Quadrant by Quadrant Preoperative Planning for Oncoplastic Resections

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Introduction

The first oncoplastic breast conserving surgery (OPS) techniques have been described almost 30 years ago [1–3]. Over the last decade, several authors have published algorithms that they use in their clinical practice to indicate a specific procedure and individualize partial breast reconstruction [4–10]. Several OPS pioneers described the selection of the appropriate technique based on tumor location either by quadrant or by the poles of the breast [4, 8]. Others described the specific procedure in detail and then outlined to what clinical situations it could be applied [6, 7]. Another approach is to base the classification on the detailed documentation of the extent and complexity of the procedure [5]. Personally, we favor to focus on the size and shape of the breast when starting the treatment planning process [9, 10]. However, all surgeons use a combination of all of these criteria when finalizing their individualized oncoplastic treatment plan.

Indications

The round block mammoplasty was initially performed by circular incision at the border of the areola and then further developed to a circumareolar mastopexy technique, also known as donut mastopexy, which has been first described by Benelli et al. almost 30 years ago [1]. It works well for tumors in all locations except the

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ones that are close to the submammary fold or peripheral in large ptotic breasts. Due to the limited exposure through the outer incision circle, partial breast reconstruction and complete removal of the tumor with clear margins can become challenging in these two situations. Prerequisite for this technique is a minimum distance between tumor and skin of a few mm to allow surgical dissection in this plane with clear anterior margin. We prefer this technique in women with small- or medium-sized breasts and no major ptosis, but it is feasible in most situations with decent results.

The second group of procedures that can be used for tumors in all quadrants are the various forms of oncoplastic reduction mammoplasty. Originally, this technique has been described for use in lower quadrant tumors [2]. In the meantime, several modifications have been proposed that allow partial breast reconstruction for tumors in all quadrants [8–10]. Several series demonstrated good local, regional, and distant control with extended follow-up [11, 12]. Pre-requisite for this group of techniques are breasts with high volume and preferably some degree of ptosis.

Besides these two groups of procedures that can be used for tumors in most quadrants, other techniques have been designed for use in more specific situations [3, 7, 8, 13, 14]. For tumors near the submammary fold, the triangle excision or its modification V-mammoplasty can be used as technically not very demanding procedures to avoid an asymmetry called the bird's beak deformity [4, 8]. A small thoraco-epigastric flap is the alternative for tumors at this location [7]. The hemi-batwing mammoplasty, also known as racquet technique, has been developed for tumors in the outer quadrants [4, 8]. It works best in medium- to large-sized breasts with some degree of ptosis. For supraareolar tumors with close distance to the skin, the crescent or batwing mammoplasties are straight-forward approaches to en bloc resections with good aesthetic results [8]. Since these techniques result in lifting of the NAC, a contralateral procedure for symmetry is often performed. For retroareolar tumors that require central tumorectomy with removal of the nipple-areola-complex (NAC), the Grisotti mammoplasty, also known as the B-technique, allows immediate reconstruction of the areola with adequate reshaping of the breast in most situations [3, 13].

Preoperative Evaluation and Planning

In our practice, every patient is presented at an oncoplastic board before surgery to discuss and finalize the treatment plan. In preparation, the surgical resident takes pictures of both breasts from the front, oblique, and lateral view. At the board meeting, the pictures and the radiological findings are presented along with the clinical baseline data. We select the basic technique according to our local indication and partial breast reconstruction algorithms and discuss predictable needs for adjustment to tailor the procedure to each patient [9]. While our own algorithms work well in our hands, several other classification systems are available [4, 6, 8]. In fact, an independent panel of experts concluded that other systems may perform better than ours in clinical practice and research [15]. Hence, we believe that it is a critical step for all surgeons to find the clinical algorithms that work best for themselves and their units.

