

Aesthetic Refinement in Breast Reconstruction: Complete Skin-Sparing Mastectomy with Autogenous Tissue Transfer

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Aesthetic results in breast reconstruction are often compromised either by prominent scars or by the presence of an island of skin that differs in color and texture from the native breast skin. Complete skin-sparing mastectomy is a technique by which breast scars can be largely eliminated and the need for a visible skin island avoided. A circumareolar incision is used for mastectomy with a separate axillary incision if needed. Autogenous tissue is used to fill the skin envelope, and a disk of skin temporarily replaces the areola. Twenty-eight patients treated by this method were reviewed retrospectively. Prerequisites included a favorable biopsy scar location and a suitable tissue donor site. The mean patient age was 42.5 years, and the majority were reconstructed with TRAM flaps (92 percent). There was no evidence of increased morbidity or any instance of local recurrence during a follow-up period, which averaged 25.7 months. Aesthetic results were judged excellent in 12 patients, good in 11 patients, and fair in 5 patients. Insufficient tissue volume, shape asymmetry, and areolar position asymmetry were the most common factors that detracted from the quality of the results. Advantages of this method, besides the prospect of an ideal aesthetic result, include easier flap inseting and simplified subsequent revision procedures. Disadvantages include the requirement of a skilled ablative surgeon and incompatibility with conventional expander/implant methods of reconstruction. (*Plast. Reconstr. Surg.* 102: 63, 1998.)

Autogenous tissue breast reconstruction has advantages that include more natural shape, normal consistency, and less need to alter the contralateral breast. These reconstructions are permanent and age well in comparison with breast implant methods. However, one consistent disadvantage from an aesthetic point of view is the characteristic patch-like appearance of the breast due to replacement of portions of the breast skin with donor site skin. The color

and texture discrepancy is usually quite noticeable. Although reduced skin resection has been advocated more recently,¹ any portion of the donor site skin left visible on the breast detracts from its appearance.

Complete skin-sparing mastectomy is an approach whereby mastectomy is performed entirely through a circumareolar incision no larger than the original areolar diameter.² A separate axillary incision is made if it is necessary to perform either lymph node dissection, microvascular anastomoses, or both. The best results with this technique show no stigmata of surgery, because there are no visible scars on the breast after nipple reconstruction. This retrospective review examines recent experience with this technique to determine its indications, safety, advantages, and limitations.

PATIENTS AND METHODS

Twenty-eight patients ranging in age from 32 to 53 years (mean, 42.5 years) underwent complete skin-sparing mastectomy with immediate autogenous tissue reconstruction between June of 1994 and June of 1997. Prerequisites for this procedure included a favorable biopsy scar location (either periareolar or far enough away from the areolar edge to avoid a narrow intervening skin bridge), a favorable areolar diameter (to provide adequate exposure for dissection), and a suitable tissue donor site (Table I). Other requirements included a skilled general surgery colleague and patient comfort with a microsurgical approach (when necessary). Donor sites for reconstruction in-

TABLE I
Procedure Requirements

Immediate reconstruction candidate
Autogenous tissue areolar skin replacement
Favorable biopsy scar location
Adequate areolar diameter

cluded the abdomen ($n = 26$) and gluteal area ($n = 2$). Two patients had bilateral TRAM flap reconstruction, and one patient had staged bilateral gluteal free flap reconstruction.

Twenty-three patients had a preoperative diagnosis of intraductal carcinoma (82 percent). Two patients had lobular carcinoma, and three patients underwent bilateral prophylactic mastectomy. Four patients were previously treated with lumpectomy with or without radiation and presented with either recurrent or persistent disease. There were no patients with stage III or stage IV disease.

Incision Design

A circumferential areolar incision is planned at the areolar edge, just outside any preexisting biopsy scar. Small areolae (less than 3.5 cm) are a relative contraindication to this technique, particularly if the breast is large. Although dissection could be performed in these patients using a larger diameter incision, areolar position and breast shape may both be adversely affected by a purse-string closure required to equalize the areolar diameters during final closure.

