

Rotation advancement flap—a novel technique for breast conserving surgery in tumors of the upper lateral breast quadrant

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Background: Focus on patient's quality of life has dramatically changed the paradigm of surgical treatment of breast cancer. Contemporary breast surgery has to provide not only with good margins, but also with the best aesthetic result possible.

Methods: A novel modification of an oncoplastic technique for breast tumors located in the upper-lateral quadrant is proposed and is based on two principles—flap rotation and advancement. Rotation advancement flap is a combination of wide rotation parenchymatous flap from the lateral part of the breast with a tissue complex from the axillary region. The point of rotation is the nipple-areolar complex (NAC).

Results: Between 2013 and 2017, 33 procedures with the described technique were performed. The mean age of the patients was 49 years (range, 33–69 years), mean specimen weight 113.5 g (range, 36–268 g), tumor size—26 mm (range, 10–50 mm). Six patients (18.2%) received neoadjuvant chemotherapy. Sentinel lymph node biopsy (SLNB) was performed in 25 (75.8%) and axillary lymph node dissection (ALND) in 12 (36.4%) patients. Complications occurred in 7 (21.2%) patients: hematoma (n=2, including one revision), cellulitis (n=3, conservative treatment), and wound edge necrosis (n=2, revised). We followed up 32 (97%) patients during 29 (range, 6–48) months postoperatively. No loco-regional recurrence was registered, whereas distant metastases were revealed in 2 (6.1%) patients; 1 (3%) of the patients succumbed to breast cancer.

Conclusions: We have proposed a novel technique of the rotation advancement flap in breast conserving surgery. This technique is reliable and allows for correcting potential deformities and significant volume loss. It may provide with an excellent aesthetic result and is considered a safe alternative to more complex operations.

Keywords: Oncoplastic breast surgery; therapeutic mammaplasty; breast conserving surgery

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Introduction

Focus on patient's quality of life and advances in oncological treatment of breast cancer have dramatically changed the paradigm of surgical treatment of breast cancer. Contemporary breast surgery has to provide not only with a radical surgery with good margins, but also with the

best aesthetic result possible. These principles have been successfully implemented in oncoplastic breast conserving surgery and numerous studies have shown oncological safety of these techniques and high patient satisfaction (1,2).

In the era of precise diagnostics and improved tumor mapping, oncoplastic techniques are considered as safe as the classical wide local excision and, therefore, become a

