Vertical Scar Reduction Mammaplasty Using the Superomedial-Based Pedicle Technique in Gigantomastia

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Background: Breast reduction surgery has witnessed significant advancements in recent years; however, it continues to pose challenges for both surgeons and patients when dealing with cases involving excessive breast volume and severe breast ptosis. This study aimed to assess the aesthetic outcomes and the impact on the quality of life, as measured by the BREAST-Q questionnaire, in patients with gigantomastia and severe breast ptosis who underwent reduction mammaplasty using the superomedial-based pedicle technique.

Methods: We present a retrospective series comprising 84 patients who underwent reduction mammoplasty utilizing the superomedial pedicle technique. The surgical resections exceeded 1 kg per breast, with a mean resection weight of 1506.58 g (right breast) and 1500.32 g (left breast). The preoperative mean suprasternal notch to nipple distance measured 40.50 cm (right breast) and 40.38 cm (left breast). Postoperatively, the patients were followed up for a minimum of 6 months. Both preoperative and postoperative BREAST-Q surveys were administered to the participants, and scores were analyzed using descriptive statistics.

Results: Complications were observed in 3 patients (3.57%), characterized by partial loss of the areola, which resolved spontaneously over time. Additionally, 2 cases of hematoma and 2 instances of minor delayed wound healing were reported. All patients expressed satisfaction with their aesthetic outcomes, as they achieved a natural breast shape and minimal scarring, along with symptomatic relief.

Conclusions: The superomedial pedicle reduction mammaplasty technique has demonstrated its ability to produce satisfactory aesthetic outcomes and long-term benefits in patients with excessively large breasts. Careful patient selection and postoperative management are vital for achieving optimal results. Further investigations involving larger sample sizes and longer follow-up periods are warranted to validate our findings.

Level of Evidence: IV.

Key Words: gigantomastia, mammoplasty, breast reduction, superomedial pedicle, breast reduction, vertical scar mammaplasty

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Gigantomastia and severe breast ptosis are medical conditions that can have significant physical and psychological implications for women. The excess breast tissue in these conditions often leads to drooping breasts, neck and back pain, skin rashes, and can severely impact the patient's physical and psychosocial well-being. Vertical scar reduction mammaplasty has emerged as a surgical approach for breast reduction, aiming to preserve the medial breast tissue, create a natural breast shape, and minimize scarring. While the superomedial pedicle with vertical scar reduction technique has shown efficacy in small and medium volume reductions, there has been reluctance among some surgeons to apply this technique for large-volume reduction mammoplasties. Concerns have been raised regarding increased complication rates with higher resection volumes.[1–3] Consequently, many authors still favor the "free nipple" technique.[4] However, this technique has its drawbacks, including flattened and insensitive nipples. Additionally, incomplete graft integration can result in irregular pigmentation, which is particularly noticeable in patients with darker skin tones. Despite the technique not being novel, the optimal reduction mass that ensures desirable outcomes remains uncertain.

This study aims to provide a comprehensive analysis of the superomedial-based pedicle technique for the treatment of macromastia. We present our experience with this surgical approach, focusing on the surgical technique itself, the assessment of aesthetic outcomes, and the impact on quality of life as measured by the BREAST-Q questionnaire. Our objective is to offer an extensive overview of the superomedial-based pedicle technique and its potential advantages in addressing the challenges associated with large-volume breast reduction.

METHODS

A retrospective analysis was carried out to investigate the outcomes of vertical scar reduction mammaplasty utilizing the superomedial-based pedicle technique.