A separate axillary incision is designed to provide access for axillary dissection and performance of the microvascular anastomoses when a free flap is used. This incision is greater in length than more conventional axillary dissection incisions and has a "S" shape (Fig. 1). This design facilitates en bloc resection of the breast tissue and axillary contents through two separate incisions and simplifies the microsurgical

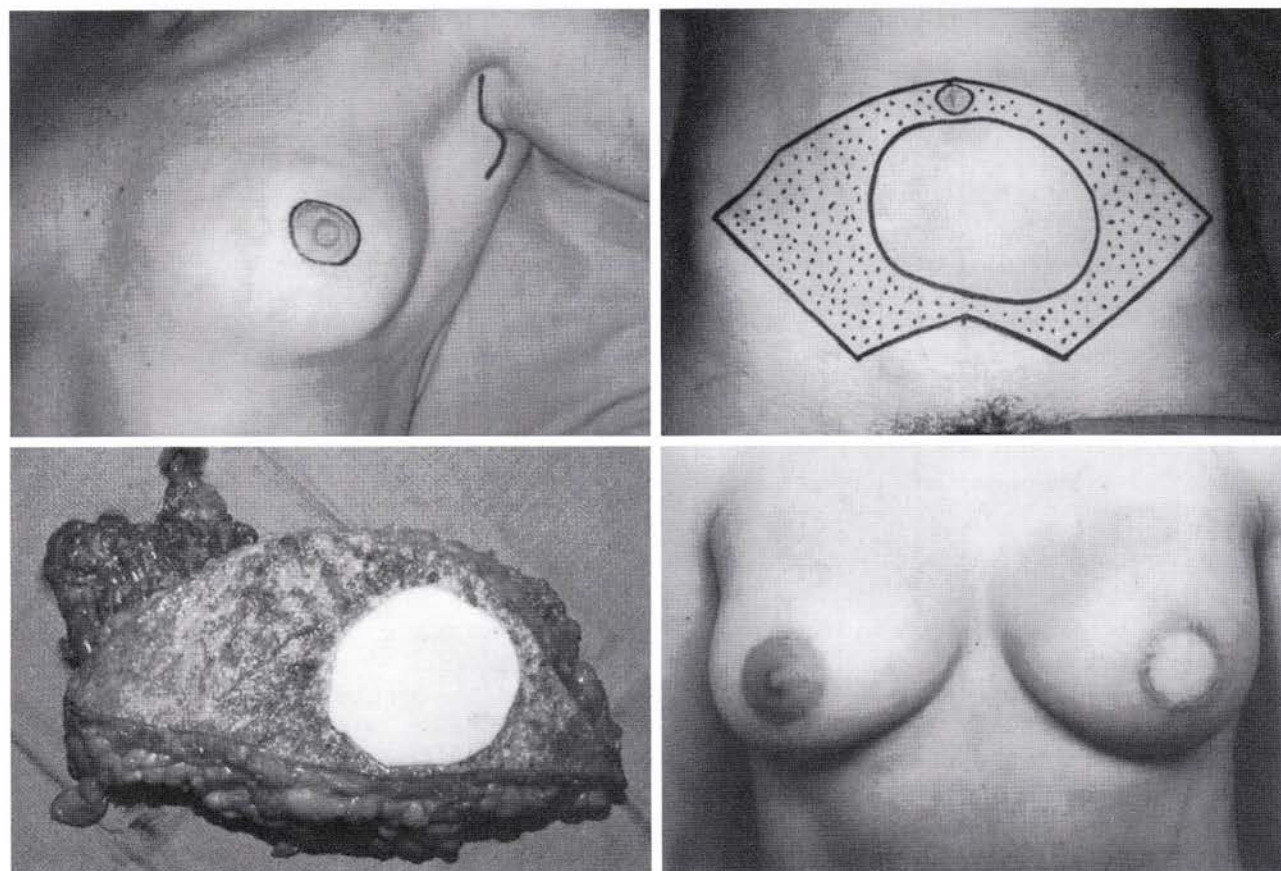


FIG. 1. Composite views from four different patients illustrating skin-sparing mastectomy and reconstruction. (Above, left) Periareolar and axillary incision design. (Above, right) TRAM flap design. The speckled area is deepithelialized before flap transfer, but the central circle of remaining skin is designed larger than the areola. (Below, left) A deepithelialized inferior gluteal artery free flap is shown. (Below, right) Early postoperative result in a patient who failed previous treatment by lumpectomy and radiation therapy. The flap is shown before revision and nipple reconstruction.