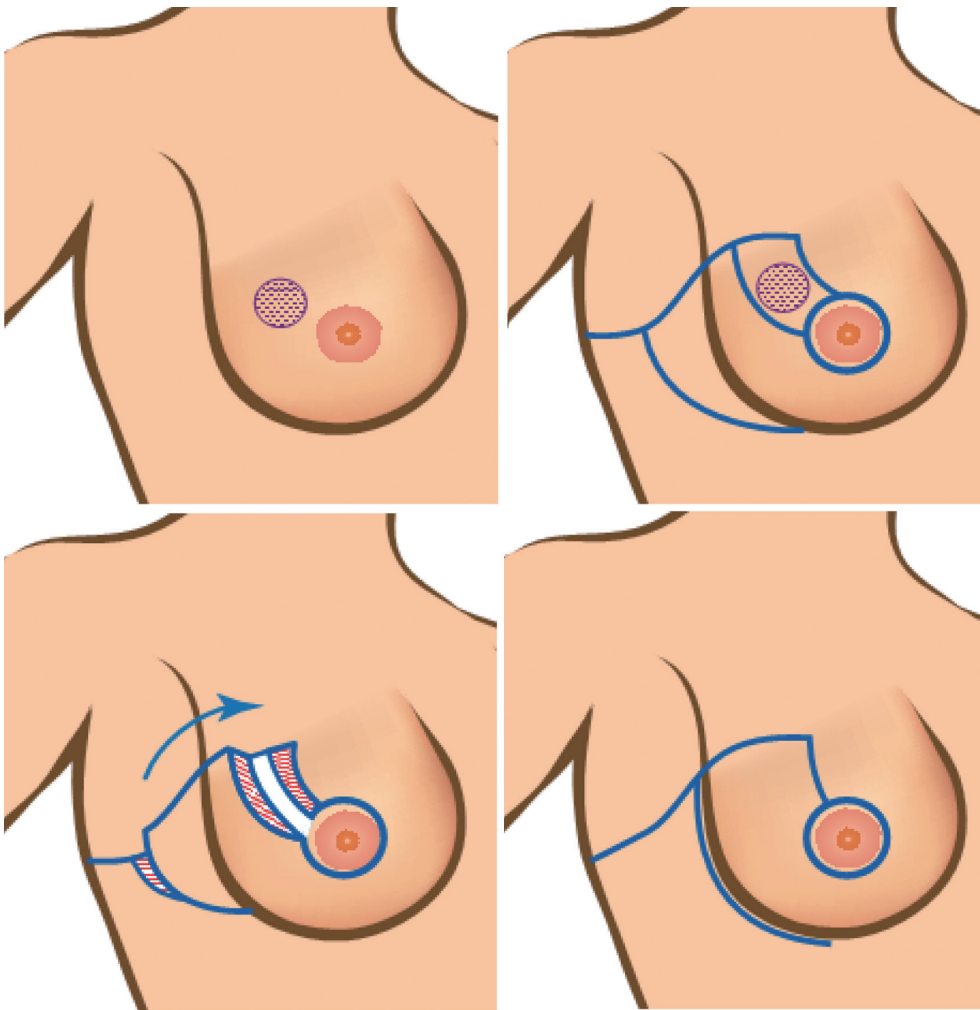


Figure 2 Incisions and surgical planning, described in the text.

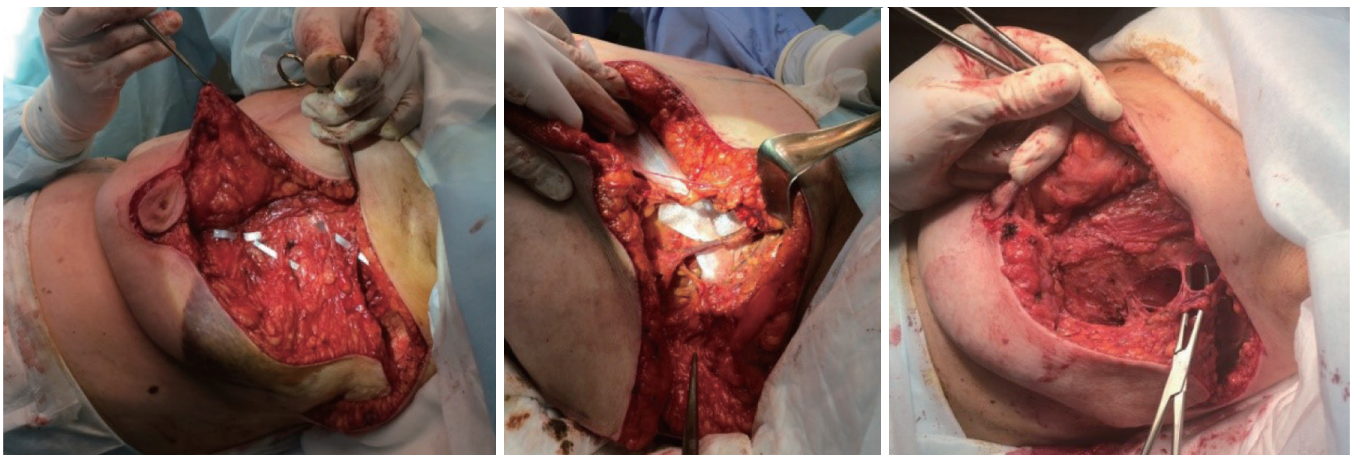


Figure 3 Tissue mobilization, identification and preservation of the vessels supplying the flap and breast parenchyma.



Figure 4 Patient case: preoperative, marking, intraoperative and postoperative (9 months) photos. Weight of specimen—198 g.

Table 1 Breast cancer stage distribution among patients

Stages	No. of patients (%)
0	1 (3.0)
1	6 (18.2)
2a	13 (39.4)
2b	7 (21.2)
3a	4 (12.2)
3b	1 (3.0)
3c	1 (3.0)

patients. In non-palpable lesions (8/33, 24.2%), a fine needle localization with mammographic verification (n=5), radioguided occult lesion localization (n=2) or intraoperative ultrasound verification (n=1) were utilized. Involved margins were found in one (3.0%) case and the patient opted for a nipple-sparing mastectomy with immediate implant reconstruction. All patients but one received external beam postoperative radiotherapy in BED 50 Gr/25 fractions, 18 (54.5%) received adjuvant chemotherapy and 9 (27.3%) endocrine therapy.

Breast cancer stage distribution is presented in *Table 1*.

Complications occurred in 7 (21.2%) patients: hematoma (n=2, including one requiring revision), cellulitis (n=3, conservative treatment), and wound edge necrosis (n=2, revision).

Notably, this technique was used in a patient after previous breast augmentation. With the breast implant preserved, a block of tissues from the axillary region was transferred to compensate the partial breast defect with an excellent aesthetic result (*Figure 5*).

The proposed technique could be also utilized to correct secondary breast defects, e.g., following radiotherapy. Thus, one patient received a reconstruction following excision of a late (>2 years) radiation sequella (*Figure 6*). A marginal necrosis of the flap, however, was seen in the early postoperative period, which required revision surgery and debridement. The wound healed primary, but the late deformity of the gland was formed. We suggested the patient correction of the deformity with the symmetrizing reduction mammaplasty and lipografting, but the patient refused.