In any case, preoperative marking of the patient is the basis for a successful performance of advanced oncoplastic surgery procedures. The goal is to take measurements

and establishing landmarks in the upright position that are used during surgery when the patient is supine. We draw a line from the top of the mid-sternum to the xiphoid process and then mark the submammary folds full-length on both sides, followed by the clavicles. Next, we draw the breast meridian lines, starting at the midclavicular line about 5 cm laterally from the midline down through the nipples to the abdomen, which divide each hemithorax into two halves with equal widths. Occasionally, the line has to be adjusted medially or laterally to the nipple to ensure that it leads to the midline of the hemithorax. To mark the optimal new position of the nipple, the fingers are placed behind the breast with the fingertips pushing at the submammary fold toward the investigator. The point of maximum pressure can be felt by the other hand; it corresponds with the position of the submammary fold. This point marks the optimal position for the nipple in a younger and the new border of the areola in an older patient when bilateral procedures are planned. In case of unilateral surgery, the nipple is generally recentralized into the direction that is opposite to the tumorectomy cavity. All these lines are used to plan the incisions that vary widely between different techniques, as described in the next chapter.

Surgical Techniques by Quadrants

Upper Quadrants

Our default approach to a tumor in the upper quadrants in a small- to medium-sized breast is the *round block* or *donut mastopexy*. Please see Fig. 5.1 for the procedure at a glance.

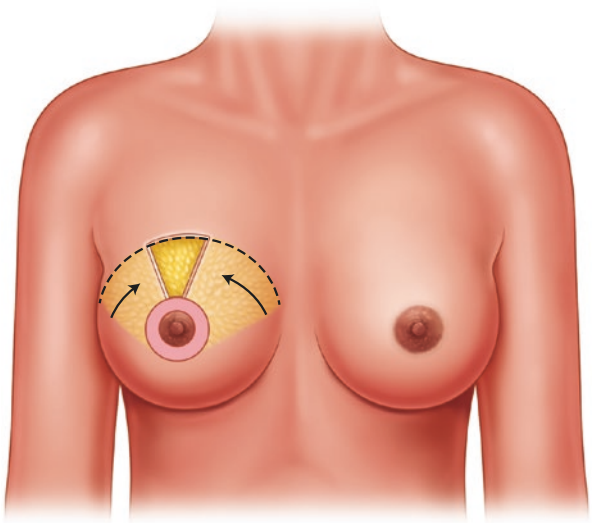

Fig. 5.1 Round block mastopexy for tumors in the upper quadrants

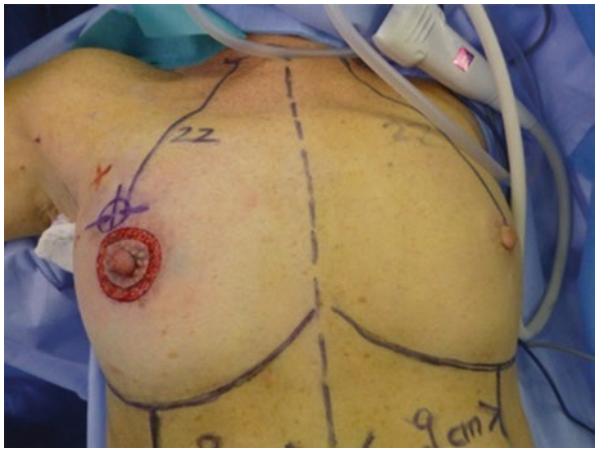

Fig. 5.2 Round block mastopexy by circumareolar de-epithelialization of skin between inner and outer circle

Fig. 5.3 Tumorectomy cavity and specimen

It starts by de-epithelialization between the inner and outer circumareolar lines with a distance in between the two circles of about 1 cm. The wider the distance between the inner and outer circle, the more flattening of the breast will occur, since the technique does not allow formal reshaping of the breast to promote its projection. As you can see in Fig. 5.2, the access to the subcutaneous mastectomy plane when using the outer circle is both closer to the tumor and longer compared to the traditional periareolar incision. Therefore, it gives wider access to the tumor. Hence, this technique offers advantages for the oncological part of the oncoplastic procedure as well. A crucial step of that specific procedure is wide mobilization in that plane to the border of the gland whenever possible. In general, this allows safe tumorectomy (Fig. 5.3). The round block mammoplasty reliably prevents severe deformities in most situations and good to excellent results in patients selected by small- to medium-sized breasts, as you can see in this patient 3 years after surgery (Fig. 5.4).

