

## Skin Sparing Mastectomy with Immediate Reconstruction

OMAYA NASSAR, M.D.

*The Department of Surgical Oncology, National Cancer Institute, Cairo University.*

### ABSTRACT

**Purpose:** Skin-sparing mastectomy with immediate reconstruction is a recent major advance in breast reconstruction after radical glandular mastectomy. This study intended to assess its preliminary results in our patients with regards to oncologic safety and aesthetic quality.

**Patients and methods:** Twenty-eight patients with, early-stage invasive breast cancer, diffuse ductal in-situ carcinoma and large phylloids tumors were operated upon by the periareolar incision approach, followed by immediate reconstruction using pedicled TRAM in 17 patients and latissimus dorsi myocutaneous flap for the other 11. Meticulous pathologic examinations for the mastectomy margins and separate native skin biopsies were done. Aesthetic quality of the procedure was judged by the developments of complications and by patient's satisfaction.

**Results:** Surgical margins were free in all except 2 cases where the superficial margins were involved and an average 20 months of observation did not show local or systemic relapses. The results of the skin-sparing breast reconstruction are better than other post mastectomy reconstructive techniques for breast final shape, colour, symmetry and the incision scar appearance. Reconstruction was satisfactory for the patients in 67.8%, fair for 17.8% and poor in 14%. Periareolar native skin necrosis appeared in 6 cases but skin healing was satisfactory in all cases.

**Conclusions:** Skin sparing mastectomy is an oncologically safe technique. It is an excellent alternative to total mastectomy and reconstruction in cases not suitable for conservative wide local mastectomy. It offers good shape and symmetry and saves the patients contra lateral breast aesthetic maneuvers and adjuvant irradiation after wide local conservative mastectomy.

**Key Words:** Breast reconstruction - Skin sparing mastectomy.

### INTRODUCTION

Breast conservation has evolved from an accepted to a preferred method for the treatment of early-stage breast cancer. The safety of these procedures as regards survival and recurrence has been confirmed by the results of up to 10

years of follow up. However, there are many cases that need not less than total mastectomy to control their lesions because of multiplicity of the lesions, associated extensive ductal in-situ elements, discrepancy between the size of the lesion in comparison to the breast size and other contraindications to conservative mastectomy [8,13].

Immediate breast reconstruction has become a common practice with proven medical and psychosocial benefits for patients and increasing attention has been directed at the components of aesthetic satisfaction that are consistent with oncologic safety.

Perhaps no single element of a breast reconstruction technique exceeds the importance of preserving the breast skin envelope, shaping the breast in its entirety, enhancing the anatomical contour of the inframammary crease, and avoiding skin color mismatching [10,12,16].

The current era of breast-preserving strategies acknowledges that multiple factors other than the skin resection borders predict the probability of local relapse after mastectomy, including the extent of axillary nodal involvement, site and size of the primary tumor, histologic grade, patient age, hormonal receptors status and skin changes adjacent to the primary tumor. In addition, local recurrence is viewed as a manifestation of systemic disease [11].

The term skin-sparing mastectomy was used first by Toth and Lappert in 1991 [18]. They described preoperative planning of mastectomy incisions to maximize skin preservation and to facilitate breast reconstruction.

Skin-sparing mastectomy have been described by a variety of designs incorporating

either a periareolar, or other incisions around the areola as linear extensions or a key-hole pattern to improve access to the anatomical borders of the breast glandular tissues. Incision type depends on, size and configuration of the breast, tumor size and location, or biopsy site or other scar [3]. Separate incision for axillary node dissection is added if needed. These approaches are combined with immediate reconstruction to fill the skin envelope using implants or tissue expanders in addition to autologous tissue flaps as latissimus dorsi (LD) or rectus abdominis (TRAM) myocutaneous flaps [2,6,7,14,17].

There is agreement among surgeons that the nipple-areola complex must be excised as some studies have identified breast ductal epithelium identical in appearance to the extra lobular ducts of breast parenchyma in it. Also the proven involvement of the nipple and areola in carcinoma of the breast has made it desirable to remove breast ductal epithelium as completely as possible [2,3,16].

The purpose of this study was to assess the skin sparing mastectomy technique as regards oncologic appropriateness by histologic assessment of skin edges and margins of mastectomy specimens. In addition, to evaluate the aesthetic results with reconstruction using TRAM or LD myocutaneous flaps.

