

Conservative Mastectomies

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Abstract Nowadays, oncological breast surgery has to be performed to maximize cosmetic results, and even mastectomies, when unavoidable, should conform to acceptable aesthetics. We investigated surgical approaches to skin-sparing mastectomies. Scar positioning and volume replacement were evaluated. We also discuss nipple-sparing mastectomy (NSM), probably the most outstanding item in the current debate on breast shape preservation. We give suggestions for safe admission criteria and effective treatment.

Keywords Skin-sparing mastectomies · Nipple-sparing mastectomies · Breast reconstruction · Breast prosthesis

Conservative techniques have become a major issue in modern oncological breast surgery. Many surgeons are investigating less disfiguring procedures even when a mastectomy is unavoidable [1–9]. In our current practice, the conservative concept in breast reconstruction not only is based on preservation of mammary appearance, but we also particularly care for the optimal biomechanical balance of our patients [10, 11]. We reviewed the available literature to provide easy guidelines for volume restoration and symmetrical scarring.

Surgical Planning: Skin Incision

Small mammary glands can be removed through a circular incision, including only the nipple-areola complex. Wound closure can be performed by using a purse-string suture or, when flaps are employed, preserving a round skin paddle to replace the areola [12, 13]. Data regarding complications with this approach in the literature are quite scarce and validation over a longer period should be available.

Mastectomies in larger breasts are commonly accomplished by extending the skin ellipse surrounding the nipple-areola complex and converting a skin-sparing mastectomy (SSM) into a conventional one. This strategy does not allow us to predict *ab initio* the amount of final skin reduction; furthermore, if a contralateral procedure is required, scarring will be asymmetric.

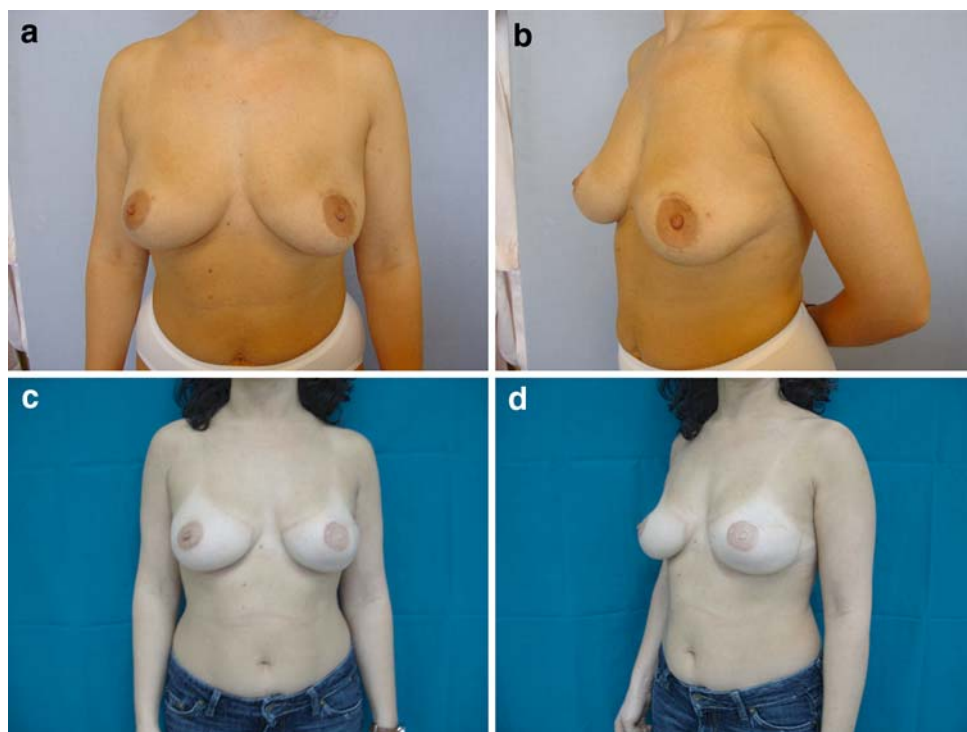
When an envelope reduction is required, it can be accomplished via a “Wise Pattern” access. Such an approach was criticized in the past for its high complication rate (between 16.6% [14] and 26.5% [15]) due to the long and possibly ischemic residual flaps [1, 14–18]. Our institution is currently developing a technical modification of “Wise Pattern” mastectomies called a “skin-reducing mastectomy” (SRM) [19]. This operation yields good cosmetic results in one surgical procedure with anatomical permanent prostheses and contralateral breast reduction. A second surgical procedure is not required. If radiotherapy is needed it can be administered on a permanent prosthesis. Unfortunately, the overall complication rate is still high (13% of reconstructions totally failed).