Fig. 5.4 Patient 3 years after round block mastopexy

Fig. 5.5 Patient before surgery

If the tumor is located directly under the skin in the supraareolar region, part of the skin between the outer and inner incisional circle can be left attached en bloc to the tumorectomy specimen to secure the anterior margin. Alternative procedures in this situation are the *hemi-batwing* and *crescent mastopexies* [8]. For the crescent mastopexy, the distance between the inner and outer circle increases toward the upper pole of the breast (Figs. 5.5 and 5.6). This allows great access to these tumors with a wide skin island left attached to the specimen (Fig. 5.7). Due to the lifting of the nipple-areola complex, however, a contralateral procedure for symmetry is commonly recommended (patient 2 years after surgery in Fig. 5.8). In addition, even though the procedure is feasible also in large breasts with advanced ptosis, the lack of reshaping clearly limits the projection of the breast and accordingly, the final aesthetic results in these patients.

To increase the projection of the breast, glandular reshaping by the use of an oncoplastic *reduction mammoplasty* with inferior pedicle can be used for tumors in the supraareolar region (Fig. 5.9).

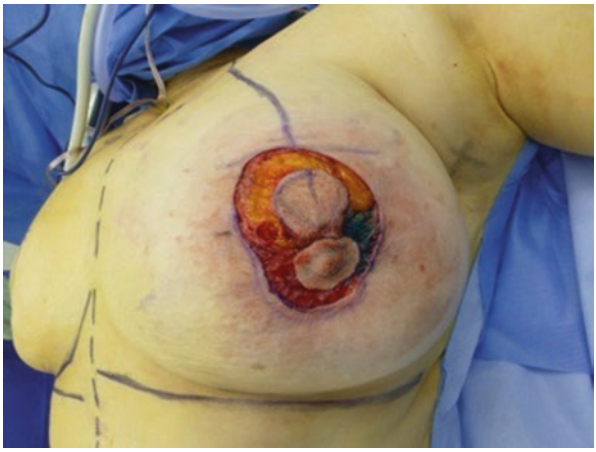

Fig. 5.6 Crescent mastopexy with de-epithelialization of skin crescent along the breast meridian

Fig. 5.7 En bloc tumorectomy cavity and specimen

Fig. 5.8 Patient 2 years after left oncoplastic crescent mastopexy and right crescent mastopexy for symmetry

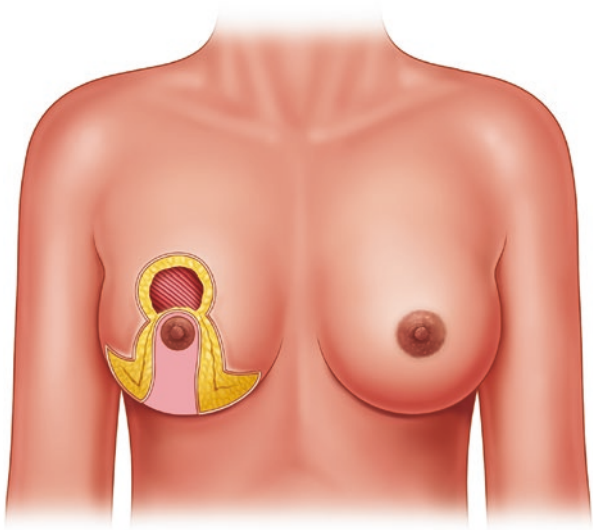

Fig. 5.9 Oncoplastic reduction mammoplasty with inferior pedicle for supraareolar tumors

Finally, if the skin has to be removed due to proximity to the tumor at very high positions in the breast not amenable to any of these techniques, we recommend the use of radial incisions in the form of an ellipse for better exposure during partial breast reconstruction and less risk of nipple distortion after radiotherapy. The removal of a wide skin island helps avoid wrinkling of the residual skin in large volume resections.

