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ORIGINAL ARTICLE BREAST SURGERY

Breast Reduction Using the Superomedial Pedicle- and Septal Perforator-Based Technique: Our Clinical Experience

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Abstract

Background Adequate tissue removal must be performed for symptom relief following reduction mammoplasty. However, this is not always possible in patients with gigantomastia because the pedicle is planned wider and the breast cannot be sufficiently reduced to prevent compromising the blood supply to the pedicle. To maximize blood circulation to the nipple–areola complex in our patients, the pedicle was planned to include the internal thoracic artery branches coming from both the second and third interspaces and the intercostal artery branches coming from the fourth and fifth intercostal spaces.

Methods A total of 185 patients underwent reduction mammoplasty with the superomedial pedicle- and septal perforator-based technique. The mean weight of excised tissue was 928.77 g from the right breast and 899.92 g from the left, whereas the mean distance of nipple–areola transfer was 11.52 cm on the right breast and 11.27 cm on the left.

Results Complications developed in 11 patients (5.94%): hematoma occurred in three patients, partial loss of areola and fat necrosis in five patients, and wound dehiscence in three patients.

Conclusions The pedicle included vessels of both superomedial and septum origin without any disruption in circulation. Consequently, the blood supply of the nipple–areola complex was preserved. Furthermore, in cases where the pedicle was long, intercostal perforators were identified and the pedicle was narrowed thoroughly; thus, the breast was reduced to the desired volume while minimizing the risk of complications.

Level of Evidence IV This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266.

Keywords Reduction mammoplasty · Breast reduction · Superomedial pedicle technique · Septal perforator technique · Gigantomastia

Introduction

Heavy breasts cause neck, back, and breast pain; grooves from the pressure of brassiere straps; and maceration in the inframammary fold. Breast tissue must be sufficiently reduced to relieve almost all symptoms related to heavy breasts, while ensuring sufficient blood supply to the nipple–areola complex. However, this is not always possible, especially in patients with gigantomastia, as the pedicle is planned wider so as not to disrupt the blood flow to the nipple–areola complex.

Strombeck first introduced the concept of a dermoglandular pedicle, in which the nipple–areola complex was transferred via a pedicle including dermal and

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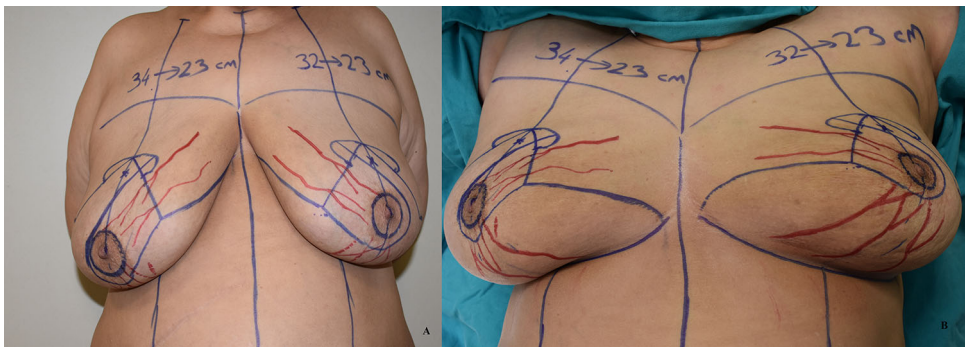

Fig. 1 The pedicle was planned to include both the perforator branches of the internal mammary artery and the intercostal perforators

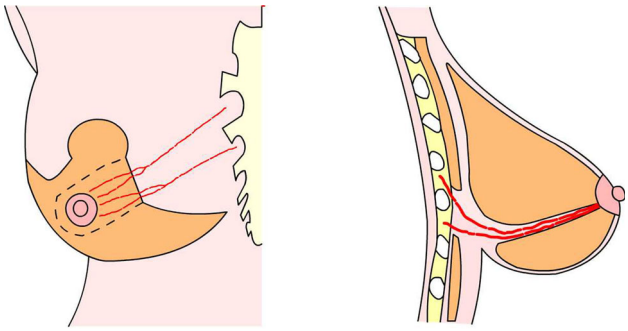

Fig. 2 Schematic diagram showing the blood supply achieved with the superomedial pedicle- and septal perforator-based mammoplasty reduction technique