## PATIENTS AND METHODS

From July 1998 till May 2001 twenty-eight patients with a mean age of 43 years (21-56) were treated by skin-sparing mastectomy. Patients were selected according to certain criteria (Table 1).

Most of the patients had infiltrating carcinoma (20/28) and most had small size primary tumors 2-3 cm (20/28) (Table 2).

Choice of the flap type was random in the first 18 cases, where either TRAM or LD flaps were alternated, however for the following 10 patients selection took in consideration, breast size and prosthesis availability, so 17 patients were reconstructed by TRAM and 11 by LD of whom 6 with adding silicone gel prosthesis and 5 cases without.

### *Preoperative assessment:*

Metastatic work-up investigations were car-

ried out as usual, mammographic and sonographic assessment of the lesions in all patients and pathologic diagnoses were done by fine needle for all except five cases who had open biopsy.

Patients positioning was designed to fit for mastectomy and flap harvesting at the same time for cases needing LD flaps.

### *Incision design:*

Carlson and his colleagues in 1997 classified skin-sparing mastectomy into 4 types according to the incision design [3]:

- Type I: only nipple and areola removed.
- Type II: nipple-areola, skin overlying superficial tumors and previous biopsy incision removed in continuity with nipple-areola.
- Type III: nipple-areola removed, skin overlying superficial tumors and previous biopsy incision removed without intervening skin.
- Type IV: nipple-areola removed with an inverted or reduction pattern skin incision.

The circum-areolar incision was designed at the edge, just outside any preexisting biopsy scar and 5mm away from the areola. Small areola (less than 3.5 cm) (5 cases) needed a medial and/or lateral linear incision of 5 to 10 cm to facilitate mastectomy. Separate skin biopsies, four in number and 3-4 mm in thickness are taken from the periareolar skin and examined for tumor infiltration in all cases.

### *Mastectomy and axillary dissection:*

Skin flap elevation should be meticulous in the fatty layer between the dermis and the glandular tissues so as not to jeopardize skin vascularity. It is demanding and time consuming and needs careful retraction to dissect it to the required limits in all directions (Fig.1). Dissection from the pectoralis muscle goes as in the usual mastectomy with careful skin retraction.

Axillary dissection was performed through another separate transverse incision 10-12 cm in between the axillary folds. It was used in 20 patients only, where as 4 patients had non-invasive lesions and the other 4 had phylloids tumors. Axillary dissection is not demanding, however it is imperative to preserve the thoracodorsal vessels.

The two separate incisions facilitate delivery of the whole specimen through the periareolar one as one piece (Figs. 1 & 2).

*Reconstruction:*

Pedicled TRAM and latissimus dorsi (LD) flaps were prepared in the usual ways with few exceptions (Figs. 3 & 4). The skin of the flap was partially deepithelialized during the course of dissection to match the nipple-areola complex skin defect. It is not possible in most patients to predict precisely where the skin circle matching with the defect should be located on the flap. Therefore, a larger oval area of skin is left on the portion of the flap most likely to correspond to the final location of the areola.

For the LD flap this large oval area is designed over the muscle before elevation nearly midway between the inferior angle of the scapula and the iliac crest so as to avoid excessive skin loss in the donor area.

The pedicled flap was carefully inserted into the breast skin envelope via a tunnel from the donor area to it and its muscle was sutured securely to the pectoralis muscle and chest wall to maintain optimal configuration of the pedicle. Inserting was performed with the patient sitting upright to allow comparing symmetry with the normal side.

The inframammary crease is often detached during the course of mastectomy and pedicled TRAM flap transfer. It was reformed by direct suturing to the chest wall taking care to have the same distance from the new areola as the normal side. This step was also necessary so as to maintain areolar position symmetry and to avoid distortion of the shape of the lower pole of the reconstructed breast due to insufficient skin length.

The flap was sutured to the pectoralis major muscle superiorly and laterally and the remaining flap skin was tailored as the final location of the new areola, however its size was made as the contra lateral normal side not as the skin defect provided no excessive native skin was removed (type I) otherwise larger flap's skin was kept (type II).

Pedicled LD flap was sutured to the pectoralis muscle as above, but around the silicon implant all around (superiorly, medially, inferiorly and laterally) to avoid prosthesis migration and the new areolar skin was tailored according to the size and position of the areolar skin defect.

In five cases, the original breast sizes were

small and on the contrary their back subcutaneous fat were bulky enough to fulfill the skin envelope without adding silicone gel prostheses (Fig. 5). There were depressions in the donor site skin in all of them; however it could be accepted.