Outer Quadrants

Our default operation for tumors in the outer quadrants in large breasts is oncoplastic *reduction mammoplasty*. Prerequisite is a distance of a few mm between the tumor and the skin to allow access from the incision lines for the reduction mammoplasty. After performing the standard markings as described above, the lines for the inferior part of the reduction are drawn from the nipple – by gentle rotation of the breast to the lateral and medial side – on to the landmark on the middle of the hemithorax. The superior border of the areola is marked 2 cm above the nipple, from where the new border of the areola is drawn in a dome-shaped form over a distance of 6 cm until it crosses the inferior reduction line. Another 6 cm are measured down that line to mark the new inframammary fold, from where the incision lines deviate to the medial and lateral sides according to the Wise pattern. With this technique, large volume resections are possible with good access (Fig. 5.10). The NAC is repositioned on a superomedial pedicle, and the volume is displaced into the defect by the de-epithelialized inferomedial glandular flap (Fig. 5.11). The flap is rotated into the defect (Fig. 5.12). Three years after surgery, the aesthetic result is good and the patient is satisfied (Fig. 5.13); however, due to higher than anticipated

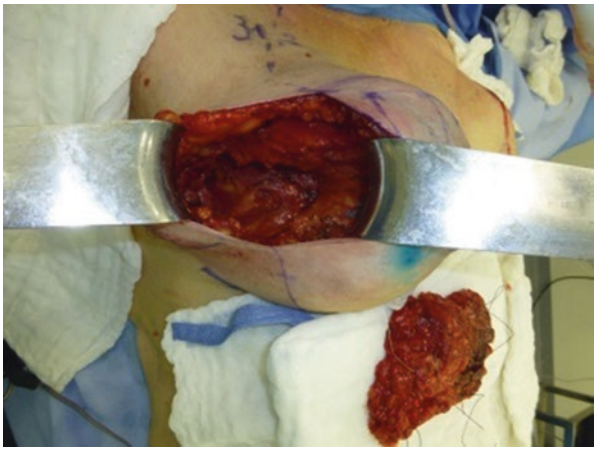

Fig. 5.10 Large volume tumorectomy cavity and specimen in the outer quadrants during oncoplastic reduction mammoplasty

Fig. 5.11 Superomedial nipple areola complex pedicle and de-epithelialized inferomedial glandular flap for partial breast reconstruction

Fig. 5.12 Volume displacement by rotation of inferomedial glandular flap into defect in outer quadrants

Fig. 5.13 Patient 3 years after surgery

shrinkage of the right breast after radiotherapy, it turned out to be smaller. We generally reduce the contralateral side by an additional 20% to adjust for the anticipated radiation-induced volume loss during long-term follow-up. Symmetry can be optimized by performing the contralateral procedure as a second step at least 6 months after the end of radiotherapy, when shrinkage has already occurred for the most part. In some countries, this is still standard of care. It also allows enough time to request coverage of costs by the insurance companies on an individual basis before performing the procedure if it is not generally granted. In Switzerland, for example, coverage of contralateral symmetrizing reduction mammoplasty by general insurance has been introduced in December 2014. This allowed us to offer immediate symmetrization to all patients from that time on to spare them the disadvantages of major asymmetry, although temporary, and the morbidity of a second surgical procedure.