Surgical Technique

Preoperative marking for bilateral reduction mammaplasty using the superomedial-based pedicle technique is performed in the surgical holding area. The patient is positioned in a standing posture with relaxed arms by their sides. The midline of the chest and the inframammary creases are carefully marked. To establish the central axis of the breast, a straight line is drawn from the midpoint of the clavicle, passing through the nipple and intersecting with the inframammary crease. With 1 hand inserted behind the breast up to the level of the inframammary crease, the corresponding point is projected anteriorly onto the breast surface and designated as point A, representing the superior boundary of the new nipple-areolar complex (NAC). Point A is then transferred to the contralateral breast instead of relying on the contralateral inframammary crease. This adjustment accounts for potential asymmetries in the height of the inframammary crease, which can lead to postoperative asymmetry in the NAC position. The new location of the nipple is marked as Point B, shifted downward by 2 cm. The inferior limit of the planned skin excision is marked as point D, positioned above the inframammary crease and determined based on the desired extent of reduction. Larger reductions necessitate a longer distance (greater movement of the inframammary crease). The technique employed in this study utilizes a mosque dome pattern. The roof of the mosque dome is delineated by curving lines extending from point A to points C and C′, which define the borders of the new NAC. The roof is drawn to ensure that when points C and C′ are approximated and the breast is coned, the resulting shape will resemble a circle. The vertical limbs of the mosque dome pattern are created by extending curved lines from point D to points C and C′, outlining the margins of the planned skin excision (Fig. 1).

Surgery is performed using a full general anesthetic, and xylocaine with epinephrine is infiltrated into the base of each breast.

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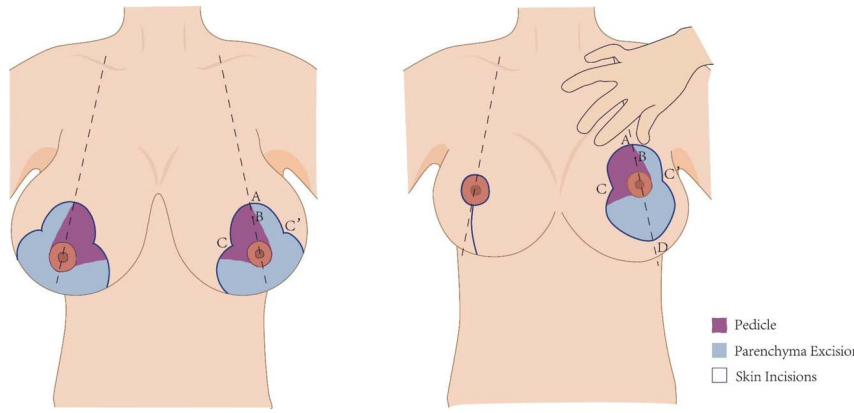

FIGURE 1. The skin marking technique employed in the Mosque Dome method involves the identification of specific points. Point A corresponds to the position where the anterior projection of the inframammary crease intersects the breast. This point will serve as the new superior border location for the areola. Point B indicates the revised placement of the nipple. Point D represents the lower boundary of the skin excision. Specifically, it is situated 2–4 cm above the inframammary crease along the central axis of the breast.

The de-epithelialization of the superomedial pedicle (SMP) is accomplished using delicate long scissors. Subsequently, the surgeon proceeds to elevate the inferomedial, lateral, and superior lateral aspects of the breast adipocutaneous flaps. The inferomedial, inferior, inferolateral, lateral, and superolateral sections of the breast tissue are then excised en bloc, reaching just above the pectoralis fascia. The resulting SMP, which supplies blood to the NAC, is meticulously transposed to the predetermined superior position. The incision is temporarily secured using #7-0 nylon sutures. The same technique is then applied to the contralateral breast.

To achieve proper symmetry and extent of the reduction, the patient is positioned in a 90-degree sitting position for additional breast contouring. Intraoperatively, the excised breast tissue is weighed and subsequently submitted for pathological analysis. Hemostasis is diligently achieved, and the breast is thoroughly irrigated with a saline solution. Intradermal resorbable stitches and interrupted skin sutures are utilized to adapt the skin surrounding the areola. Layered closure of the incisions is carried out using absorbable sutures of 2-0 and 4-0 sizes, fortified by the application of Steri-Strips. Prior to skin closure, a drain is appropriately placed. A light gauze dressing is applied over the incisions, followed by the application of surgical abdominal pads. Upon completion of the procedure, the patient is awakened from anesthesia and transferred to the postanesthesia care unit for the recovery phase.