The native skin was sutured to the oval flap's skin by interrupted stitches so as to allow for drainage for serous fluids collecting in between the flap and the skin which is little with good drainage. Suction drainage was used for reconstructed breast, axilla and the flap's donor area and that of the breast was removed 4-5 days postoperative.

Nipple and areola reconstruction was not attempted in the same sitting in all cases. Most of patients were satisfied with tattooing of the circular skin flap later after complete healing.

The other breast did not need any reduction procedures because the reconstructed side was large enough to keep the bilateral symmetry and moreover all patients with asymmetry were satisfied with the results and refused contra lateral breast reduction surgery.

*Follow up:*

The reconstructed side was checked for local recurrence and other complications regularly by examination, breast ultrasound and in cases without prosthesis by mammography.

**RESULTS***Oncologic consideration:*

The sizes of the mastectomy and axillary contents were equal to the ordinary modified mastectomy specimens (Fig. 1) however the operative time was longer with a mean of 160 min (115-227). Considering the time for flap harvesting and reconstruction in addition, the whole operation had on the average 332 min (280-435).

Surgical free margins were adequate in all cases and free of malignant cells. Superficial margins especially above the tumor were carefully sliced and were found clear except in two specimens (2/28) where the skin of the biopsy site were excised with the mastectomy specimens.

Separate skin biopsies (average 4) taken from the periareolar skin were free of infiltration in all patients. Nipple-areola removed did not show tumor infiltration in any case.

Associated extensive in-situ ductal carcinoma (more than 25%) was discovered in 5/20 cases of infiltrating lesions, however the specimens' margins were free of it.

Axillary lymph node metastases ranging from (1-3 nodes) were found in 4/20 and postoperative adjuvant chemotherapy and irradiation were given to these cases with the same courses and regimens as the other breast cancer patients.

Follow-up periods were not long enough to assess recurrence and survival. The cut off date was February 2002, so the range was 9-43 months with a median of 20±9 months. All cases were regularly and carefully followed up bi-monthly and there were no local or systemic relapse detected till the time of reporting.

#### *Reconstruction consideration:*

Type I skin-sparing incision was adopted in 20 cases whereas 5 were approached by type II and 3 with type III. Type IV was not needed in any case.

Aesthetic quality of this technique was assessed according to the Hidalgo's criteria [9] (Table 3). The aesthetic result of the reconstructive procedure was considered excellent if none of these problems appeared, good if only one issue was evident, fair if two were present and poor if three or more criteria were noticed. According to these criteria only Type I skin-sparing mastectomy without any other adverse criteria was considered of excellent results (Figs. 5 & 6).

Considering Hidalgo's grading 6 patients were considered of good appearance (Fig. 7) because of asymmetry of the areolar position in 4, retained distant scar in two (type III). Those with fair results were due to asymmetry of both the areola sizes and incomplete skin-sparing design (much of the native breast skin was removed with the mastectomy) and these cases were 3 with large phylloid tumors and two with type 2 skin sparing design (the periareolar incision was extended to include biopsy scars) (Figs. 8 & 9).

The poor results according to patients' satisfaction were due to periareolar native skin necrosis in association with partial TRAM flap necrosis in two cases, who were managed by debridement and prolonged hospital care (29 and 37 days) till complete epithelialization. The

other two patients developed necrosis and infection in the new areolar skin with viable underlying flap in one patient and the other had periareolar native skin necrosis followed 6 months later with prosthesis implant migration medially away from the redundant reconstructed breast and this implant was removed. During this second surgery careful palpation for local recurrence detection was performed and the fibrous capsule around the implant was assessed histologically.

Periareolar native skin necrosis (partial or full thickness necrosis) developed in 6 cases (21.4%), of whom four had originally large sized breasts and one case was heavy cigarette smoker.

Donor sites healing were uneventful in all cases reconstructed with TRAM with no infection, seroma or hernia. Hernia formation was not experienced by any patient because prolene mesh implants were used for all of them.

LD donor areas showed prolonged drainage (14 days) in 7 cases due to excessive seroma formation and minor wound infection in 3 cases. One case developed severe infection that needed open drainage and prolonged hospitalization.

Table (1): Criteria for patient inclusion.

Early stage (T1-2, N0-1)
Suitable age (preferably less than 50 years)
Healthy breast skin
Minimal disfiguring scars in the breast
Patient agreement and compliance

Table (2): Pathology and size of the tumors (28 patients).