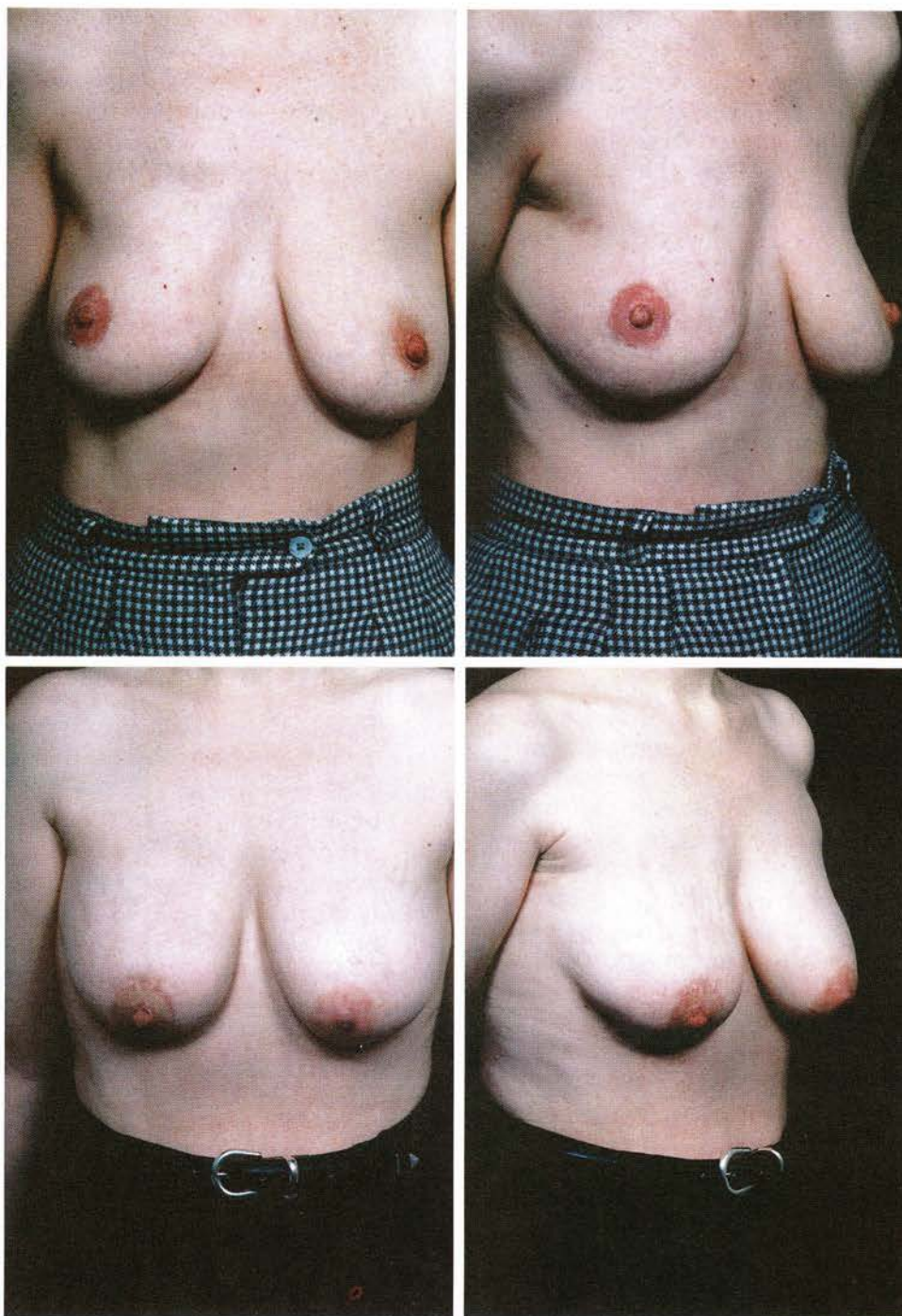


FIG. 2. Postoperative views of two patients after complete skin-sparing mastectomy and TRAM flap reconstruction. These results are typical of those rated as "excellent."

gical portion of the procedure by providing maximal exposure of the thoracodorsal vessels.