Thirty two (97%) patients were available for follow up, on average 29 (range, 6–48) months postoperatively. Follow up included clinical examinations every 3–4 months, ultrasound every 6 months and mammography every 12 months.

No loco-regional recurrence was registered, whereas distant metastases were revealed in 2 (6.1%) patients with clinical manifestations and confirmed with CT; 1 (3%) patient succumbed to breast cancer.

Discussion

The upper-lateral quadrant is one of most frequent locations of breast cancer (8–10). Partial mastectomy in this area is considered a relatively easy task for breast surgeons. Wide local excision with free margins with a good aesthetic result is achievable in cases of smaller tumors in large breast (C–D cup). Otherwise (i.e., larger tumor/smaller breast) it is often challenging to avoid a typical breast deformity such as deviation of the NAC and volume deficit of the lateral breast contour (*Figure 7*). It happens due to the loss of volume in the upper-lateral quadrant, which is typically compensated by the linear advancement of parenchyma of the lower part of the breast. This could often lead to NAC displacement from its geometric center and the volume of the gland inevitably decreases (*Figure 7*). Several methods have been proposed to prevent this distortion (*Table 2*).

Inferior flap mammaplasty, or a modified Ribeiro technique allows achieving a very good aesthetic result (11). However, both shape and size of the breast may change significantly, which frequently requires a symmetrizing procedure. In our practice, the patient's anxiety for the cancer operation is often greater than the concerns regarding the aesthetic results, so patients are reluctant to/ postponing symmetrizing procedures. Based on this, the methods of choice at our institution are the rotational flap and the lateral thoracal flap.

When using a rotational flap, a sector of the parenchyma with the tumor is removed to the full depth—from the skin and to the fascia of the m. pectoralis major. Then, the parenchyma is mobilized in the retromammary space, with the cutting of the skin along the submammary fold. It is also required to mobilize the NAC with a circular cutting of the dermis around the areola. Thus, we form a rotational flap from the lower sector of the gland and advance it to close the defect around the nipple. Nipple is the point of rotation. This maneuver preserves the shape, prevents deformations of the lateral part of the breast and ensures the full filling of the parenchymal defect. Nevertheless, the volume of the breast decreases, because the tissue of the gland is redistributed (*Figure 8*).

The lateral thoracic flap is an effective and useful method to address the defects in the lateral part of the breast.



Figure 5 Patient with a previous augmentation, tumor in left breast. Preoperative photos before neoadjuvant chemotherapy, marking, postoperative photos after 8 months. Weight of specimen—64 g.



Figure 6 Patient with radiation-induced soft tissue changes 8 months after radiotherapy. The use of rotation advancement flap after the revision. Weight of specimen—136 g. Wound edge necrosis requiring revision. Final result after 6 months.

Holmström *et al.* initially suggested this technique as a simple method for implant coverage and volume deficits in delayed reconstruction (12,13). Munhoz *et al.* described this technique to close defects of the lateral sector of the breast in oncoplastic breast-conserving surgery (14). A similar technique was later published by Koh *et al.* where a skin-fascial flap from the axillary region on a wide base was used to fill the defect after tumor removal (15). This region has

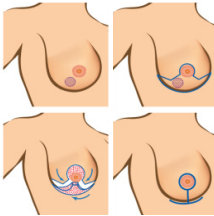
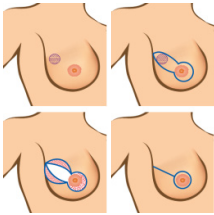
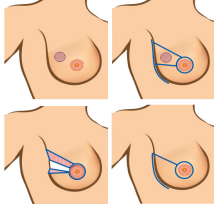
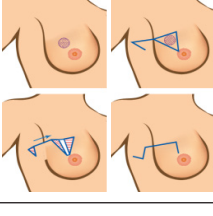
no aesthetic significance, and the quality of the skin and subcutaneous tissue here are very similar to those in the mammary gland (Figures 9,10).

The rotation advancement flap may help to achieve a better aesthetic result, because it differs from the previously discussed techniques by using the natural boundaries of the gland and natural point of rotation (NAC). This technique can be effectively used for tumor located in upper-lateral



Figure 7 Example of breast deformity following regular wide local excision in the upper-lateral quadrant.