A vertical scar [17, 20–22] could be an alternative to inverted-T mastectomies. This strategy looks promising to avoid skin suffering, although it has some limitations in very large and ptotic breasts in which a “Wise Pattern” seems more appropriate.

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Fig. 1 Periareolar skin-sparing mastectomy. **a, b** Preoperative views. **c, d** Postoperative views



Although validation from the literature and personal experiences is still scarce, we propose a possible rationale for skin incision selection in conservative mastectomies. We base it on the morphological properties of the breast, patients' wishes, and final expected results.

In small and medium-size breasts with little or no ptosis, a periareolar skin-sparing mastectomy is advisable. However, under such conditions final bilateral symmetry, a good inframammary fold, and lower pole definition are very difficult to obtain. Very often a contralateral augmentation (possibly via the submammary fold) or a periareolar mastopexy is required (Fig. 1). Medium-size and large breasts with moderate to severe ptosis can be removed via a "Wise Pattern" or through a vertical scar incision (in selected cases). Contralaterally, we advise performing a breast reduction or mastopexy with auto-prosthesis according to the patients' wishes (Fig. 2).

Surgical Planning: Volume Replacement

Should We Use Myocutaneous Flaps for Conservative Mastectomies?

The breast envelope after glandular removal can be refilled either with implants, pedicle flaps, or free flaps [23–25]. Myocutaneous flaps yield a final shape comparable to the original and reduce the need for contralateral adjustment [25]. They are helpful in patients already treated by

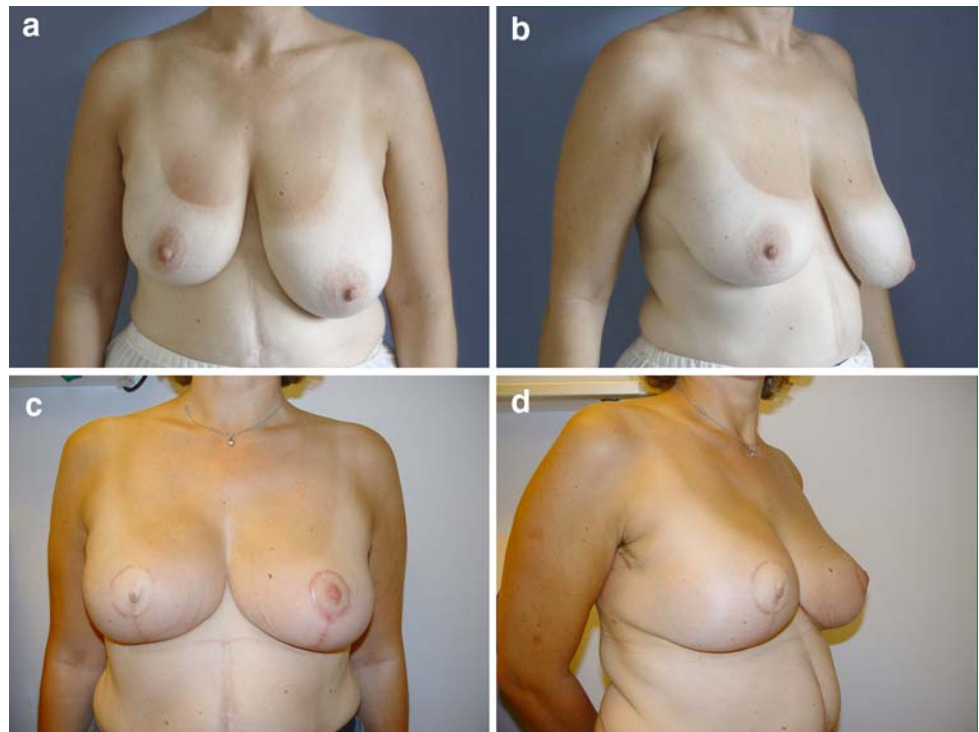
radiation or, in selected cases, at high risk of extensive nodal involvement [26, 27]. However, there are some limitations: they are challenging procedures with a higher overall complication rate [16]; blood transfusions may also be required. The use of myocutaneous flaps in SSMs contradicts, in our opinion, the ultraconservative purpose of the technique. Their transposition generates severe biomechanical sequelae that are probably the most long-term unfavorable outcomes in this kind of breast reconstruction [10, 11, 27–29].

Microvascular surgery with muscle-sparing free TRAM and DIEP flaps allows the surgeon to preserve large muscular areas [23]. The DIEP flap dissection requires microsurgical expertise and has a long learning curve. Final results are long-lasting and abdominal sequelae are extremely reduced as demonstrated by a comparative study between TRAM and DIEP flaps [30]. DIEP flaps, in our opinion, can be particularly suitable in more advanced disease and whenever radiotherapy has been or will be performed. Validation of oncological safety of SSM in these conditions has still to be proven.