Data Collection

Demographic data, including age, body mass index (BMI), personal surgical history, diabetes history, and tobacco use, were extracted from electronic medical records encompassing preoperative clinic notes, pathology reports, and postoperative clinic notes. Essential breast measurements, such as preoperative and postoperative suprasternal notch-to-nipple distance, were documented. Information regarding specimen reduction weight and final histopathology was obtained from the pathology reports. Comprehensive review of postoperative visits was conducted to identify and record any recorded complications. These complications encompassed postoperative seroma, hematoma, infection, delayed wound healing, partial nipple necrosis, full nipple necrosis, and skin flap necrosis.

All individuals who underwent consultation for breast reduction surgery, performed exclusively by the senior author (Z.X.Z.), during the period of January 2020 to December 2022, were invited to participate in this study. As part of the data collection process, these patients were requested to complete the BREAST-Q surveys both prior to the operation, which took place within 24 hours of surgery, and during the 6-month postoperative visit.

Descriptive and summary statistics were employed to conduct the statistical analysis, aiming to establish measures of central tendency. To assess the BREAST-Q scores, the Q-score program was utilized, which involved converting the original survey scores ranging from 1 through 4 or 5 to continuous scores ranging from 0 to 100. Higher scores indicated increased satisfaction, more frequent symptoms, or stronger agreement with specific statements. An unpaired t test was conducted to evaluate the significance of changes in mean scores for satisfaction with breast appearance, psychosocial well-being, sexual well-being, and physical well-being between the preoperative and postoperative surveys. A threshold of $P < 0.05$ was set to determine statistical significance.

RESULTS

The superomedial pedicle technique for NAC reconstruction was uniformly employed in all 84 patients included in the study. The age range of the patients varied from 18 to 59 years, with a mean age of 39.35 years. Body mass index values ranged from 26.1 to 37.8 kg/m^2, with a mean BMI of 31.61 kg/m^2. Among the cohort, six patients had a history of diabetes. Preoperatively, the mean suprasternal notch to nipple (SN-N) distance measured 40.50 cm (range: 36-44 cm) on the right side and 40.38 cm (range: 36-44 cm) on the left side. The excised weight of breast tissue ranged from 1055 g to 1947 g on the right side and 1024 g to 1950 g on the left side, with a mean value of 1500.32 g (Table 1). Postoperatively, all patients expressed overall satisfaction with the aesthetic outcomes of the procedure and reported relief from their preexisting back pain. Sensation was preserved in 163 breasts, while partial loss of sensation was observed in 5 breasts from 3 patients.

The complications encountered were minor in nature and exhibited self-limiting characteristics. Notably, there were no instances of complete loss of the nipple-areola complex. Hematoma occurred in three breasts among 2 patients, and these cases were effectively managed through conservative measures. Additionally, 2 patients experienced minor delayed wound healing, requiring dressing changes for less than 1 month, while 1 breast necessitated more than a month of dressing changes (Table 2).

Statistically significant enhancements were observed in the mean scores of all 4 assessed categories between the prereduction and postreduction surveys, namely, satisfaction with breast appearance, psychosocial well-being, sexual well-being, and physical well-being. Specifically, satisfaction with breast appearance exhibited a marked