Table 2 Analysis of technical options for operations that are used to address defects in the upper-lateral quadrant

Procedure	Indications	Breast shape changes/ symmetrizing procedure	Aesthetic results	Scheme of the surgery
Therapeutic mammaplasty using Wise pattern	For medium and large breasts, with ptosis (3–4 grade)	Significantly decreases the size of the breast, a symmetrizing contralateral operation is necessary	Excellent	
Tennis racquet	Applicable for any breast size and degree of ptosis, effective for smaller tumors	Moderately reduces the size of the breast, decreases volume in lateral quadrants, a symmetrizing procedure is recommended	Satisfactory	
Rotation flap	Effective for medium or larger breasts, with 1–2 degrees of ptosis	Moderately reduces the size of the breast, a symmetrizing operation is possible	Excellent	
Lateral thoracic flap	Applicable for any size of the breast and degree of ptosis	Minimally changes the size of the breast, may lead to the deformity. The symmetrizing procedure usually is not required.	Good to satisfactory	

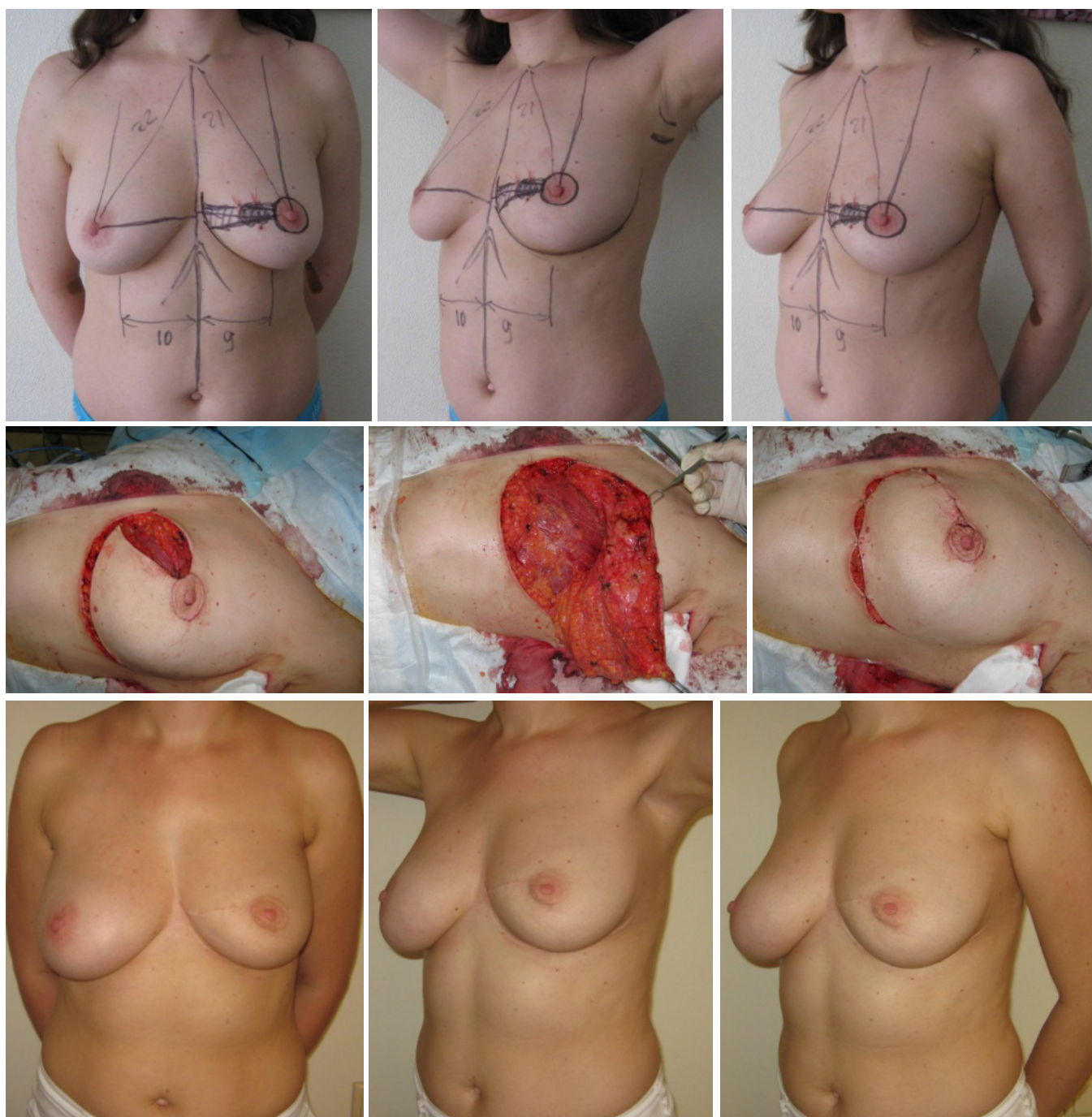


Figure 8 Patient case using rotational flap: preoperative, intraoperative and postoperative (24 months) photos. Weight of specimen—60 g.

quadrant of the breast, for different sizes of the breast—small (*Figures 11,12*), medium (*Figure 13*) and large (*Figures 14,15*). Sometimes it allows removing the bigger amount of tissue, e.g., in case of local recurrence (*Figure 16*). The following case is also noteworthy because

it allows to compare different techniques—previously done wide local excision on the left side and our type of surgery on the right side.