Mastectomy and Axillary Dissection

There are two contributions required of the ablative surgeon for the successful implementation of this technique: a healthy skin flap after completion of mastectomy and intact tho-

racodorsal vessels after axillary dissection. Skin flaps that are too thin result in "aesthetic" morbidity, whereas compromised thoracodorsal vessels may preclude the feasibility of a planned free flap reconstruction.

Skin flap elevation must be precise: thin enough to remove all breast tissue yet thick enough to preserve flap circulation. Dissected

flaps that exhibit patches of exposed dermis on the undersurface may result in periareolar skin loss postoperatively. Skin flap elevation, therefore, must be performed in a meticulous fashion despite the more limited exposure inherent in this technique. This portion of the procedure is particularly demanding of the ablative surgeon.

The thoracodorsal vessels are the preferred recipient vessels when a free flap is planned. They are routinely exposed during the course of axillary dissection. In cases in which complete axillary dissection is not anticipated, enough axillary tissue must be removed to provide adequate exposure of these vessels.

Flap Dissection and Transfer

Both TRAM flaps and gluteal free flaps are designed in a standard fashion, well described elsewhere previously.^{3,4} The inferior gluteal flap is preferred to the superior type, because the longer pedicle will reach the thoracodorsal vessels. Pedicled TRAM flaps are preferred when the donor site to breast volume ratio is high and for patients in whom an axillary dissection either is not necessary or has been done previously. The latter usually consists of patients who have undergone an attempt at breast conservation and have failed. Free TRAM flaps are preferred when the donor site to breast volume ratio is low or the patient is obese, smokes, or has other factors that increase her risk of fat necrosis.

The flap skin is partially deepithelialized during the course of dissection. It is not possible in most patients to predict precisely where the skin circle representing the areola should be located on the flap. Therefore, a large oval of skin is left on the portion of the flap most likely to correspond to the final location of the areola (Fig. 1).

The donor site is not closed until after the microvascular anastomoses are performed when TRAM flaps are used. Gluteal donor sites are closed, and the patient is repositioned before performing the microvascular anastomoses.

After transfer to the chest, free flaps are inverted (skin side down) and temporarily secured adjacent to the axilla. It has proven far easier to perform the anastomoses with the flap outside of the breast skin pocket. Exposure is enhanced by the type of axillary incision described. After completion of the anastomoses, the flap is carefully inserted

into the breast skin envelope, and its muscle is sutured securely to the chest wall to maintain optimal configuration of the pedicle. Circumareolar skin fixation of the flap alone is not reliable in terms of maintaining flap position on the chest wall.

Flap Insetting

Insetting is performed with the patient sitting upright. The first step is to reestablish the inframammary crease through the circumareolar incision. The crease is often detached during the course of mastectomy and must be restored by suturing the skin flap to the chest wall. The measurement between the crease and the lower border of the areola must be the same as the normal side as this is done. This method is necessary so that the areolar position is symmetric and the shape of the lower pole of the reconstructed breast is not distorted due to insufficient skin length. It is sometimes necessary to recruit a small amount of upper abdominal skin when fixing the crease to the chest wall so that this potential problem is avoided.

The flap is sutured to the pectoralis muscle superiorly and laterally, excising excess flap tissue as indicated. The remaining flap skin is gradually deepithelialized as the final location of the areolar skin circle becomes more evident. A purse-string suture (clear 2-0 nylon, straight needle) is placed in the dermis of the circumareolar skin edge. The remaining skin island excess is deepithelialized as the opening is closed down to the diameter of the opposite areola. It is sometimes necessary to incise portions of the skin island edge through the dermis to prevent a step-off deformity during final closure.