subcutaneous tissue [1]. Then, single superior dermal, superomedial dermoglandular, and medial pedicle techniques were described [2–6]. Würinger et al. identified a thin horizontal septum dividing the glandular tissue into cranial and caudal parts. The septum arises from the pectoral fascia at the level of the fifth rib and divides the gland into cranial and caudal parts. The septum carries intercostal perforators and the main nerve supply to the nipple–areola complex [7]. The septum-based technique for reduction mammoplasty was first defined by Hamdi et al. [8]. They used a lateral or medial pedicle based on Würinger's horizontal septum.

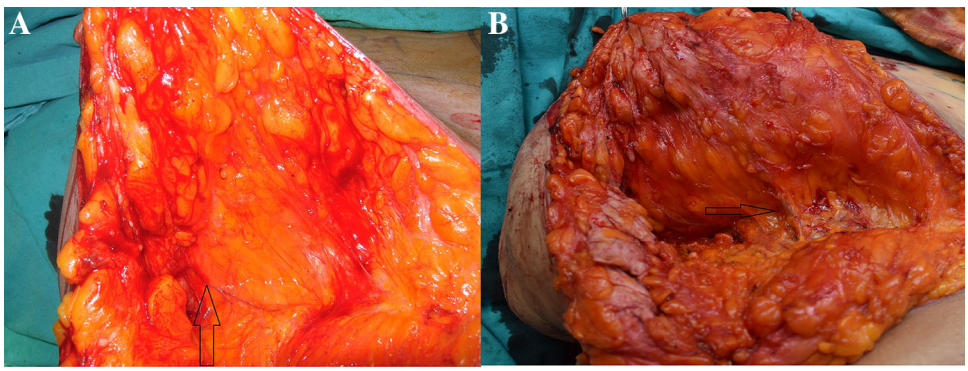

Fig. 3 Perforator vessels coming from the fourth and fifth interspaces course toward the nipple–areola complex

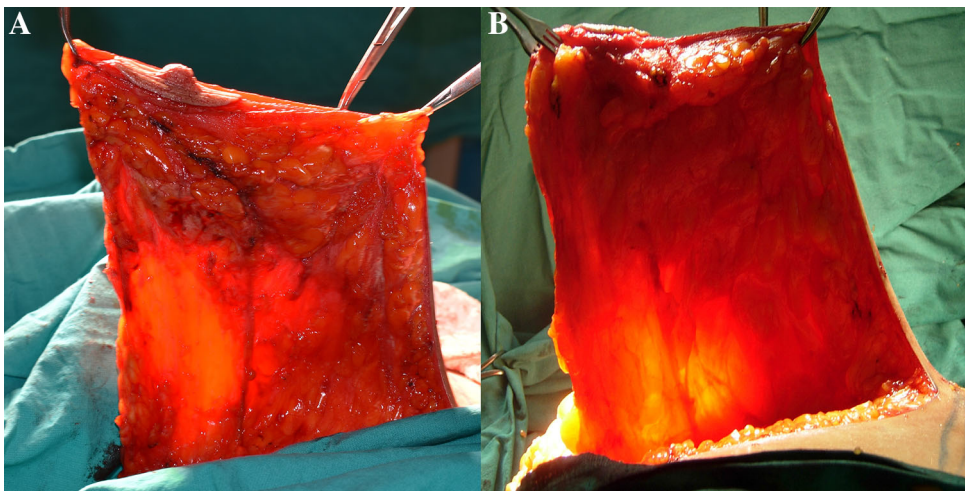

Fig. 4 The perforating vessels in the septum can be distinguished by translucency

Fig. 5 Lateral view of the pedicle. The superficial part of the pedicle is wide, as the pedicle was thinned to consist only of the perforating vessels and the septum at the base