It is efficient even when the tumor is located in the upper sector of the breast (*Figure 17*).



Figure 9 Patient case using a lateral thoracic flap with upper base: preoperative, marking and postoperative (48 months) photos. Weight of specimen—86 g.

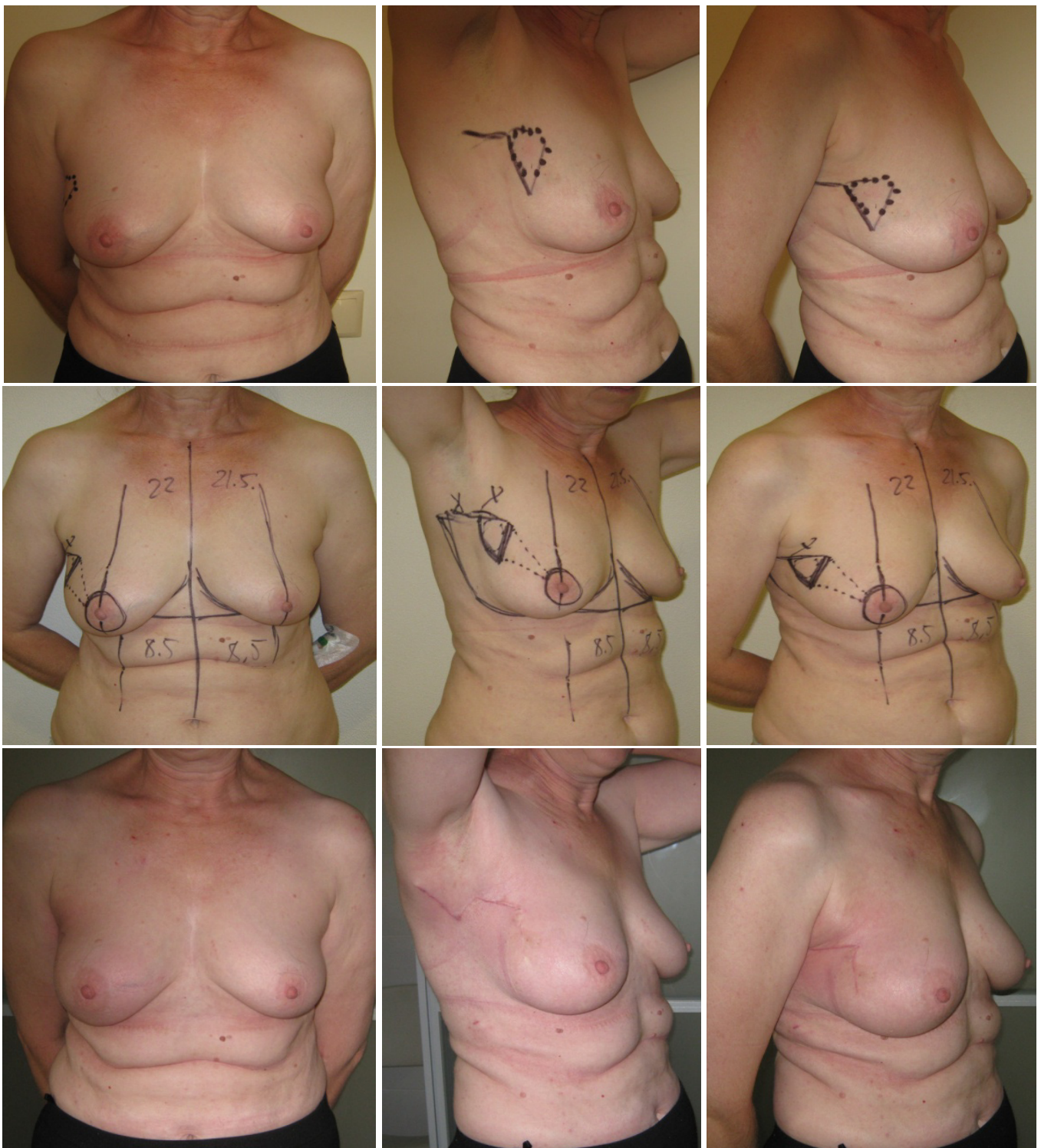


Figure 10 Patient case, a lateral thoracic flap with a lower base: preoperative, marking and postoperative (1 month) photos. Weight of specimen—52 g.



Figure 11 Patient case: preoperative, marking and postoperative (36 months) photos. Weight of specimen—49 g.

