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A Matched Cohort Study of Superomedial Pedicle Vertical Scar Breast Reduction (100 Breasts) and Traditional Inferior Pedicle Wise-Pattern Reduction (100 Breasts): An Outcomes Study over Three Years

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Abstract

Background—The superomedial pedicle with vertical scar (SMP) breast reduction (BR) is gaining popularity for its round, projecting breast and shorter incision when compared to the traditional Wise-pattern reduction using an inferior pedicle (IFP). However, there is a paucity of large volume institutional outcomes studies identifying how SMP/BR fares against more traditional methods of reduction. The purpose of this study is to compare outcomes after SMP/BR and IFP/BR in the only large volume, matched cohort study-to-date.

Methods—A retrospective review of a prospectively-maintained database of all bilateral BRs over the three-year period was performed. 100 SMP/BR breasts (50 patients) were matched to 100 IFP/BR breasts (50 patients). Matching was implemented based on age (+/− 3 years) and size of reduction (+/− 200 grams). Patient demographics including age, BMI, and ethnicity, size of reduction, NAC sensitivity, minor and major postoperative complications, and symptomatic relief were assessed. Statistical analysis was performed with SAS v9.2 (Cary, NC).

Results—212 patients underwent 424 bilateral BR between 1/2009 – 6/2012 at a single institution; IFP/BR was used in 76% of cases. Mean age and BMI was 31.4 (+/−9.9) and 30.8 (+/− 3.5) in the SMP/BR cohort and 31.6 (+/− 9.9) and 31.8 (+/− 3.6) in the IFP/BR cohort. Mean volume of tissue reduced was 815 grams per breast (range 200–2068g) and 840 grams per breast (range 250–2014g), respectively. All patients achieved symptomatic relief. No statistical difference in major or minor complications was seen between two cohorts; SMP: major 4% (Return to OR 2%; wound infection 2%) and minor complications 25% versus IFP: major 3% (NAC necrosis 1%; hematoma 1%; wound infection 1%) and minor complications 24%. No significant difference in complications was seen between small and large volume reductions.

Conclusion—SMP/BR is a novel, alternative mammaplasty technique with low complication rates and excellent functional and aesthetic outcomes. This is the first matched cohort study to

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demonstrate that SMP/BR can be used for a wide range of macromastia without a significant difference in complication rates when compared with the traditional Wise-pattern IFP reduction mammoplasty.

Level of Evidence—Prognostic/Risk, Level III

Introduction

Since the early twentieth century, attempts to optimize aesthetic and surgical outcomes in reduction mammoplasty have prompted constant development and revision of surgical techniques¹. The primary goals of reduction mammoplasty, substantial decrease in breast volume and preservation of the nipple-areolar complex (NAC), have been consistently achieved through various combinations of pedicles and skin excision patterns^{2,3}. However, it is the ability to accomplish these primary aims while increasing attention to aesthetic result, maintenance of NAC sensation, and minimized scarring which has driven the evolution of reduction mammoplasty techniques – and the controversy over the ideal technique².

The inferior pedicle technique with inverted-T skin excision (IFP), as described by Robbins in 1977, is the most commonly utilized procedure, gaining widespread acceptance for its consistency in NAC viability, ease in teaching, and successful outcomes across reductions of all sizes. However, its critics recognize some aesthetic drawbacks to the technique, including a hypertrophic scar along the inframammary fold, squaring of the breast contours, and a tendency to produce pseudoptosis over time^{3–6}.

To reduce these aesthetic complications, adaptations of the Hall-Findlay vertical reduction with medial or superomedial pedicles have recently gained acceptance. Though recent papers cite use of the superomedial pedicle with high satisfaction^{7,8,9}, this pedicle is often combined with a Wise-Pattern method of skin excision contributing to higher scar burden. The SMP with vertical scar reduction (VS) allows for a shorter scar with decreased scar hypertrophy, as well as the benefits of retained upper pole fullness and more extensive lateral parenchymal reduction, producing a desirable surgical result with greater projection^{1,5,6}. While the SMP/VS technique has proven effective for small- and medium-volume reductions, some surgeons have expressed hesitancy in applying SMP/VS techniques for large-volume reduction mammoplasties, citing increased complications rates with higher resection volumes^{7,10,11}. Furthermore, despite several studies indicating the reliability of SMP reductions in gigantomastia^{2,3,6–8}, concern over compromise of blood supply to the NAC during pedicle rotation has prompted some surgeons to limit application of the vertical reduction with superomedial pedicle to breast reductions less than 1000g^{2,10}.