Implant-Based Reconstructions Are the Most Suitable for Highly Conservative Techniques

Implant-based reconstructions, either with a single- or a two-stage strategy, are safe and easy operations in skilled hands. Good results in the old days were compromised by a high capsular contracture rate. The texturized shell surface

Fig. 2 Skin-reducing mastectomy. **a, b** Preoperative views. **c, d** Postoperative views



has significantly decreased this phenomenon [31] and anatomically shaped prostheses enhance cosmetic results.

The complication rate of implant-based reconstructions is very low [2, 32–35]. Special care has to be taken in large mastectomies to avoid damage to the subdermal vascularization during flap harvesting. In a recent study we tested the extra-projection prosthesis as an alternative surgical model for implant-based reconstructions [36]. In that series we aimed to reconstruct for all women a bilateral cosmetic medium-size breast (between 400 and 500 cc), highly projected, with small to moderate ptosis. The volume of the implants ranged from 397 cc for women with small breasts who received an augmentation to 533 cc for those whose healthy side required reduction surgery. Eighty-six percent of patients underwent contralateral procedures. The complication rate was 8.4%, and 66% of the reconstructions were rated as “good” in the patients’ opinion. Extra-projection implants, coupled with contralateral breast surgery, provided a good aesthetic outcome and avoided the use of myocutaneous flaps only on the basis of breast size and shape.

The increased indications for radiotherapy limit prosthetic reconstructions because capsular contracture rates become unacceptable and severe radiodermatitis may cause extrusion of the device. The need to switch the technique to a flap-based one may be unavoidable [37]. We await refinements from new regenerative tissue technologies to reduce capsular contracture rates and to increase prosthesis compatibility with radiation treatments [38].

Although the literature is based on a small amount of evidence and no prospective randomized trials are available, we propose a possible pathway for breast volume reconstruction that can be used in patients undergoing skin-sparing procedures:

- For women with very small breasts we thoroughly investigate their wishes regarding their final appearance. If they do want to undergo a second surgical visit, we insert a permanent implant soon after mastectomy. Breast implant insertion in one procedure does not allow inframammary fold reshaping. The reconstructed lower pole can also be more projected than on the healthy side especially when patients lie supine.
- Patients with small to medium breasts that have not been irradiated and with moderate to no ptosis are selected for a two-stage procedure with anatomical expanders followed by permanent prosthesis insertion. This allows us to discuss a contralateral operation in a second procedure and eventually reshape the inframammary fold. Smaller glands often require a contralateral augmentation yielding a rewarding cleavage and good inframammary fold (IMF) definition. Medium-sized breasts with minimal ptosis can be treated contralaterally with a minimal periareolar mastopexy.
- In large or medium-size breasts with moderate to severe ptosis, a single-stage strategy with anatomical permanent implants could offer promising results (skin-reducing mastectomy) (Fig. 3). An anatomical permanent prosthesis

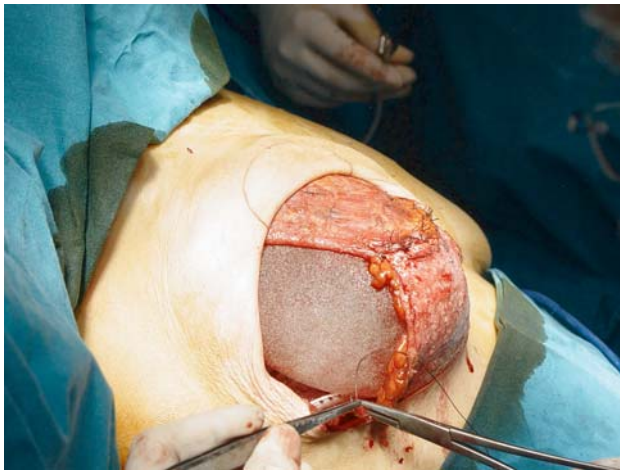


Fig. 3 Skin-reducing mastectomy, intraoperative view

and preservation of the original inframammary fold give a natural look to the reconstructed breast, with appropriate volume distribution and a good degree of ptosis. Contralateral symmetrization can be done during the same surgical procedure with an inferior pedicle reduction or a mastopexy and autoprosthesis.

In the past we considered TRAM flaps only for previously irradiated patients. This subset of women nowadays can be offered a less invalidating DIEP flap. When post-operative radiation is required on the basis of nodal status and a two-stage implant expander reconstruction has been

performed, we prefer to deliver radiation soon after replacement of the expander with a permanent implant [39].