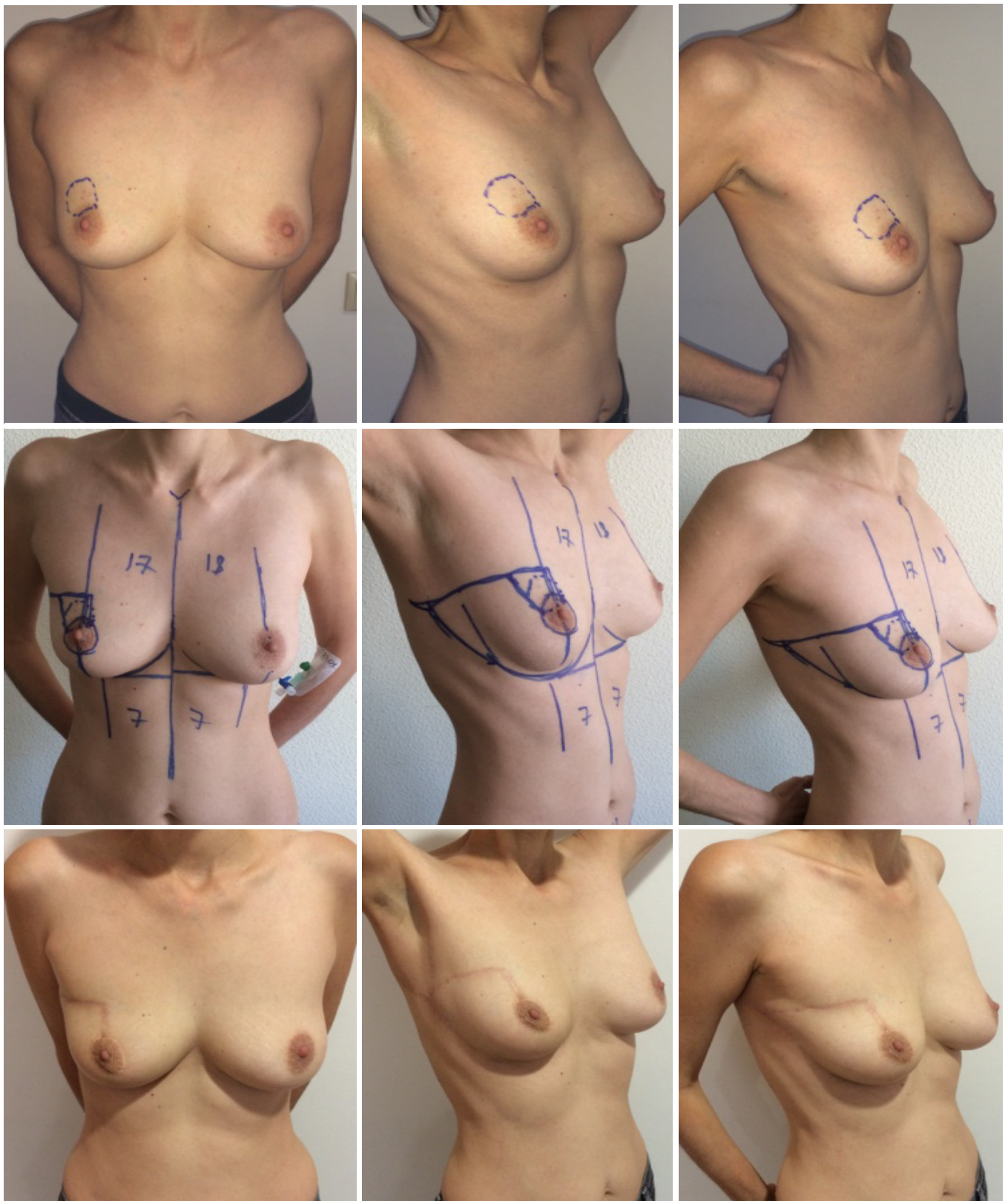


Figure 12 Patient case: preoperative, marking and postoperative (9 months) photos. Weight of specimen—36 g.



Figure 13 Patient case: preoperative, marking and postoperative (12 months) photos. Weight of specimen—72 g.



Figure 14 Patient case: preoperative, marking and postoperative (6 months) photos. Weight of specimen—102 g.



Figure 15 Patient case: preoperative, marking and postoperative (12 months) photos. Weight of specimen—138 g.