Additional Treatment

Subsequent revision of the reconstructed breast is generally a simple matter. Liposuction of portions of the breast mound is often all that is required. This procedure can usually be combined with nipple and areola reconstruction because revision requirements tend to be minor and the location of the areola is largely predetermined. The timing and plan for additional treatment is modified as indicated, based on the need for either postoperative chemotherapy, radiation therapy, or both.

RESULTS

The average postoperative follow-up period was 25.7 months (range, 13 to 47 months). There were no instances of free flap loss. Complications involving the reconstructed breast were unusual and minor. Some degree of fat necrosis was detected in 6 of 18 pedicled TRAM flaps (33.3 percent) and in 2 of 12 free flaps (16.6 percent). The amount of fat necrosis seen in free flaps was typically less than that seen in pedicled flaps. One patient had residual disease close to the skin. This case required secondary excision and skin graft coverage of the involved area. Pathology after excision confirmed residual disease in the specimen but the margins were clear. One patient had bilateral periareolar skin slough, which healed with some textural irregularity but no distortion in breast shape. Another patient had several episodes of cellulitis of the breast in an area with underlying fat necrosis. This condition eventually responded to antibiotics.

Donor site problems were uncommon: vague abdominal pain in two TRAM patients, infected mesh in one TRAM patient, seroma in one gluteal free flap patient, and contour deformity in one gluteal free flap patient.

Eight patients had positive axillary nodes, and half of these had more than three nodes involved. Postoperatively, 11 patients underwent chemotherapy, 1 patient underwent radiation therapy, and 5 patients underwent both chemotherapy and radiation therapy. These treatments did not adversely affect the reconstruction result in any patient.

The aesthetic quality of the result was compromised in some patients either by inaccurate flap volume, shape asymmetry, areolar position asymmetry, areolar diameter asymmetry, skin loss, flap fat necrosis, or a combination of these problems (Table II). A result was considered excellent if none of these problems existed, good if only one issue was evident, fair if two issues were evident, and poor if three or more issues were present. Based on these criteria,

TABLE II
Factors that Compromise Aesthetics

Inframammary crease asymmetry
Nipple and areola asymmetry
Inaccurate tissue volume
TRAM flap fat necrosis
Periareolar skin slough
Near-complete skin-sparing design
Retained distant biopsy scar(s)

results were judged as excellent in 12 patients, good in 11 patients, and fair in 5 patients. None of the outcomes qualified as poor.

Eight patients underwent revision of the breast mound. This procedure was most commonly performed with liposuction alone. Nipple and areola reconstruction was usually accomplished at the same time. Contralateral symmetry procedures were not required in any patient. Both gluteal free flap patients required additional donor site procedures, which consisted of stripping of a bursa cavity in one patient and liposuction of both gluteal areas to improve symmetry in the other patient.

DISCUSSION

Modified skin incisions for mastectomy offer the prospect of a reduced scar burden from this procedure. Several approaches have been tried, including subcutaneous mastectomy through an inframammary crease incision with preservation of the nipple and areolar skin, inverted "T" scar design, and a periareolar incision combined with a horizontal extension laterally for improved exposure ("tennis racket" design).⁵⁻⁷ Subcutaneous mastectomies remain controversial with regard to efficacy, and high-quality aesthetic results do not necessarily result despite the conceptual attractiveness of this method.⁸ An inverted "T" scar design is frequently accompanied by significant postoperative wound healing problems at the confluence of the incisions when this method is used for mastectomy. Thinner flaps and wider undermining are required with mastectomy compared with the more traditional use of this incision design in breast reduction and mastopexy. The horizontal extension associated with a periareolar incision design can be avoided if a separate incision is made in the axilla instead.

