Tumor-Adapted Reduction Mammoplasty in Oncoplastic Breast Surgery

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Key Words

Breast cancer · Breast surgery · Oncoplastic surgery · Macromastia · Reduction mammoplasty · Breast-conserving therapy

Summary

Macromastia has been considered a contraindication for breast-conserving therapy because of difficulties with radiation therapy. Bilateral reduction mammoplasty in conjunction with a tumor-directed and segmentally oriented partial mastectomy is a surgical technique that can potentially improve the efficacy of radiation therapy in this setting, alleviate the neuropathic symptoms that can accompany macromastia, and increase rates of breast-conserving surgery for breast cancer patients. Many different and varied techniques for breast reduction have been described. In addition, many of these procedures have variably overlapping technical details, all of which can create confusion when attempting to evaluate published results. To achieve aims and quality indicators of breast-conserving therapy in conjunction with aesthetic results, a reduction technique with a modified inferior flap and superior pedicle was developed. This technique can be used as a standardized oncoplastic procedure in breast-conserving therapy associated with macromastia and in aesthetic surgical treatment of macromastia, ptosis, and tubular breasts. The principles of the developed tumor-adapted reduction mammoplasty are described.

Schlüsselwörter

Mammakarzinom · Mammachirurgie · Onkoplastische Chirurgie · Makromastie · Reduktionsplastik · Brusterhaltende Therapie

Zusammenfassung

Die Makromastie stellt aufgrund von Komplikationen in Zusammenhang mit der postoperativen Strahlentherapie eine relative Kontraindikation für die brusterhaltende Therapie des Mammakarzinoms dar. Durch die Kombination einer bilateralen Reduktionsplastik mit einer segmental durchgeführten tumoradaptierten brusterhaltenden Operation können diese potentiellen Komplikationen im Zusammenhang mit der Strahlentherapie vermieden werden. Zusätzlich kann die tumoradaptierte Reduktionsplastik neuropathische Symptome behandeln, die mit der Makromastie assoziiert sind und gleichzeitig den Anteil brusterhaltender Therapien bei Makromastie erhöhen. Eine Vielzahl unterschiedlicher und variierender Techniken mit teilweise überlappenden Details wurden zur Durchführung der Reduktionsplastik beschrieben. Viele dieser Techniken führen eher zur Verwirrung, wenn die publizierten Ergebnisse näher betrachtet werden. Um möglichst viele Ziele und Qualitätsindikatoren der brusterhaltenden Therapie zu erreichen, wurde eine Reduktionstechnik mit modifiziertem inferiorem Lappen und kranial gestieltem Nipple-Areola-Komplex entwickelt. Die Prinzipien dieser Technik können als universelle onkoplastische Standardmethode im Rahmen der brusterhaltenden Therapie bei Makromastie und als ästhetisch-operative Standardmethode zur Behandlung der reinen Makromastie, Ptosis und der tubulären Brust eingesetzt werden. Die Prinzipien der entwickelten Technik zur tumoradaptierten Reduktionsplastik werden beschrieben.

Introduction

Breast-conserving therapy, consisting of a margin-negative segmental mastectomy and breast irradiation, is a standard and oncologically safe treatment modality for patients with early stage breast cancer, and for many patients with locally advanced disease if their tumors can be downstaged sufficiently with induction chemotherapy [1–5]. Multicentric lesions, or a medical contraindication for chest wall irradiation, however, mandate mastectomy for definitive locoregional disease control. The presence of obesity or other body habitus associated with large, pendulous breasts can complicate the efficacy and suitability of both treatment approaches. Delivery of radiotherapy to a bulky and ptotic breast can be very challenging technically and may result in excessive radiation toxicity and worse cosmetic outcomes.