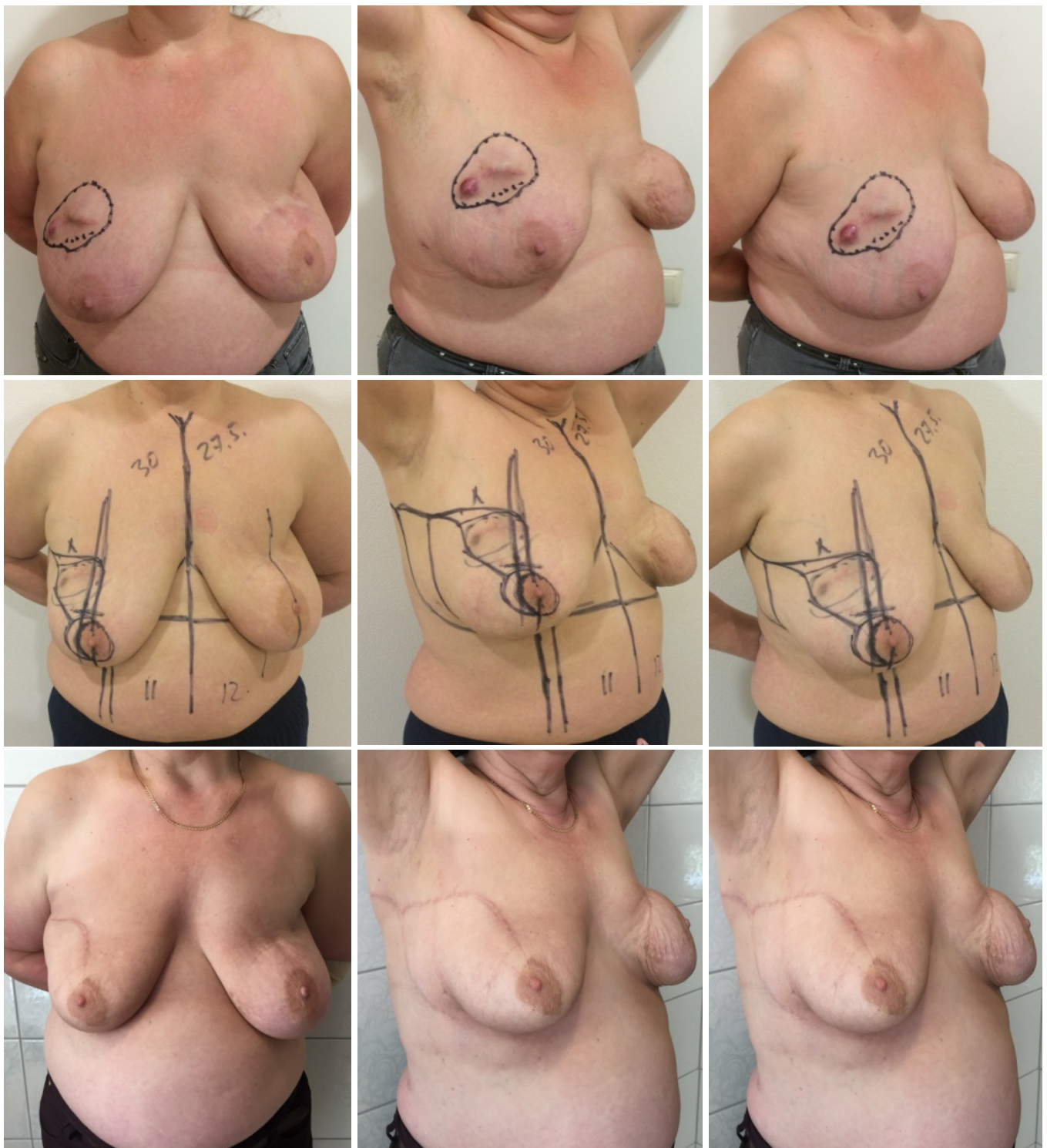


Figure 16 Patient with local recurrence after bilateral wide local excision (performed elsewhere). Preoperative photos before neoadjuvant chemotherapy, postoperative photos after 17 months. Weight of specimen—268 g.