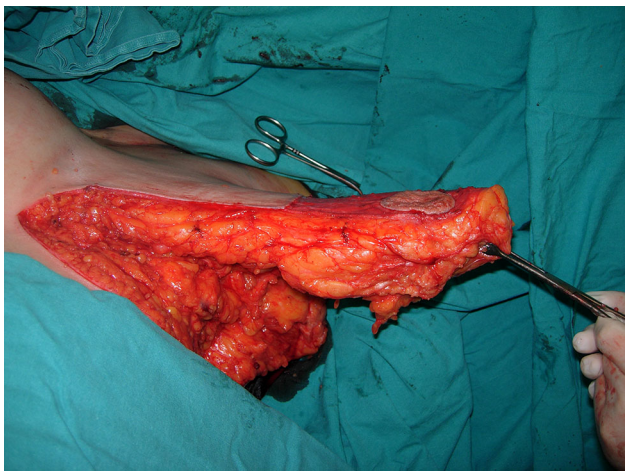

Fig. 6 Intraoperative view of reduction mammoplasty with the superomedial pedicle, including perforating vessels coming only from the internal thoracic artery. The septum and vessels within were not preserved

Since 2011, pedicles have been planned to supply arteries coming from both the superomedial dermoglandular region and Würinger's septum, to increase blood supply to the nipple and areola complex. This retrospective study documents our experience with the superomedial pedicle- and septal perforator-based mammoplasty reduction technique, based on 185 patients.

Materials and Methods

Preoperative Markings

A midline extending from the suprasternal notch to the xiphoid, a breast meridian dividing each breast vertically into two parts, and inframammary folds were marked while the patients were standing. Projection of the inframammary fold on the breast meridian was marked as the new position of the nipple. The upper border of the areola was marked 2 cm superior to this spot. Afterward, the breast was first pulled to the medial side and next to the lateral side, and two vertical lines were drawn downward from this spot to form vertical pillars. Thus, a triangle was formed on each breast. A point 4.5 cm from the apex was marked on each limb of the triangle, and these two points were joined at the apex of the triangle with arcs to form a mosque dome shape. The vertical pillars on the triangle limbs were planned to be 6 cm, and the ends of the pillars were joined with the line in the inframammary fold to form an inverted T-scar. The pedicle was marked 2 cm inferior from the apex of the new nipple–areola complex position, passing around the nipple–areola complex to the corner of the medial vertical limb (Fig. 1). Thus, both septal intercostal

Table 1 Patient demographics, breast measurements, and resection weights

	Value
No. of patients	185
Anesthesia (no. of patients)	
Epidural	25
General	160
Age (years)	
Mean	41.42
Range	17–66
Suprasternal notch-to-nipple distance (cm)	
Right	32.99
Left	32.72
Distance of pedicle transfer	
Right	11.52
Left	11.27
Weight of resection per breast (g)	
Right	928.77
Left	899.92

Table 2 Complications

Complication	No. of patients	%
Hematoma	3	1.62
Seroma	0	0
Infection	0	0
Wound breakdown	3	1.62
Nipple–areola necrosis	5	2.70
Partial	5	2.70
Complete	0	0

Fig. 7 A 52-year-old patient before (**a**, **c**) and 3 years after (**b**, **d**) resection of 1650 g from the left breast and 1550 g from the right

perforators and the internal thoracic artery were included in the pedicle (Fig. 2).

Surgical Technique

The patients were operated on under general or epidural anesthesia. A local anesthetic solution was injected into the intended lines of the incision, excluding the pedicle. After passing through the skin of the inframammary fold with a scalpel, the incision was extended down to the muscle fascia with monopolar cautery. Then, the inferior border of the pedicle was incised. The septum was observed on the inferior side of the pedicle. The incision was continued up to the muscle fascia, preserving the intercostal perforators in the septum (Fig. 3). The septum was detected especially easily in patients with breasts rich in fat. In patients who lost weight, the septum displayed rather large vessels. Some adipose tissue was left on the muscle fascia, and the tissue to be excised was lifted from the medial toward the lateral side. Perforators were identified, and a lateral incision of the pedicle was completed, leaving 1 cm of de-epithelized tissue around the areola. The superior incision of the pedicle was then made. The pedicle width was narrowed to 1 cm at the base to significantly reduce especially large breasts (Figs. 4, 5). Next, superior and inferior tissues were excised as a whole. In addition to the internal thoracic artery, we also added the vessels coming from the septum to the pedicle (Fig. 6). The areola was set in place following hemostasis. First, the inferior edge of the areola, and then an edge of the T, were attached with temporary sutures. Gaps between the sutures were closed with deep dermal sutures, and incisions were repaired with running subcuticular sutures.