The circumareolar incision approach is not to be confused with a subcutaneous mastectomy. The type of mastectomy performed through this incision is a standard modified radical mastectomy. Although exposure is limited compared with a traditional incision approach, the amount of tissue removed is the same, except for the amount of skin.²

Fortunately, there is no evidence that mastectomies which preserve maximal breast skin increase the risk of local recurrence.¹ Instead, local recurrence correlates most closely with the pathologic stage of disease.⁹ There were no

instances of local recurrence in this study. The average follow-up period was just over 24 months, the period during which most local recurrences appear.

Conceptually, a circumareolar incision preserves skin circulation better than the classic mastectomy incision. However, dissection

through a circumareolar incision can be difficult if the areola is small, the breast is large, or the ablative surgeon is inexperienced with methods of extensive flap elevation through limited exposure. Intentionally exposing the dermis in the region of the tumor or inadvertently near the base of the flap can compro-

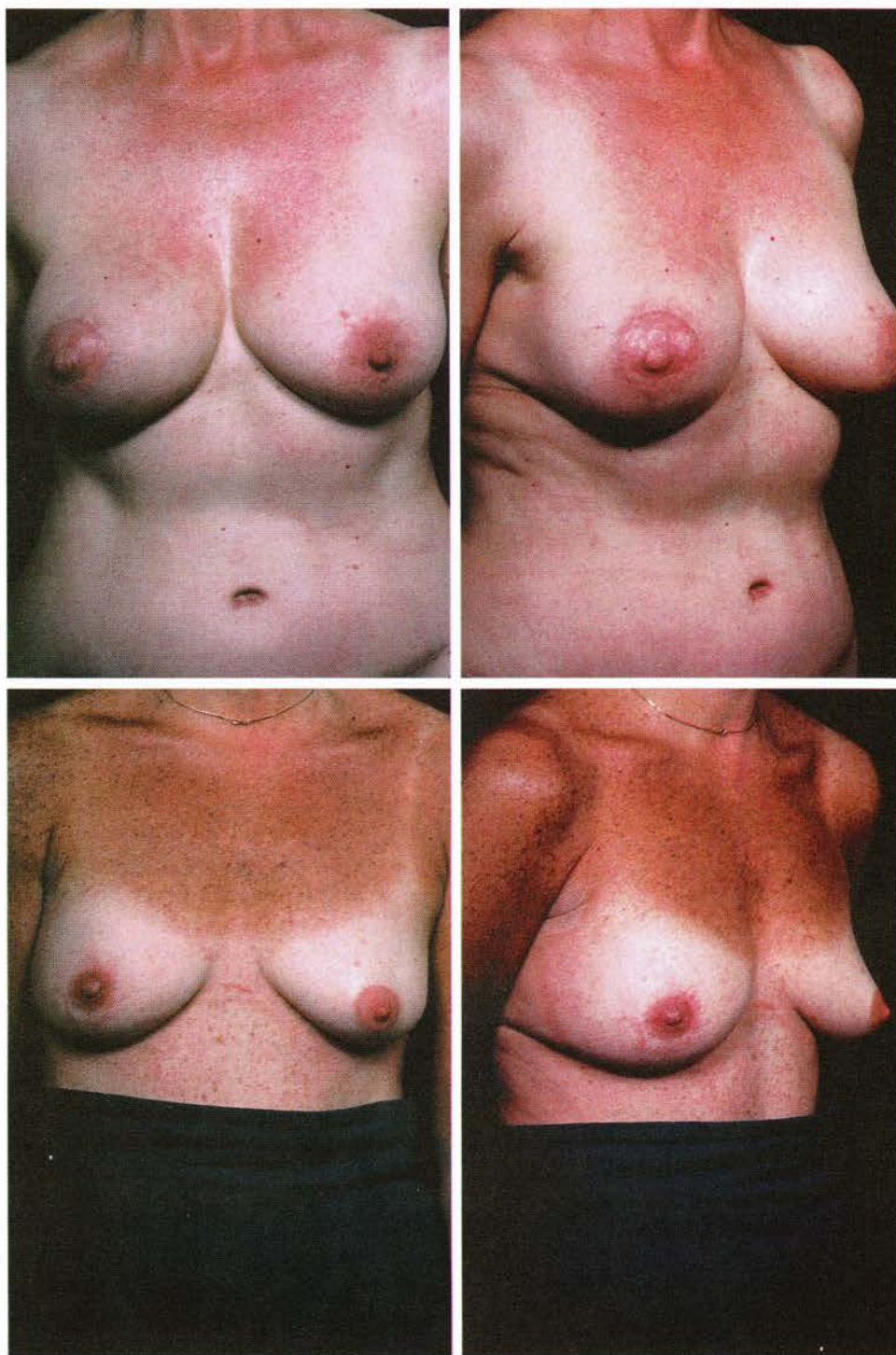


FIG. 3. Two additional patients treated with complete skin-sparing mastectomy and TRAM flap reconstruction. These results were also rated as "excellent."

mise the skin circulation enough to result in postoperative periareolar skin slough. Fortunately, this complication is unusual. It occurred in only one patient in this series and was avoidable. Acute morbidity from skin slough is generally minor given that a healthy deepithelialized flap resides just below the skin. The long-term aesthetic sequelae are also quite limited. Although there may be color and textural differences compared with the surrounding skin, distortion of breast shape due to contracture is unlikely.

Patient eligibility for this procedure is not determined just by preexisting biopsy scar location and a plan to use an immediate autogenous tissue reconstruction method. Proximity of the lesion to the skin must also be carefully considered. Skin mobility is not an infallible criterion, because one patient in this series required reexcision of skin because of persistent disease. Although replacement of the skin with a skin graft incurred a patch-type appearance in this patient, the overall aesthetic result was still superior to what a more traditional approach would have accomplished.