A procedure specifically designed for use in the outer quadrants is the hemibatwing mammoplasty or racquet technique [4, 8]. It basically consists of a radial ellipse and a crescent excision (Fig. 5.14). The radial ellipse allows en bloc tumorectomy that resembles the form of a quadrantectomy. Thereafter, almost the entire residual gland is mobilized from the thoracic wall to allow rotation of the superolateral and inferolateral dermoglandular flaps into the defect. In case of very large volume resections, additional tissue can be displaced into the defect from the lateral part of the M. latissimus dorsi, a technique called lateral thoracic wall advancement [7]. Fixation of the reconstruction with several stitches using fully absorbable suture material is recommended to prevent deviation of the nipple toward the axilla after radiation. The second measure to prevent asymmetry is the crescent mastopexy part of the procedure, which works best in patients with some degree of ptosis (Fig. 5.15).

Finally, the round block mastopexy works well for tumors in the outer quadrants as well.

Fig. 5.14 Hemi-batwing mammoplasty (racquet technique)

Fig. 5.15 Patient 1 year after surgery

Inner Quadrants

Whenever possible, a scar in the décolleté should be avoided. As so often, this depends on the distance between tumor and skin. Our favorite approach is the *round block mammoplasty* in smaller to medium sized breasts and *reduction mammoplasty* in larger breasts. If the distance between tumor and skin requires skin excision, the V-mammoplasty is a safe option (Fig. 5.16) [4]. This technique allows en bloc resection of the skin, tumor, and pectoral fascia. Reconstruction consists of rotation of an inferolateral dermoglandular flap into the defect, which requires extensive opening of the submammary fold toward the axilla. Recentralization of the NAC in the form of a small crescent mastopexy is commonly recommended.

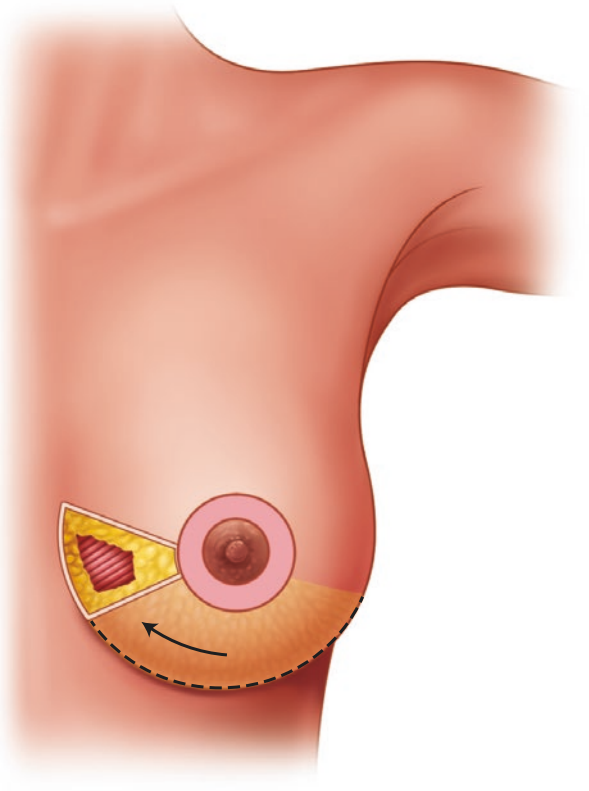

Fig. 5.16 V-mammoplasty with partial breast reconstruction by rotation of an inferolateral dermoglandular flap

Lower Quadrants

For tumors close to the submammary fold, one safe approach is *reduction mammoplasty* in larger breasts. The first oncoplastic reduction mammoplasties have been performed and described for tumors in this location, since it requires minimal adjustment of the standard reduction techniques with superior pedicles and Wise or vertical incision patterns, and virtually no tailored glandular flaps [2]. An even simpler technique that works in all sizes and forms of breasts is the *triangle excision* [8]. It consists of en bloc resection of the skin, tumor, and pectoral fascia in the form of a triangle (Fig. 5.17) and opening of the submammary fold in both directions until the dermoglandular flaps can be mobilized and rotated into the defect without tension (Fig. 5.18). Minor recentralization of the NAC by use of a small crescent or circumareolar mastopexy helps prevent bird's beak deformity (Fig. 5.19).