Results

Between 2011 and 2015, 185 patients underwent surgery using a superomedial pedicle- and septal perforator-based technique. The vertical scar technique was used with 21 patients, and the T-scar technique was used with the rest. In five patients requiring a nipple–areola complex elevation exceeding 15 cm, a free nipple graft technique was preferred; these five patients are not included in this study. The mean excised weight was 928.77 g from the right breast and 899.92 g from the left. The mean operation time was 128 min (range 65–195 min; Table 1). No patient experienced any vascular problems that might have required an intraoperative free nipple graft technique. Routinely, a single drain was placed in each breast, except

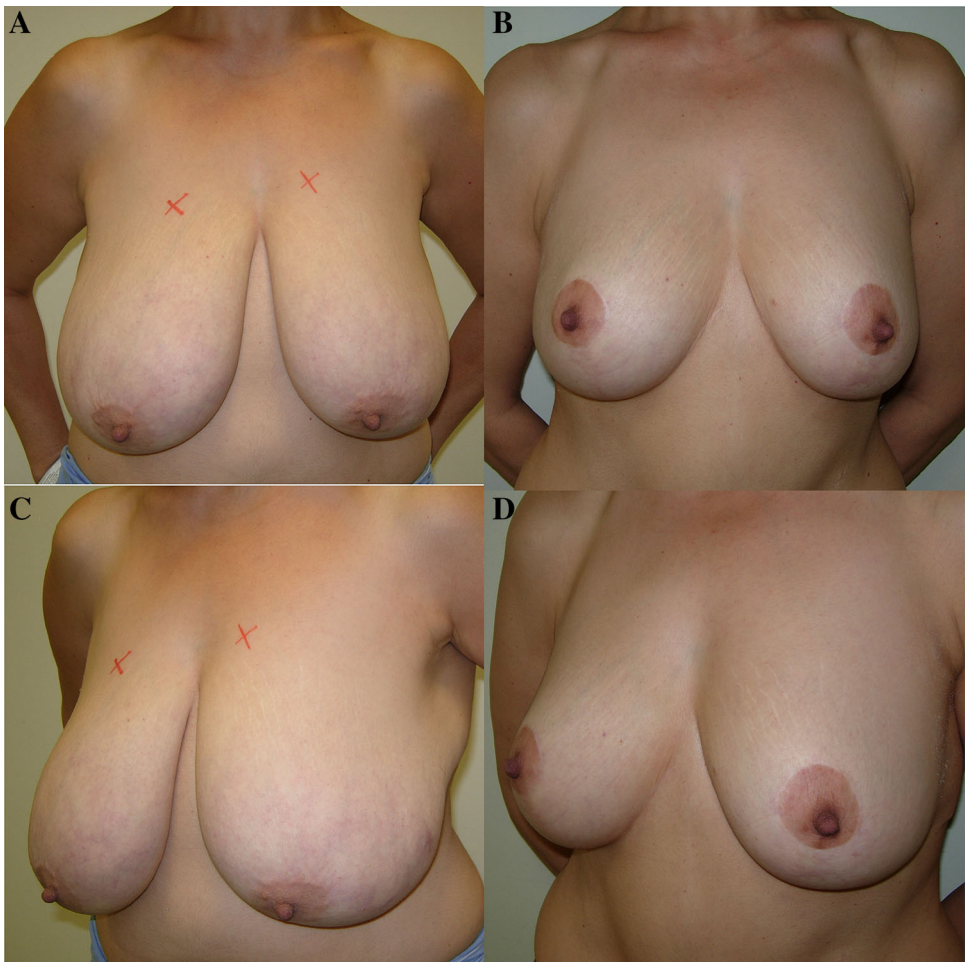

Fig. 8 A 53-year-old female, shown before (**a**, **c**) and 1 year after surgery (**b**, **d**). The amount of breast tissue removed was 550 g from the right breast and 400 g from the left

for one patient who had two drains placed in each breast because reduction mammoplasty and accessory breast excision operations were performed within the same session. The drains were removed on the second postoperative day in most patients, and the patients were discharged thereafter.