Autogenous tissue reconstruction is an integral part of a complete skin-sparing mastectomy approach. Abdominal or gluteal tissue is required so that a skin island can be used to replace the resected nipple and areola. Reconstruction of the nipple and areola is done later to cover the visible skin disk. The alternative of using a tissue expander with a circumareolar incision approach has been reported¹⁰ but has proved to have little advantage compared with more traditional mastectomy incision design. The required purse-string suture closure of the areolar defect in this situation poses a problem with subsequent expander exchange and later reconstruction of the nipple and areola. Four patients (not included in this series) in whom this method was used had final results indistinguishable from those of a more standard approach, except possibly that their final incision was slightly shorter. Since this study closed, a latissimus dorsi flap with either an expander or a final implant was performed in several young, thin patients in whom optimal aesthetic results were a prerequisite to surgery but who lacked sufficient donor site volume for either a TRAM or gluteal flap. The preliminary results in these patients are visually similar in quality to those achieved with a TRAM or gluteus flap, although the breast mound consistency is usually not as natural.

TABLE III
Complete Skin-Sparing Mastectomy

Advantages	Disadvantages
Superior aesthetic result	More demanding of ablative surgeon
Easier flap inseting	Flap required
Mound revision simplified	

Flap inseting is easier and faster after complete skin-sparing mastectomy, because preservation of the entire skin envelope simplifies restoration of breast shape. Final volume determination also tends to be more precise as a result. Subsequent revision procedures usually consist of only a minor amount of liposuction. Nipple and areola reconstruction can be conveniently performed at the same time, because overall breast shape does not change much and the areolar location is already largely predetermined.

Near-complete skin-sparing mastectomy describes a variant of the circumareolar incision approach. In these cases the biopsy scar is close to the areola and is excised in continuity with it. A disk of skin is removed that is usually oval in shape and is larger than the preexisting areolar diameter. Often only a small crescent of skin from the flap is visible postoperatively after reconstruction of the nipple and areola in these patients. These patients usually achieve a final aesthetic result only slightly less impressive than the typical complete skin-sparing result.

The complete skin-sparing approach to mastectomy described has limited applicability because of the prerequisites necessary. It has distinct advantages and disadvantages (Table III). In properly selected patients, it offers the prospect of an ideal reconstruction in which there is close symmetry, normal consistency, and inconspicuous scars (Figs. 2 and 3).

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