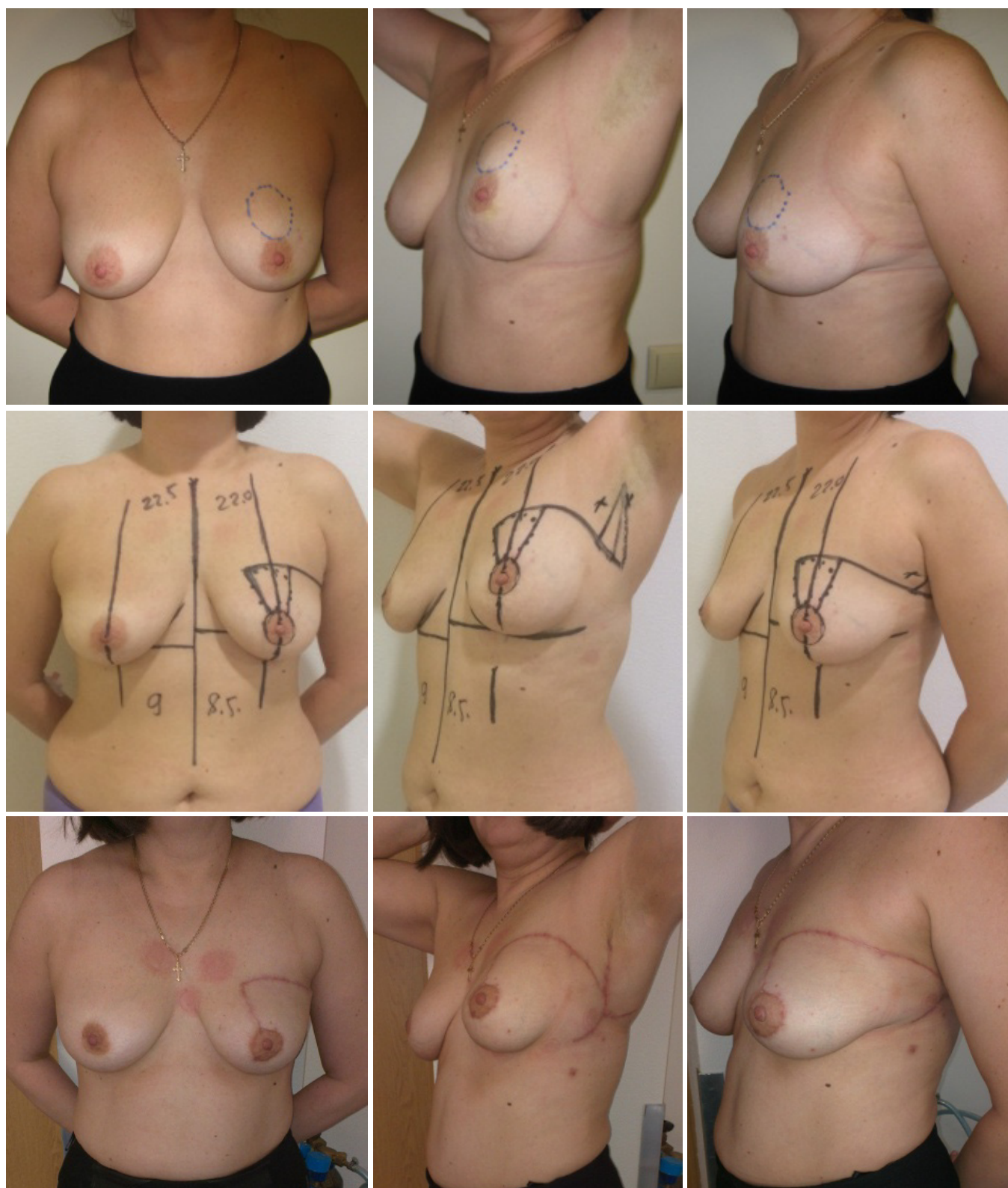


Figure 17 Patient case with the rotation advancement flap, tumor in the central cranial part of the breast: preoperative, marking and postoperative (4 months) photos. Weight of specimen—94 g.

The complexity of this procedure is intermediate. It could be done by surgeons familiar with the therapeutic mammoplasty but not with island perforator flaps, such as LICAP or TDAP. Due to the wide base of the flap, a total flap necrosis is unlikely but partial marginal necrosis may occur due to aggressive tissue mobilization with the damage of the perforator vessels. We consider the proposed method more reliable and safe compared to the perforator island flap techniques, a consideration for younger surgeons. On the other hand, this technique has several disadvantages. These include the visible scars in the upper outer part of the breast (yet not in the décolleté area). Further, in larger tumors or in those located below the NAC level, this technique may cause a breast deformity (such as shown on *Figure 14*), which, however, can be corrected by fat grafting. Finally, like in any other type of breast conserving surgery, there are some reservations for the postradiation changes in the breast shape after rotation advancement flap procedure.

Our first experience with this method has been previously presented at the ESSO congresses (16,17) and the ORBS meeting (18).

Conclusions

We have proposed a novel technique of the rotation advancement flap in breast conserving surgery. This technique is reliable and allows correcting the deformities and significant volume loss. It may provide with an excellent aesthetic result and is considered a safe alternative (transition procedure) to more complex operations as island perforator flaps.

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Footnote

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/abs.2018.01.02>). AZ reports in addition, AZ has a patent (19) UA (11) 119416 (13) U (51) MПК (2017.01) A61B 17/00 issued. VP reports in addition, VP has a patent (19) UA (11) 119416 (13) U (51) MПК (2017.01) A61B 17/00 issued. DU has no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). This is a retrospective analysis and evaluation of the novel modification of a surgical technique to reconstruct the breast after tumor removal during breast conserving surgery. All study participants signed the preoperative informed consent. The article was approved by the ethical committee of the LISOD Hospital of Israeli Oncology, where all the surgeries have been performed.

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