Fig. 5.17 Large volume en bloc tumorectomy and cavity

Fig. 5.18 Reconstruction with two dermoglandular flaps after broad incision of submammary fold

Fig. 5.19 Patient 1 year after surgery

Round block mastopexy is only recommended for tumors in the lower central portion of the breast due to the limited exposure for tumorectomy and partial breast reconstruction. To prevent the bird's beak deformity, the entire gland has to be mobilized on both sides of the tumorectomy to allow safe parenchymal support of the NAC.

Central Tumors

Our default approach for central tumors that require removal of the NAC in large breasts is oncoplastic *reduction mammoplasty*. However, the *Grissotti mastopexy* or *B-technique* allows immediate reconstruction of the areola and reshaping of the breast to restore projection in most situations [3]. The technique consists of central tumorectomy and immediate partial breast reconstruction by use of an inferolateral dermoglandular flap, which is de-epithelialized except for the skin island used to reconstruct the areola (Fig. 5.20). The flap is dissected along the medial line and

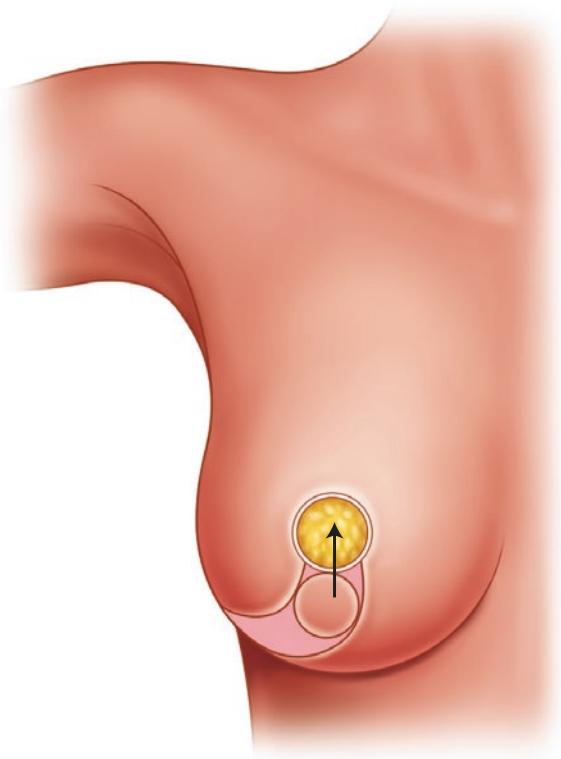

Fig. 5.20 Grissotti mastopexy, also known as B-technique, consists of central tumorectomy and immediate partial breast reconstruction by use of an inferolateral dermoglandular flap, which is de-epithelialized except for the skin island used to reconstruct the areola

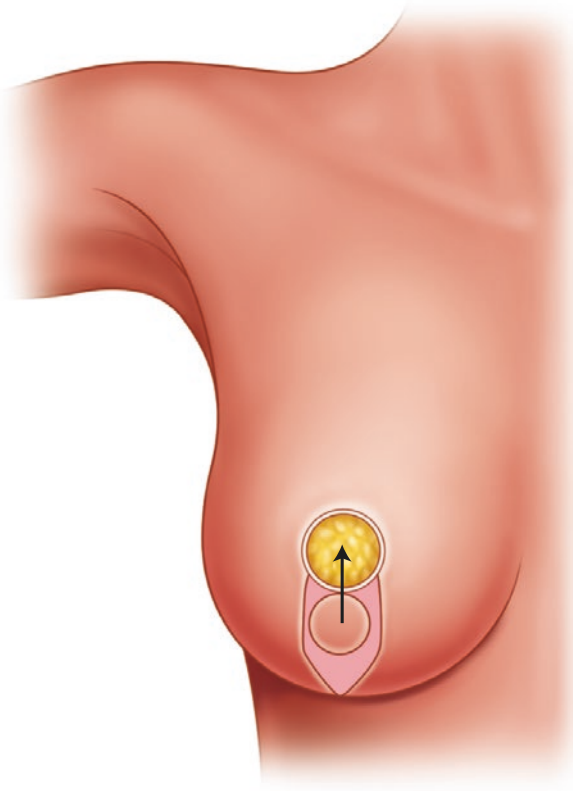

Fig. 5.21 The Grissotti mastopexy can be modified in small breasts by mobilizing the middle flap toward the chest wall from both incision lines to allow adequate mobility