Histopathology	No. of cases (%)	Size of the lesion	No. of cases (%)
Infiltrating duct carcinoma	16 (57.1)	2-3 cm	20 (71.4)
Infiltrating lobular carcinoma	4 (14.3)	3-4 cm	4 (14.3)
Phylloids tumors	4 (14.3)	> 4 cm (phylloids tumors)	4 (14.3)
Ductal in-situ carcinoma	4 (14.3)		

Table (3): Hidalgo's factors that compromise aesthetics.

Incomplete skin-sparing design.
Inframammary crease asymmetry.
Areolar position asymmetry.
Inaccuracy of tissue volume replacement.
Fat necrosis of flap.
Periareolar skin slough.
Retained distant biopsy scar.
Prosthesis complications.

Table (4): Aesthetic results in 28 patients of this study.

Following Hidalgo's criteria		Patients' satisfaction	
Excellent	8 (28.5%)	Excellent	19 (67.8%)
Good	6 (21%)	Good	5 (17.8%)
Fair	5 (17.8%)	Poor	4 (14.2%)
Poor	9 (32%)		

Table (5): Aesthetic results in relation to flap type.

	TRAM reconstruction	LD reconstruction
Excellent	2/17	6/11
Good	4/17	2/11
Fair	5/17	-
Poor	6/17	3/11

Table (6): Complications noticed in 28 cases.

Problem	Number %	TRAM reconstruction	LD reconstruction
Periareolar skin necrosis	6 (21.4)	4/17	2/11
Partial flap necrosis	2 (7)	2/17	None
Donor site infection	4 (14)	None	4/11
Donor site seroma	7 (25)	None	7/11
Prosthesis complication (migration)	1/6	None	1/6



Fig. (1): The mastectomy specimen together with the axillary specimen is delivered in one piece through the periareolar incision. Notice the separate skin island taken because tumor was near skin in this case (type III). The mastectomy specimen is equal in size to that of modified mastectomy.



Fig. (2): Skin envelope after removal of the specimen showing pectoralis major muscle in the bottom which is the deep margin of dissection. TRAM or LD flap is inserted in the skin envelope and the skin is deepithelialized to match the areolar size of the other breast.



Fig. (3): TRAM flap preparation and elevation of the abdominal skin and fat to form a tunnel to the chest. Note that the skin of the flap is not deepithelialized in this stage to allow for correct positioning of areolar reconstruction after inset of the flap.

Fig. (4): Preparation of the LD flap with an oval area slightly larger than the areolar defect. Flap is harvested with whole LD muscle and the subcutaneous fat overlying. LD flap is inserted in the skin envelope and fixed to the underlying chest wall before suturing to the native skin (no prosthesis was used in this case).





Fig. (5): (Right) 37 years old lady with right invasive breast cancer two months after type I skin sparing mastectomy using LD flap without prosthesis. Symmetry is evident for the nipple site and size in addition to the inframammary crease and this obviated the need for contra lateral procedures. (Left) Same lady in lateral view showing the inframammary crease, the axillary scar and the LD donor site scar. The depression in the donor skin is acceptable because it is hidden.



Fig. (6): 41 years old lady with right breast infiltrating duct carcinoma and reconstructed with TRAM flap, 12 days post operative with accepted symmetry for the areolar size and position in addition to total breast symmetry with the other side even with raised arms. This patient had prolonged drainage from her axilla and chest wall.

Fig. (7): 21 years old lady with invasive left breast cancer 14 days post operative and LD flap reconstruction with prosthesis (silicone gel 300 ml). There is asymmetry of the areolar size but the inframammary crease is preserved. She had type II skin-sparing because of previous biopsy scar near the areola.



Fig. (8): 49 years old lady with right breast cancer treated with type II skin sparing incision and reconstructed with TRAM flap. There is asymmetry of the areolar size and breast contour which improved by time.

Fig. (9): 56 years old lady with 3 cm infiltrating duct lesion in the left breast, 14 days post type III operation and LD reconstruction without prosthesis. Inframammary crease is preserved but there is asymmetry of the breast contour and areolar size together with the visible scar (same case of Fig. 1).