TABLE 1. Demographic Data and Descriptive Statistics

	No. Patients (%)	Minimum	Maximum	Mean	Standard Deviation
Age, years		18	59	39.35	11.65
BMI presurgery, kg/m^2		26.1	37.8	31.61	3.74
BMI postsurgery, kg/m^2		22.9	36	29.18	3.71
Comorbidity					
DM history	6 (7.14%)				
Hypertension history	8 (9.52%)				
Smoking history	7 (8.33%)				
Back pain	84 (100%)				
Breast enlargement period					
Adolescence period	29 (34.52%)				
After pregnancy	44 (52.38%)				
Postmenopausal period	11 (13.09%)				
Patient's posture					
Normal	69 (82.14%)				
Kyphotic posture	15 (17.86%)				
Hospital stay (days)		3	7	4.77	1.29
Follow-up (months)		6	12	9.07	2.09
Preoperative Suprasternal notch-to-nipple distance (cm)					
Right		36	44	40.50	2.63
Left		36	44	40.38	2.42
Postoperative Suprasternal notch-to-nipple distance (cm)					
Right		20	24	22.14	1.53
Left		20	24	21.95	1.51
Mass of reduction per breast (g)					
Right		1055	1947	1506.58	267.52
Left		1024	1950	1500.32	275.48

improvement, with scores increasing from 21.01 ± 8.83 preoperatively to 79.43 ± 8.15 postoperatively ($P < 0.001$). Similarly, psychosocial well-being scores significantly increased from 32.19 ± 10.45 preoperatively to 82.71 ± 11.87 postoperatively ($P < 0.001$). Notably, sexual well-being experienced a substantial positive transformation, with scores rising from 35.19 ± 11.61 preoperatively to 76.96 ± 14.16 postoperatively ($P < 0.001$). Finally, remarkable improvements were observed in the category of physical well-being, as scores increased from 46.14 ± 9.60 preoperatively to 78.42 ± 6.14 postoperatively ($P < 0.001$) (see Fig. 2 and Table 3 for graphical representation and detailed results).

DISCUSSION

In recent decades, there has been a proliferation of breast reduction techniques. The primary aim of these procedures is to effectively address hypertrophic breasts by reducing their size, while ensuring proper repositioning of the skin envelope and preserving the viability of the NAC. As our understanding of breast anatomy has advanced and patient expectations for aesthetically favorable outcomes with minimal scarring have heightened, numerous surgeons have pioneered various techniques Figs. 3–7.

Although breast reduction surgery is a commonly performed procedure with an overall favorable safety profile, it is important to acknowledge the potential complications that can arise, particularly in patients with obesity. Previous studies have consistently shown an increased risk of surgical complications and tissue necrosis with higher degrees of obesity.[5–7] Traditionally, the Wise-pattern reduction technique has been the standard approach for patients with higher BMI. While this technique is known for its reproducibility, it does have certain limitations that can potentially be addressed by utilizing a short-scar reduction mammaplasty approach. Initially, the use of the short-scar technique was primarily limited to patients requiring smaller reductions. However, our study demonstrated that vertical pattern mammaplasty can be successfully performed in patients undergoing larger reductions (>1000 g) with minimal complications and favorable aesthetic outcomes (Figs. 3–7).

In cases of gigantomastic breasts, the significantly increased suprasternal notch-to-nipple areola complex (SNNAC) distance raises concerns about the vascular safety of the NAC. Previous studies have reported NAC necrosis rates of up to 7.3% in breast reduction and mastopexy procedures.[8] While traditional reduction mammaplasty techniques employing inferior, superior, medial, or lateral pedicles may

TABLE 2. Complications

Complication	No. Patients (%)
Hematoma	2 (2.38%)
Seroma	0
Infection	0
Wound breakdown	2 (2.38%)
Minor delayed wound healing	2 (2.38%)
Major delayed wound healing	0
Nipple-areola necrosis	0
Loss of areola	3 (3.57%)
Partial	3 (3.57%)
Complete	0