Complications developed in 11 patients (5.94%). During the postoperative period, unilateral breast hematoma developed in three patients, and urgent reoperation was performed. Partial loss of the nipple–areola complex and fat necrosis were observed in both breasts of two patients and in a single breast of three patients. Wound dehiscence requiring surgical correction was observed in three patients (Table 2).

Discussion

The breast cannot always be reduced to the desired extent, especially in cases in which the pedicle of the breast is too long. A longer pedicle needs to be wider to prevent disruption of the blood supply to the nipple–areola complex, and this results in insufficient breast reduction. One of the most troubling complications of breast reduction surgery is the loss of the nipple–areola complex. Therefore, pedicle blood supply is crucial (Figs. 7, 8, 9, 10).

Blood supply to the breast comes from the internal mammary artery, the highest thoracic artery, the anterior and posterior branches of the intercostal arteries, the thoracoacromial artery, the superficial thoracic artery, and the lateral thoracic artery [7–13]. Breast reduction techniques are planned so that the pedicle includes one of these arteries [9]. The superomedial pedicle probably has the most reliable vasculature. Branches from the lateral thoracic artery and anterior intercostal arteries may not supply the nipple–areola complex, but the nipple–areola complex always receives one or more perforating branches from the internal thoracic artery [12].

Hamdi et al. defined septum-based mammoplasty using the information on the horizontal septum provided by Würinger [8]. Mojallal et al. [14] combined the superior dermal pedicle and posterior vascular pedicle. In addition to glandular pedicle techniques, the septum-based mammoplasty technique preserves the sensitivity of the nipple–

Fig. 9 A 52-year-old female, shown before (**a**, **c**) and 2 years after surgery (**b**, **d**). The amount breast tissue removed was 1400 g from the right breast and 1440 g from the left