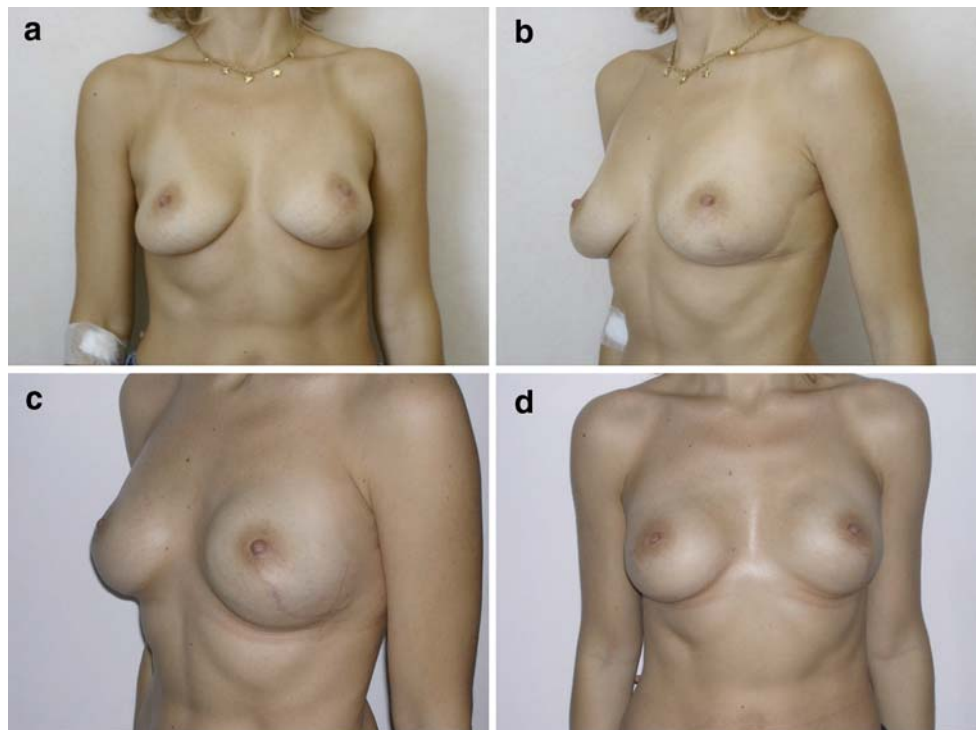
Nipple-Sparing Mastectomy (NSM)

Open Items

There are several techniques for nipple reconstruction following a skin-sparing mastectomy. Unfortunately, in a large majority of cases, the final results do not fulfill the patient's and the surgeon's expectations. The reconstructed nipple may become flat and has no sensitivity, the new areola lacks the typical conical projection, and Montgomery's tubercula lose their pigmentation over the years [40]. For these reasons nipple preservation is currently being investigated. Oncological validation is still weak and, from a reconstructive point of view, several hurdles need to be overcome [41–46]:

1. Nipple-saving creates long skin flaps whose supply is threatened by aggressive dissections.
2. Reconstruction in large breasts using implants generates a lateral migration of the nipple–areola complex; the lower pole of the breast folds creating a double bubble contour.
3. Sensitivity is largely impaired by retroareolar undermining.

Fig. 4 Nipple-sparing mastectomy. **a, b** Preoperative views. **c, d** Postoperative views



Skin Incision and Volume Replacement in Nipple-Sparing Mastectomies

Very little information on skin incisions is currently available. Proano and Perbeck [43] tested two approaches: a “lazy-S” horizontal lateral incision and a transverse incision 1.5 cm above the inframammary fold. Different approaches did not influence the circulation of the nipple–areola complex (NAC). Regolo et al. [44] found incisions in the inframammary fold (IMF) extremely safe, while the periareolar extended scar had a very high complication rate (up to 59.7%). Unfortunately no statistical analysis of differences between the two subgroups is available.

We offer nipple-sparing mastectomy in patients (fulfilling appropriate oncological criteria) with small to medium breast size, moderate or minimal ptosis, and an areolar IMF distance up to 5 cm (Fig. 4).

In the attempt to preserve vascularity coming from the intercostal branches and the internal mammary artery (2nd, 3rd, and 4th intercostal spaces), we decided to use an italic S incision along the superior edge of the areola and across the external equatorial line. We do not perform either intra- or postoperative radiotherapy [7–9] on the residual NAC, and no paddles of retroareolar tissue are left behind the NAC. Once the NAC is reached, we excise the retroareolar ducts to expose the dermis. Two samples of retroareolar tissue (one from the residual nipple side and one from the mastectomy specimen) are sent for intraoperative pathological assessment.

If neoplastic proliferation is demonstrated in the NAC, we modify our technique in a conventional two-stage skin-sparing mastectomy, closing the nipple defect with a purse-string suture. We perform volume replacement according to the principles described in the section above on skin-sparing mastectomies.

Flap reconstruction can improve results in large reconstructions after NSM, although a higher necrotic complication rate has been recently demonstrated [46].

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