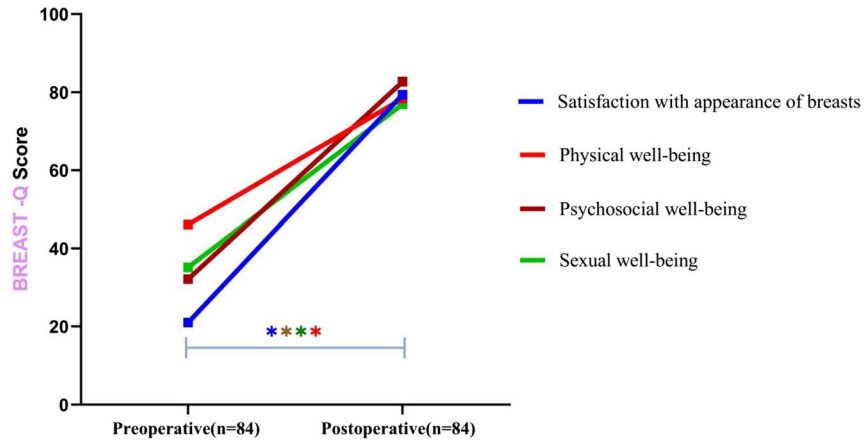

FIGURE 2. A significant improvement was observed in the BREAST-Q categories when comparing the preoperative and postoperative surveys. There was a notable increase in satisfaction with breast appearance, psychosocial well-being, sexual well-being, and physical well-being (*$P < 0.001$).

provide sufficient blood supply to the NAC in normal-sized breasts, they may not adequately accommodate the arterial flow and venous output needed for gigantomastia cases. Research conducted by Van Deventer et al on cadaver specimens revealed variations in the arterial blood supply to the breast, with potential partial or complete absence of branches despite the consistent presence of main sources such as the internal/lateral thoracic, anterior intercostal, and acromiothoracic arteries. Given this unpredictable anatomy and blood supply of the NAC, and to mitigate the risk of NAC loss, it has been recommended to employ a technique that incorporates branches from multiple sources.[9] To preserve the blood supply, the base of the superomedial pedicle is designed to maintain a width-to-length ratio of no less than 1:2. The superomedial pedicle is delineated with its base extending from the midpoint of the mosque dome roof to the medial blocking triangle, while maintaining a 2.5-cm border around the NAC. This allows for adequate vascularity while facilitating smooth rotation and proper placement of the NAC within the roof of the mosque dome. In our experience, the utilization of the superomedial pedicle is primarily reserved for cases of mammary hypertrophy with significant degrees of ptosis, requiring a greater transposition distance for the NAC. Notably, the axial blood supply to the superomedial pedicle has demonstrated greater reliability in such scenarios. Cadaveric studies have demonstrated that the superomedial-based pedicles capture the primary venous outflow of the nipple-areola complex, which directly drains into the internal mammary veins at the level of the second and third intercostal perforators.[3] Therefore, the superomedial pedicle, which includes these perforators, represents a favorable anatomical choice for preserving blood supply to the NAC.

Long-term sensory recovery following reduction mammaplasty varies among individuals. Regardless of whether sensation is increased or decreased immediately after the procedure, it tends to gradually return to a more normal state over time. Our experience suggests that sensation does not continue to deteriorate or become hypersensitive beyond the acute recovery period, which typically lasts around 8 weeks. While it may not be possible to salvage all innervation to the NAC during reduction mammoplasty due to the need for dissection in multiple breast quadrants, careful dissection in the region of primary nipple innervation, along with avoiding excessive tissue resection in superficial or deep planes, can result in better nipple sensation and improved patient satisfaction.

The superomedial pedicle demonstrates promising versatility and can be effectively utilized in conjunction with various skin reduction techniques. Additionally, the reliability and safety of the superomedial pedicle have been extensively documented in the literature. To mitigate the risk of NAC loss, it is crucial to ensure the inclusion of reliable arterial sources and maintain adequate venous drainage for the NAC. Preserving the fourth and fifth anterior intercostal perforators significantly enhances vascularization of the breast parenchyma and NAC.[10,11] The incorporation of a broad dermoglandular pedicle, in conjunction with the oblique design, facilitates a secure arc of rotation, effectively preventing kinking of the pedicle.