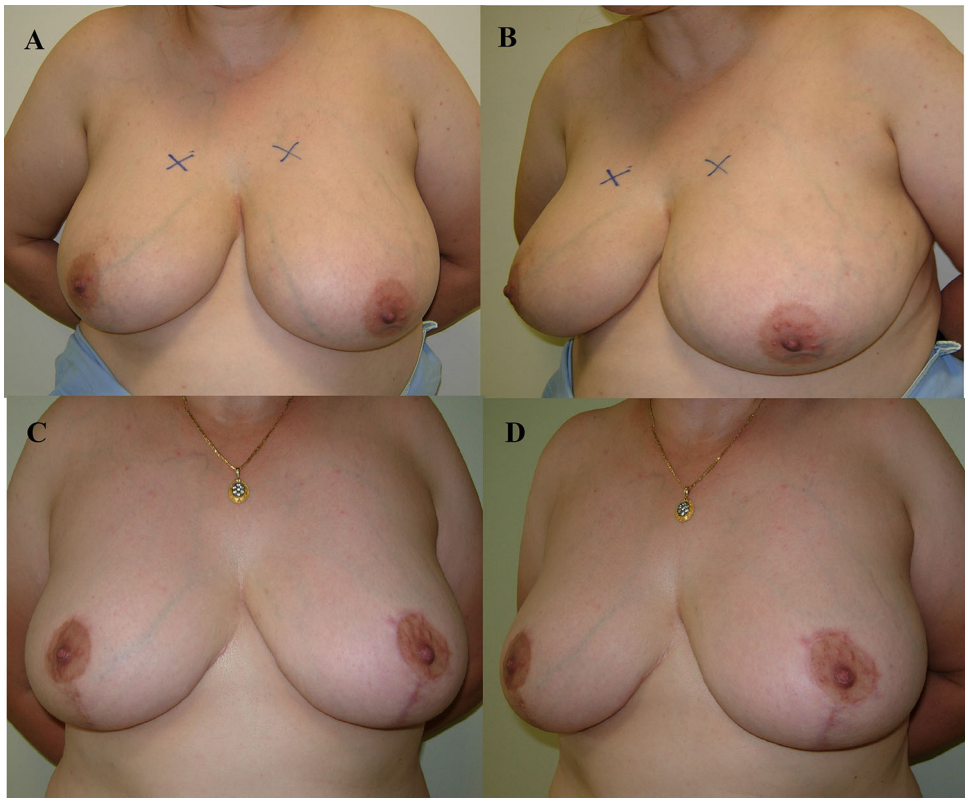

Fig. 10 A 44-year-old female patient with breast asymmetry (**a**, **b**). The same patient 12 months after breast reduction: 750 g was resected from the right breast and 850 g from the left (**c**, **d**)

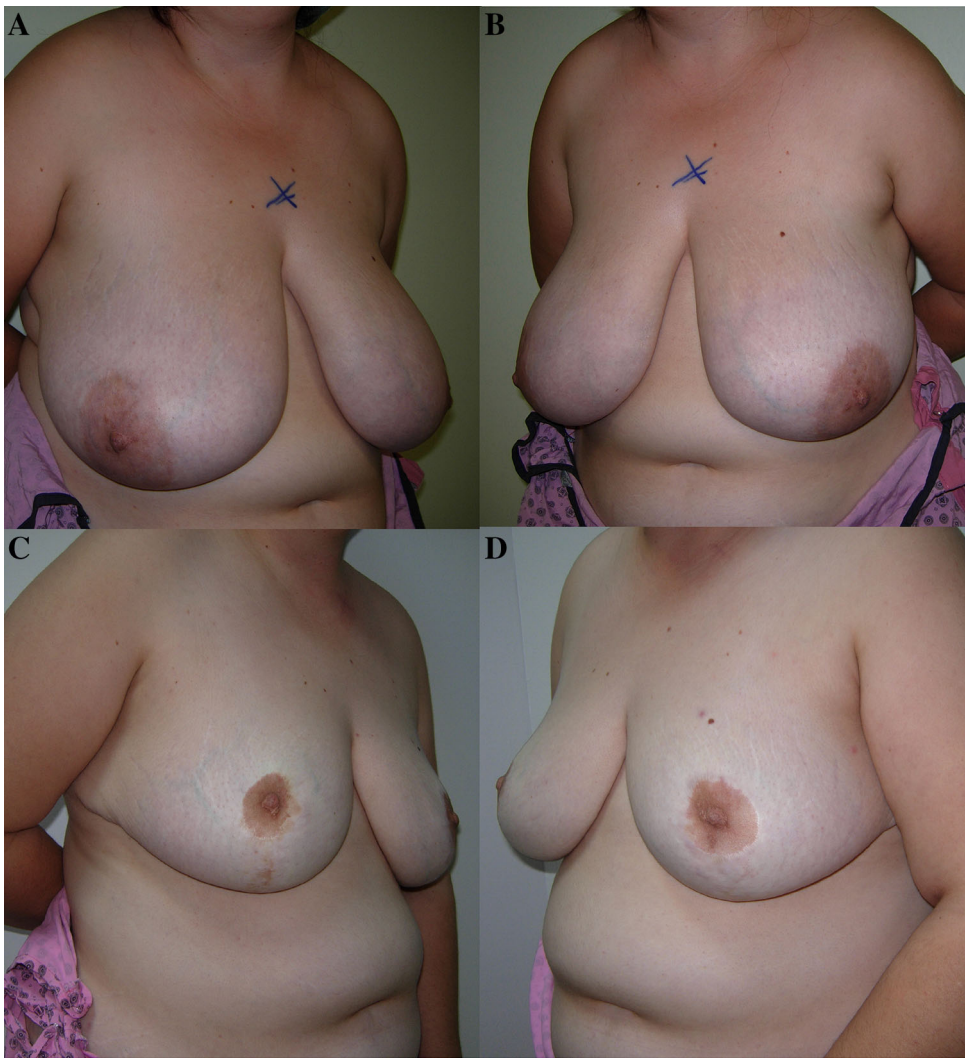

Fig. 11 A 33-year-old female patient with severe mammary hypertrophy and a lateralized nipple–areola complex (**a**, **b**). In this patient, 1075 g of tissue was removed from the right breast and 1035 g from the left breast. Postoperative view at 2 years with centralization of the nipple–areola complex (**c**, **d**)