Bilateral reduction mammoplasty in conjunction with tumor-directed segmental partial mastectomy is a surgical technique that can potentially improve the efficacy of radiation therapy in this setting, alleviate the neuropathic symptoms that can accompany macromastia, and increase rates of breast-conserving surgery for breast cancer patients. However, this option is frequently overlooked by surgeons managing newly diagnosed breast cancer patients. Many different and varied techniques for breast reduction have been described [6–11]. Several of these procedures have come to be known simply on the basis of the name of the physician who described the operation. In addition, many of these procedures have variably overlapping technical details, all of which can create confusion when attempting to evaluate published results. To assist in organizing and evaluating the multiple techniques of breast reduction, it is helpful to realize that any procedure designed to accomplish breast reduction must consist of the following 4 interrelated elements: i) preserving the nipple-areola complex (NAC) blood supply; ii) removing the redundant parenchyma or tumor-adapted segmental partial mastectomy when combining breast-conserving therapy with reduction; iii) removing excess skin; iv) shaping the breast.

Based on these 4 cardinal elements, breast reduction techniques can be divided into the following main principles: The wise pattern inverted T reduction is the most commonly performed procedure which, based on an inferior pedicle, removes tissue from around the pedicle medially, superiorly and laterally, removes skin below the medial and lateral breast flaps, including the de-epithelialized inferior pedicle, and re-drapes the skin around the inferior pedicle to shape the breast. The vertical reduction has gained in popularity as a method to reduce the length of the scars. It is based on a superior [8] or superomedial [10] pedicle, removes tissue from the lower pole of the breast, uses a circumvertical skin resection pattern, and sutures together the medial and lateral pillars for shaping. The periareolar reduction is based on using a blocked circular dermal suture passed in a purse-string fashion. The

round block constitutes a cerclage, fixing a solid circular dermodermal scar block around the areola. The periareolar approach provides easy access to the whole gland, minimizing the required incision [9].

Most of the published techniques have different limitations in the amount of removable tissue, vascularization of the nipple areola complex, and the pedicle design, and resulting scarring. In 1975, Liacyr Ribeiro [12] published a new method for reduction mammoplasty with an inferior pedicled nipple areola complex. This inferior technique has become one of the most popular procedures in reduction mammoplasty among the members of the American Society of Plastic and Reconstructive Surgery.

Development of the Reduction Mammoplasty with Modified Inferior Technique

There are several limitations associated with the described principles of reduction mammoplasty. From the surgical point of view, there is a need for a unique and standardized reduction mammoplasty technique which can be implemented either in a tumor-adapted reduction strategy in breast-conserving treatment or in aesthetic surgery for reduction and mastopexy.

Besides volume reduction, several other aspects have to be considered when developing a unique reduction mammoplasty technique combining prerequisites for breast-conserving treatment and aesthetic surgery. This technique should have the following aims and possibilities: i) creation of the desired breast size and shape; ii) breast symmetry; iii) variation of the breast basis; iv) optimizing the projection of the nipple areola complex; v) reconstruction of the upper breast pole; vi) scar-sparing procedure; vii) avoidance of secondary ptosis; viii) correction of lateral bulging; ix) combination with oncoplastic procedure (segmental resection in breast cancer patients); x) conversion into skin-sparing mastectomy with reconstruction in the case of positive margins; xi) resulting in good outer and inner aesthetics (breast diagnostics during follow-up); xii) adaptation of the contralateral breast in reconstruction after mastectomy.

For the development of a unique technique in reduction mammoplasty which fulfils these prerequisites, it is important to differentiate 2 unrelated steps: the inner reduction (volume reduction), and the outer reduction (skin envelope reduction). Compared to the original technique by Ribeiro with inferior pedicle, we developed a modified inferior technique with a superior pedicled nipple areola complex and an inferior based dermoglandular flap, which are the two important steps for volume reduction. For the skin envelope reduction, different scars and incision patterns can be combined with the volume reduction (inverted T scar, vertical scar, periareolar scar, L-scar) depending on breast size and shape.

Fig. 1. Principle of reduction mammoplasty with modified inferior technique.