## DISCUSSION

All forms of mastectomy, whether radical, modified radical, or skin sparing, leave residual breast tissue in the skin flaps and the inframammary fold. The breast is supported by Cooper's ligaments, which are peripheral projections of breast tissue in fibrous processes that fuse with the superficial layer of the superficial fascia. These projections are fixed intimately with the skin and to excise the whole breast, a large amount of skin must be sacrificed or the dissection must be kept as close to the skin to risk skin slough [2,3]. Barton et al. [1] compared the residual breast tissue after total glandular mastectomy with that after modified radical mastectomy by performing a biopsy on various sites at the time of reconstruction. They found residual breast tissue in 22% of the patients who underwent total glandular mastectomy and in 21% of the patients who underwent modified radical mastectomy.

Preservation of the skin envelop using the periareolar approach enhances the aesthetic quality of breast reconstruction regardless of the specific technique of flap used because aesthetic results of reconstruction after classical mastectomy are often compromised by, prominent scars, mismatching skin flap color with the surrounding skin, difficulty in reforming the inframammary crease and asymmetry in comparison to the other side. In addition, the periareolar incisions are more inconspicuous and the amount of flap required for reconstruction is reduced [4,5,15].

This study supports the improved aesthetic results, where most of the patients were satisfied with their reconstructed breasts, good sensation and mobility. Even those who developed periareolar skin necrosis had rapid healing because of the underlying vascular flap and the end results were acceptable to all of them.

Skin sparing mastectomy through circumareolar incision or other types in large massive sized breasts is not recommended because of the high liability to complicate by skin necrosis and sepsis in contrast to small or normal sized breasts. Out of six patients with this complication, four had large sized breasts. Carlson and his co-workers [3] in a series of 327 cases had native skin necrosis in 35 (10.7%), whereas Slavin et al. [16] reported 21.6% partial or full-thickness necrosis of the native skin in their series of 51

patients. The difference in the frequency of this type of complication is apparently due to the building up experience in the larger series.

TRAM flap (17 cases) offered a suitable volume that matched the original breast volume without the need of any prostheses; however partial flap necrosis developed in two cases (12%). The reported flap necrosis in other larger size studies ranged between 4.6-10% when using pedicled flaps that decreased with free flaps [3,7,9,15,16].

On the contrary latissimus dorsi flaps did not show flap necrosis and donor site complications were easily controlled [5]. In 5 cases with small sized breasts and bulky subcutaneous fat over the muscle, LD could be large enough to fill the skin envelope alone without prosthesis as seen in Figs. (4, 5 & 9). The use of LD alone without prosthesis in our patients with unique distribution of large subcutaneous fat and small ptosed breast is interesting in spite of its controversy with other studies. The large volume of the flap can be explained by the large subcutaneous fat thickness in these obese patients in addition to the wide flap area where the whole LD muscle is removed till its iliac crest attachment. The aesthetic results of this reconstruction were excellent in two cases (Fig. 5) and were satisfactory in the other 3 cases in spite of developing periareolar necrosis in one of them. Donor site showed prolonged seroma formation as the only complication in all of them. Further larger series with longer observation period is needed to assess this finding more elaborately.

Skin sparing mastectomy through circumareolar incision is not to be confused with subcutaneous mastectomy because the amount of tissue to be resected is as that of the classic modified radical mastectomy especially if we add a separate incision for the axillary clearance [16].

This technique depending on the histopathologic study of the specimens' clear margins and the available follow-up can be considered oncologically safe. Rivadeneria and his colleagues [15] in their retrospective study of 198 cases, with a mean follow-up of 49 months, did not find statistical difference in local recurrence between cases treated by skin sparing (5.6%) and non-skin sparing mastectomy (3.9%). Other published results support the safety of this pro-

cedure and it can be a good alternative to mastectomy in early breast cancer not suitable for conservative resection [3,4,9,16]. Postoperative radiation treatment was indicated for four cases only because of their nodal affection. All 20 patients would have been subjected to radical radiotherapy if they were treated by conservative mastectomy.

Patients with phylloids tumors in spite of their large lesions could be treated with total glandular mastectomies to prevent recurrence without the mutilation of the classical mastectomy. Similarly patients with diffuse DCIS could have good alternative to mastectomy with or without irradiation more importantly for young cases [16].

Further study is needed to assess the long-term follow-up of these presented cases as regards the risk of local recurrence and the final breast appearance, particularly for postmenopausal women whose tissues normally involute. It is also needed to assess if skin sparing mastectomy can be used for T3 breast cancer cases after downsizing by neo-adjuvant chemotherapy to control their lesions, particularly that this technique entails whole breast glandular tissue removal as the modified mastectomy version.

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