areola complex and enhances the blood supply to the pedicle by including intercostal perforators in the pedicle.

One or two perforator vessels that originate from the internal mammary artery in the second–fourth intercostal spaces were identified. The vessels run within the superficial subcutaneous tissue to the nipple–areola complex after piercing the pectoral fascia. Intercostal perforators that participate in the blood supply to the nipple–areola complex were found at the fourth and fifth intercostal spaces inferior to the nipple–areola complex [9].

As described by Hall-Findlay [15], in the patients involved in our study, the pedicle included the entire medial pillar and the inferomedial half of the new areolar marking, to avoid disruption of the internal mammary artery and thereby constitute a true superomedial pedicle technique. The pedicle was planned wide enough to include these vessels, so Doppler was not needed to detect the vessels.

The pedicle was then thinned out from both sides downward to the base, with the superficial part left wider because the perforator vessels that originate from the internal mammary artery run in a superficial plane an average of 1 cm under the skin surface [16]. Septocutaneous perforators were recognized, and all of the perforators coursing through the septum to the nipple–areola were discerned and preserved. Thus, the pedicles maintained the blood supply from the perforators of the internal mammary artery and the perforating branches of the anterior intercostal artery (Fig. 1).

Varying rates of complications have been reported with the superomedial pedicle technique [17–21]. The incidence of major ischemic complications was lower in our study compared to previous ones. Lugo et al. reported a 10.5%