Inferior pedicle reduction mammoplasty has gained significant popularity, particularly in North America, as one of the most commonly employed techniques. However, a notable criticism of the inferior pedicle technique is the occurrence of the "bottoming-out" phenomenon and loss of breast projection, which poses considerable concerns for both patients and surgeons.[12] This issue becomes particularly pertinent in cases of gigantomastia, where the skin quality and elasticity are extensively compromised, potentially leading to sagging of breast tissue below the inframammary scar. The gradual lengthening of the vertical

TABLE 3. Results and Changes in the Preoperative and Postoperative Scores

Category	Preoperatively (n = 84)*	Postoperatively (n = 84)*	*P*
Satisfaction with appearance of breasts	21.01 ± 8.83	79.43 ± 8.15	<0.001
Psychosocial well-being	32.19 ± 10.45	82.71 ± 11.87	<0.001
Sexual well-being	35.19 ± 11.61	76.96 ± 14.16	<0.001
Physical well-being	46.14 ± 9.60	78.42 ± 6.14	<0.001

*Data are presented as mean score ± standard deviation. *P* = value of statistical significance.

FIGURE 3. The pedicle is de-epithelialized (A), and the resection outline is incised (B, intraoperative view after 1460 g was removed from the right breast).

infra-areolar scar, with maximum length observed in the inferior pedicle and minimum in the superior pedicle, has been attributed to this problem.

In the past, efforts have been made to minimize scar length and address the potential issue of dog-ear deformity at the inframammary fold (IMF) in vertical mammaplasty techniques. In our experience, Chinese patients generally do not express significant concerns regarding the inframammary scar as long as it is situated within the IMF and the region of maximal breast projection. Moreover, it is essential to prioritize the preservation of the aesthetic shape of the reduced breast rather than compromising it solely to achieve shorter scars. It is worth noting that delayed wound healing is not uncommon in cases of gigantomastia, and the literature reports overall complication rates of up to 36%.[13] Nonetheless, the current series demonstrates relatively low complication rates compared to existing literature on reduction mammaplasty for gigantomastia (Table 2).

Our study has demonstrated a significant reduction in pain following mammoplasty. Previous research by Spector and Karp et al also reported notable improvements in back pain with a reduction of less than 1000 g of breast tissue, indicating that even modest reductions can effectively alleviate musculoskeletal complications associated with macromastia.[14] The observed improvements in pain levels and posture following mammoplasty can be attributed to various factors. These include changes in body mass and redistribution of torso mass, which contribute to improved musculoskeletal dynamics. Our study findings corroborate the existing literature, highlighting a statistically significant improvement in physical, psychosocial, and sexual well-being following breast reduction surgery. Patients experience enhanced confidence and perceive themselves as more attractive and self-assured postoperatively.

One of the challenges encountered with the superomedial-based pedicle technique is its inherent complexity, particularly in cases of gigantomastia where there is a significant amount of breast tissue to be removed. This complexity requires a high level of surgical skill and experience to ensure optimal outcomes while minimizing complications such as inadequate tissue perfusion, nipple necrosis, or asymmetry. Despite our efforts to preserve nipple sensation through careful

FIGURE 4. The specimen resected from the right breast.

