients had no complications, two patients had wound infection, five patients had breast wound gap, one patient had wound edge ischemia, one patient had Seroma, one patient had areola necrosis, and one patient had areola congestion which was managed by removal of peri-areolar stitches to relieve the congestion.

There was no significant difference between incidence of complications and age and BMI of the studied cases. Similarly, Escandón et al. stated in their study that the risk of complications was not increased by high BMI[15]. On the contrary, other studyies reported a higher risk of postoperative complications is strictly related to mastectomy specimen weight, associated axillary dissection[16], BMI greater than 35[17], diabetes, a thin mastectomy flap[18], the use of a permanent implant rather than an expander, and an implant of more than 468g[17].

The Stage of the tumor (*P*= 0.014) was related to incidence of complications in our study, the stage more than IA had higher rate of complications. There was no significant difference between incidence of complications and medical history or cup size of the breast. De vita et al. Concluded that flap thickness was the only surgery related factor that increases the risk of complication occurrence after SRM[18].

Immediate and delayed contralateral symmetrization after SRM is still a debatable point and depends on the surgeon preference and experience. Delayed symmetrization may help potentially to decrease the morbidities by reducing the operating times and blood loss.

In addition, fat necrosis or partial flap loss may impose a change in the plan for the reconstructed and contralateral breasts. On the other hand, immediate symmetrization may increase the patient immediate psychological self-satisfaction and furthermore reduces the number of postoperative expansions needed to the reach the optimal volume with the possibility of avoiding second-stage operation[19].

Our study stated that there was no difference between the incidence of complications and symmetrization, ptosis or operative characteristics of the studied cases. Moreover, there was no significant difference between Symmetrization and age or BMI of the studied cases, indications of surgery, neoadjuvant status or type of reconstruction among the studied cases, clinic-pathologic findings, medical history or cup size among the studied cases.

Casella *et al*., assessed SRM using a prepectoral covered tissue expander placement followed by a second-stage substitution with a silicon-based implant and found that complications requiring a reoperation occurred in seven cases[19]. In our study, in the immediate symmetrization group, there were two cases of wound dehiscence (4.8%), one on the mastectomy side and one on the symmetrization side, as well as one seroma (2.4%) and one case of skin-nipple necrosis (2.4%), both occurrences were on the mastectomy side. In the delayed symmetrization group, we reported a postoperative infection (2.4%), one seroma (2.4%), and one case of skin-nipple necrosis (2.4%). The tissue expander was removed postoperatively in three cases because of implant exposure; one case in the immediate symmetrization group and two cases in the delayed group. In our study, there was a significant difference (P=0.001) as regards the blood loss between symmetrization and nonsymmetrization cases (500±46.29 ml and 355.88±42.87, respectively). Giordano *et al*., recommended immediate symmetrization as a reasonable and safe option in autologous LDF after SRM in their study[20].

Our study stated postoperative patient satisfaction from 8 patients in the autologous-only group by postoperative Breast-Q questionnaire scores score from 0 (worst) to 100 (best), as an average (65.5, 60.3, 70.5, 92.5) for psychological well-being, sexual well-being, satisfaction with breast, satisfaction with surgeon, respectively.

Casella *et al*., found that a better patient self-satisfaction rate was achieved by contralateral immediate symmetrization through reducing negative body image with improved cosmetical outcome[19]. De vita et al., Observed that the implant volume up to 475 increased the satisfaction score[18].

CONCLUSION

SRM and immediate reconstruction can be achieved using autologous breast reconstruction as LDF or synthetic implants as Silicon implant. Patient selection is an important factor in decreasing the rate of complications. Both LDF and Silicon implant offer a good aesthetic outcome, but LDF is more available in our Center with less complications rate, while silicone implants are less frequently done mostly due to financial causes and patient's desire with relatively higher complications rate than LDF. Larger prospective data is needed to further explore those findings.

CONFLICT OF INTEREST

There are no conflicts of interest.

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