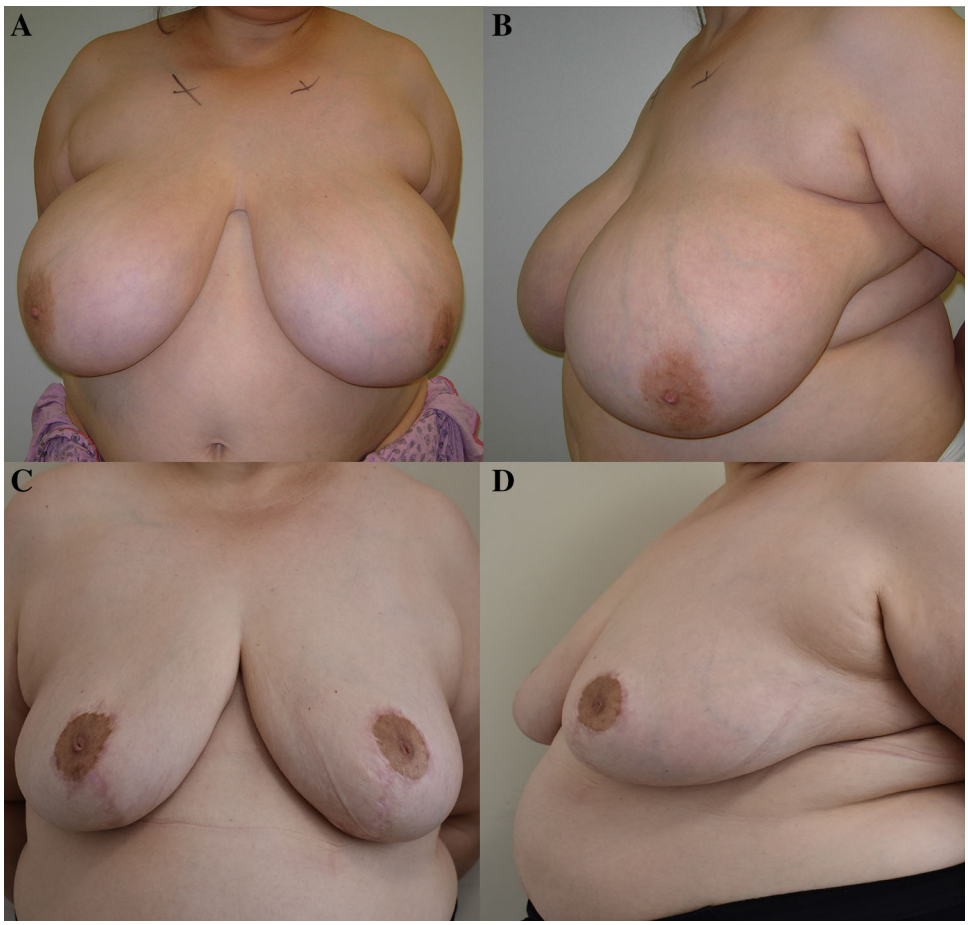

Fig. 12 A 39-year-old female patient with severe mammary hypertrophy and highly lateralized areola when standing (**a**, **b**). In this patient, 1900 g of tissue was removed from the right breast and 1800 g from the left breast. Migration of the nipple–areola complex was 12.5 cm for the right breast and 15 cm for the left breast. Postoperative views at 18 months (**c**, **d**)

incidence of partial necrosis of the nipple–areola complex [18], while such necrosis developed in five (2.7%) of the patients in the current study. These losses were healed with secondary intention. Landau and Hudson determined rates of 6.5% of partial areola necrosis and 18% of T-junction breakdown in gigantomastia cases [19]. In this study, major T-junction wound dehiscence was observed in three (1.6%) patients, who required reoperation. One of the patients who developed T-junction wound dehiscence was a smoker.

Hamdi et al. encountered partial areola and total areola necrosis in two patients using a septum-based mammoplasty technique [8]. In our study, the frequency of nipple–areola necrosis was close to that of this study (2.7 vs. 2%). However, in our study, the mean nipple–areola elevation was 11.4 cm and the mean resection was 914 g, compared to respective values of 9 cm and 658 g in the previous study.

The addition of Würinger's septum to the inferior pedicled technique lowered the rate of nipple–areola complex vascular complications. With the inferocentral pedicled breast reduction technique enhanced by Würinger's septum and inferior pedicled breast reduction mammoplasty, the nipple–areola complex vascular complication rates were found to be, respectively, 6.2 and 24.2% [22]. However, these complication rates are still higher than those in our study and that of Hamdi et al. [8]. This result can be attributed to use of the superomedial pedicle, which includes the main blood supply to the nipple–areola complex.

Another important complication is numbness of the nipple–areola complex. Varying degrees of numbness in the nipple–areola complex have been reported following reduction mammoplasty [23, 24]. Numbness of the nipple–areola complex was observed only in patients who had partial nipple–areola necrosis in this study. However, it should be noted that objective tests for assessing the degree of numbness were not performed. This preservation of sensitivity can be attributed to protection of the sensitive nerves inside the septum, together with septal perforators.

When the mass of tissue resected from the breast is larger, complication rates are higher [25, 26]. More than 1000 g of tissue was excised from at least one breast in 75

patients in this study. Among these patients, the average amount of tissue excised from the right breast was 1201 versus 1187 g from the left. Nonetheless, only five of these patients suffered partial necrosis, and three suffered T-junction breakdown in the nipple–areola complex. We discovered that the dual circulation achieved with this technique reduced complications due to decreased perfusion, especially in patients with gigantomastia (Figs. 7, 9, 11, 12).

Conclusion

This study showed that inclusion of both the perforator branches of the internal mammary artery and the intercostal perforators makes the pedicle safer. The pedicle was thinned out safely for sufficient excision by preserving the intercostal perforators, especially in patients with large breasts. Once the perforator vessels coursing through the septum toward the nipple–areola complex are discerned, the surgeon can assume that vascular compromise of the nipple–areola is minimized.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflicts of interests.

Ethical Standards All procedures performed in studies involving human participants were undertaken in accordance with ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed Consent For this type of study formal consent is not required.

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