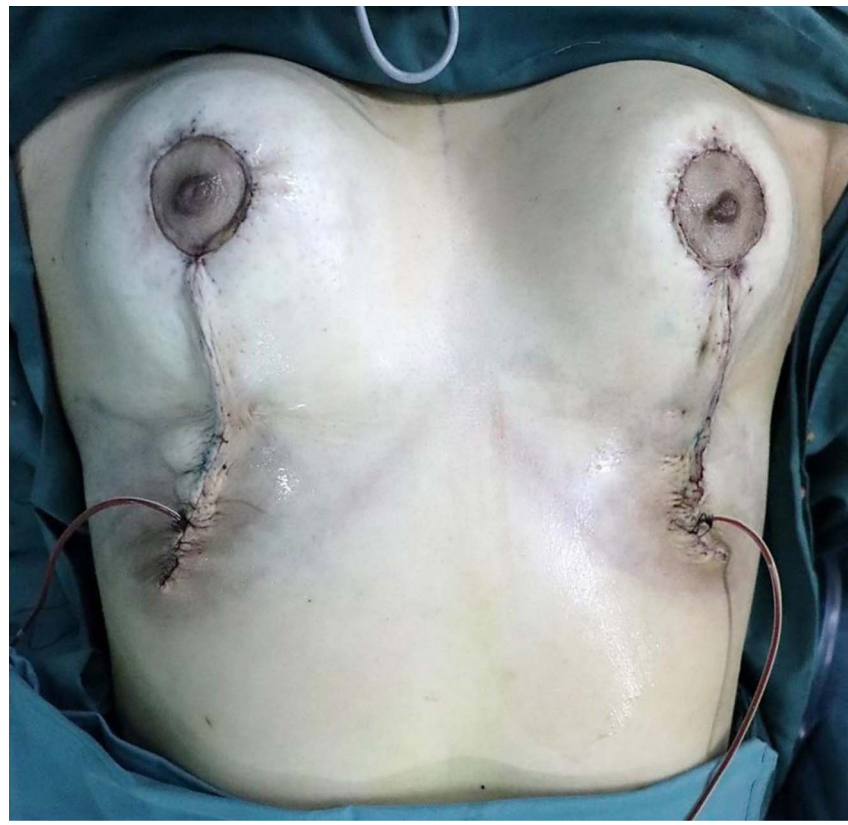

FIGURE 5. The appearance at the conclusion of the procedure is depicted. The superomedial pedicle is skillfully rotated into position, and the base of the areola is meticulously closed. The skin is effectively sutured using deep, buried, dermal sutures and a subcuticular gathering suture.

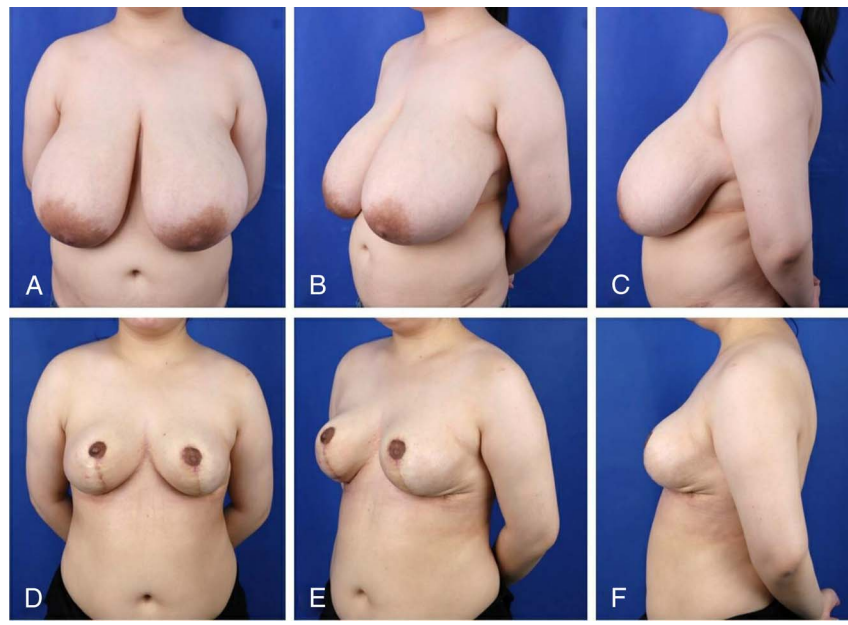

FIGURE 6. Prereduction and postreduction mammaplasty scenario employing the superomedial pedicle technique. Preoperative photographs of a 25-year-old patient afflicted with gigantomastia are juxtaposed with postoperative photographs taken 6 months after bilateral reduction mammaplasty using the aforementioned technique. The patient underwent a reduction of 1690 g (right) and 1670 g (left) from the breasts, leading to notable improvements.