rotated into the defect. In small breasts, the distance between NAC and submammary fold may be too short to allow sufficient advancement of the flap into the defect. In these situations, we propose to modify the technique by mobilizing the middle flap toward the chest wall from both incision lines to allow adequate mobility (Figs. 5.21 and 5.22).

Surgical Complications

As in all surgical disciplines, the risk of complications increases with the extent of surgery. For major oncoplastic procedures, the common complications include hematoma, seroma, wound healing disorders, and infection, which occur in approximately 20% of patients [16]. Since these complications can be severe and may delay adjuvant therapy, close follow-up of these patients and prompt initiation of treatment of such complications is recommended [17].

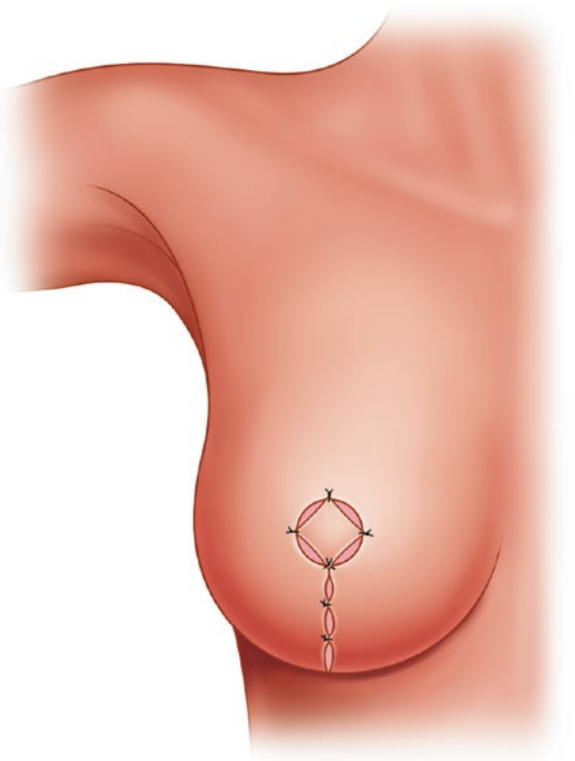

Fig. 5.22 Modified Grissotti mastopexy allows the reconstruction of the areola and the preservation of breast shape and projection by mobilizing the skin island on the middle flap from below in small breasts

However, several studies, while recognizing the high rate of complications, concluded that these did not delay adjuvant therapy in the majority of patients [18, 19].

Conclusions

In summary, OPS has a 25-year-old tradition and has now entered routine clinical breast surgery practice. Several clinical algorithms and classification systems have been published over the last decade that differ in many aspects. However, all of them offer the selection of techniques based on the size of the tumor and its location, as well as the size and shape of the breast. The Basel indication algorithm recommends to decide between the use of oncoplastic mastopexy, oncoplastic tumorectomy, or oncoplastic reduction mammoplasty based on these parameters. Once the basic approach has been selected, the Basel partial breast reconstruction algorithm recommends the use of specific nipple-areola complex pedicles and tailored glandular flaps. In most situations, more than one option is available, which requires an informed decision by the patient after a thorough discussion of the options and their

risks and benefits with the surgeon. Oncoplastic surgery allows excellent aesthetic results in many situations even in the case of larger tumors. However, the basic rules of oncologic breast conserving surgery apply: clear margins must be obtained, the general need of radiation recognized, and the risk of complications minimized.

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