Surgical Technique of the Reduction Mammoplasty with Modified Inferior Flap

With the patient in a half-sitting position, a vertical line is drawn from the hemiclavicular line to the upper edge of the areola. The new position of the nipple is marked within the vertical line responding to the projection of the inframammary fold on the upper pole of the breast. By means of a pinching maneuver and the surgeon's judgment, the 10-cm long lateral lines are determined. The lower poles of the lines are linked to the inframammary fold with curving lines, as in Pitanguy's technique. With the breast lifted so that the lower pole can be seen, the drawing of the inferior flap is started at the central

portion and is extended to 1–2 cm below the inferior edge of the areola. The outlined flap is decorticated, and an incision is made on its edges downward to the muscular level to allow the shaping of a dermo-lipo-glandular flap, supplied by the 4th, 5th, and 6th intercostal perforating vessels. The nipple areola complex and the skin in the upper and lateral pole is completely undermined. When the resection of the remaining tissue of the breast is completed, the flap is attached to the pectoralis fascia with separate stitches. In cases of a tumor-adapted reduction mammoplasty the breast cancer is marked preoperatively to achieve segmentally resected tumors for further histopathologic evaluation of tumor-free margins. The lower edges of the lateral lines are joined at the middle point of the flap base. The new position of the nipple-areola complex is marked at the main projection. After decortication, the superior pedicled nipple areola complex and the skin are sutured with monocryl 3–0 stitches.

This surgical principle of a modified inferior flap technique described with an inverted T skin incision can also be combined with vertical, L and periareolar skin incisions depending on the desired size and shape of the reduced breast. Since 1993, we have been performing this technique as a routine procedure in aesthetic reduction mammoplasty and in tumor-adapted reduction mammoplasties as the surgical part of breast-conserving treatment in patients with macromastia (figs. 1, 2).

Discussion

Breast-conserving therapy for early breast cancer includes a segmental partial mastectomy with an attempt to obtain a tumor-free resection margin of >1 mm, and is the treatment of choice for patients with unicentric primary breast cancer. Post-operative breast radiation therapy is an essential component of breast-conserving therapy, and results in 12-year local recurrence rates of 10%, compared with 35% seen in women who undergo lumpectomy without radiation [3]. For women with locally advanced breast cancer, breast-conserving therapy remains an option if the tumor can be appropriately down-staged with induction chemotherapy, and postoperative breast irradiation yields local recurrence rates that are similar to those seen with early stage disease [2].

Breast cancer patients with macromastia (whether related to obesity or a particular body habitus) present particular challenges to the radiation oncologist. The large breast may require higher energy photons to ensure radiation delivery to the deeper tissue, and the dose inhomogeneity that can result may lead to significant radiation toxicity to the skin. Significantly worse aesthetic results from breast-conserving treatment associated with large, pendulous breasts have been documented in several series [13, 14].

The fairly logical surgical therapeutic modification of reduction mammoplasty has received relatively little attention. Its

Fig. 2. Preoperative planning and post-operative results.

use as a postradiation procedure to restore symmetry in treated patients with macromastia has been discussed in a few case reports [15]. Employing this technique at the time of the patient's cancer surgery has the clear advantages of a single operative experience, as well as potentially reducing the radiation-related difficulties associated with treating the large, pendulous breast.

With the development of a reduction technique using a superior pedicled nipple areola complex and the inferior dermoglandular flap, a unique strategy for tumor-adapted reduction mammoplasty and aesthetic breast reduction was implemented in 1993. The modified inferior technique can be combined with different skin incision patterns (inverted T, vertical, L, periareolar), depending on the desired size and shape of the breast. The safety of this method is reaffirmed, with only few significant postoperative complications, no major radiation-related complication, and excellent patient satisfaction rates. In tumor-adapted reduction mammoplasty, patients received a

separate incision for their axillary surgery. In addition, lymphatic mapping with sentinel lymph node biopsy is performed routinely, because our results suggest that the identification rate and accuracy of the procedure are not significantly impaired by the reduction mammoplasty.

In summary, we believe that bilateral reduction mammoplasty using the modified inferior technique can be performed safely at the time of definitive breast cancer surgery and prior to breast irradiation in patients with macromastia. Utilization of this technique should improve the ability to deliver the radiation component of breast-conserving therapy to women with macromastia with acceptably low complication rates. Combined segmental mastectomy and breast reduction represents a valuable treatment option for the patient who presents with macromastia and cancer of the breast. The ablative procedure is not compromised, and the improved symmetry of the breast has resulted in an excellent cosmetic outcome in these patients.

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