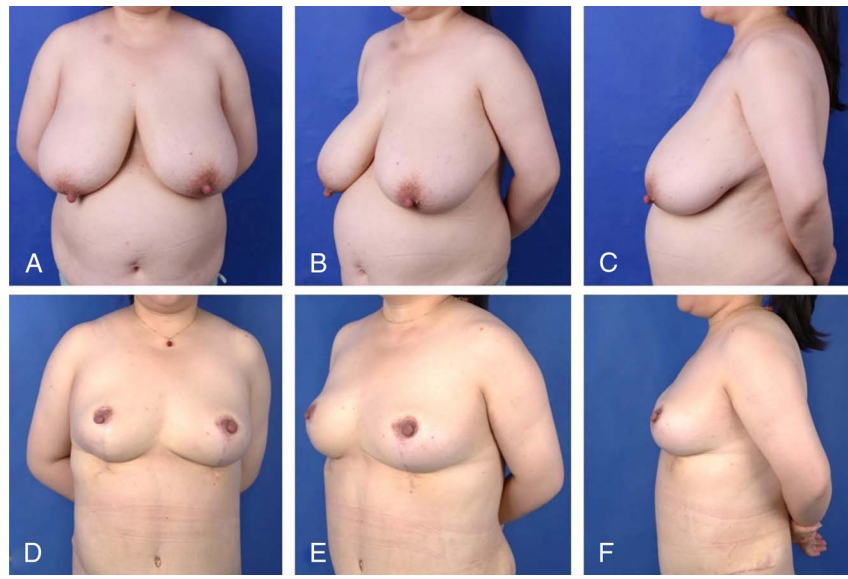

FIGURE 7. (Above) A specific patient case is illustrated where a 41-year-old woman underwent a vertical reduction mammaplasty utilizing the superomedial pedicle technique. (Below) Remarkably, no skin undermining or breast liposuction was involved in the procedure. A substantial reduction of 1475 g from the right breast and 1490 g from the left breast was achieved. The patient reports that her nipple sensation remains unchanged from the preoperative state, and she maintains an aesthetically pleasing breast shape 1 year after the surgery.

tissue dissection and pedicle preservation, some patients may still experience changes in nipple sensation following surgery. This potential complication should be discussed with patients during preoperative counseling to manage expectations appropriately.

Limitations and Concerns

One of the primary limitations of our study is the relatively small sample size, which limit the generalizability of our findings. In addition, our study was conducted at a single center, which may limit the external validity of our results. Multicenter studies with larger sample sizes would provide more robust evidence and allow for better generalization of our findings. Long-term follow-up data were not included in our study. Future studies with longer follow-up data and comparison with other surgical techniques would provide a more comprehensive assessment of the safety and efficacy of the superomedial-based pedicle technique. Finally, variability in surgical technique among different surgeons may affect surgical outcomes and complicate the interpretation of study results. Standardization of surgical techniques or subgroup analysis based on surgical approach may help address this concern.

CONCLUSIONS

Our findings lead to the conclusion that the inclusion of a vertical scar along with the superomedial dermoglandular pedicle technique represents a suitable, versatile, safe, and reliable approach for managing significantly larger breasts (>1000 g). This technique demonstrates its superiority in preserving the continuity of the medial and central breast tissue, resulting in aesthetically pleasing medial fullness. Additionally, our study provides evidence that breast reduction surgery significantly enhances satisfaction with breast appearance, psychosocial well-being, sexual well-being, and physical well-being. However, further research with larger sample sizes and longer follow-up periods is necessary to validate and reinforce our findings.

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