Although many studies have published successful results of superomedial pedicle and vertical scar reduction techniques in reduction mammoplasty of various sizes (typically less than 1000 grams),^{1–3,6,7,10,12} a PubMed literature survey reveals that no studies have directly compared rates of complication between matched cohorts for superomedial pedicle, vertical scar reduction mammoplasty versus the traditional “gold standard” Wise pattern with inferior pedicle technique. This study seeks to compare outcomes between cohorts matched by patient demographics and breast weight reduction for SMP/VS mammoplasty versus IFP/IT reductions. Primary measures include rates of complication, post-surgical preservation of NAC viability and sensation, and patient symptomatic relief. As a secondary outcome, this study will explore whether SMP/VS techniques are suitable for larger reduction mammoplasty, and whether any patient selection criteria produce more favorable outcomes.

Patients and Methods

This study is a retrospective review of all bilateral breast reductions performed by four surgeons at a single institution over a three-year period between January 2009 and June 2012. Unilateral and oncoplastic bilateral breast reductions were excluded from the study. 100 SMP/BR breasts (50 patients) were matched to 100 IFP/BR breasts (50 patients). Matching was implemented based on age (± 3 years) and size of reduction (± 200 grams). Patient demographics, including age, BMI, and ethnicity, smoking status, size of reduction, NAC sensation, minor and major postoperative complications, and symptomatic relief were assessed.

The weight of reduction specimen from each breast was calculated intra-operatively. Mean weight of reduction per individual was used for matching purposes. (Pathologic weights were used for confirmation). Patients returning for follow-up were evaluated for complications for the duration of the study period of 3 years (3–6 month minimum follow-up for study inclusion), including minor complications: loss of nipple sensation, seroma, wound breakdown, and major complications: return to the operating room, nipple necrosis, hematoma and infection. Patients are generally seen at 6 weeks, 3–6 months and annually for five years. Timing of assessment of patient symptomatic relief coincided with follow-up at 3–6 months and 1 year in the outpatient setting. An ad hoc assessment of aesthetic outcomes was made at these intervals; use of a standardized instrument to gauge aesthetic outcome is currently being considered for future work.

Statistical analyses were performed in SAS (version 9.2; SAS Institute, Cary, NC). Patients in the SMP and IFP groups were compared using t-tests for continuous data and Chi-square tests for categorical data, with Fisher's Exact test as appropriate. Whether the prevalence of complications differed between breasts in the SMP and IFP groups was determined using generalized linear mixed models for a binary outcome accounting for the within-individual correlation between breasts. All GLM models are unadjusted since our statistical approach incorporated matching controlling for age and size of reduction. Summary demographics between the two groups demonstrated that no significant difference between groups in terms of age (matched), BMI, race, smoking, and reduction size (matched) was seen. True confounders to be included into the modeling would have had to differ between the SMP and IFP groups. To assess whether the prevalence of complications differed between larger and smaller volume breast reductions in the SMP and IFP cohorts, a median split was performed; chi-square analysis using the median split was carried out to determine significance.

Surgical Techniques

Superomedial Pedicle with Vertical Scar reduction

Preoperative markings for a superomedial dermoglandular pedicle with vertical skin reduction technique are applied in the surgical holding area. (Figure 1a.) Skin quality (elasticity and stretch marks) and volume of reduction is assessed to determine new nipple position, typically at the inframammary fold or 1–2 cm below. The skin resection is drawn in the dome-mosque configuration with the vertical limbs marked with displacement of the breast medially and laterally along the breast meridian. The lower extent of the vertical limbs is typically 3–6 cm above the IMF depending on the size of reduction. (Figure 1b.)

In the operating room, the nipple-areolar complex diameters are measured at 38–42mm, and a superomedial pedicle of 6–10 cm is de-epithelialized while leaving an intact NAC. (Figure 1c.) Dermoglandular resections proceed next, beginning with the inferior portion of the breast, with direct defatting of the inframammary fold in the mastectomy plane. (Figure 1d.)

Dissection continues laterally to form the lateral pillar. The lateral pillar is approximated at 2cm–3cm thickness as it approaches the chest wall, taking care to preserve the pectoral fascia and neurovascular structures. C-shaped resection of the medial, inferior, lateral, and superior aspects of the breast allows for adequate reduction, coning of the breast, and rotational freedom of the superomedial pedicle. (Figure 1e.) Care is maintained to ensure that no undue tension or kinking is placed upon the pedicle. Following additional breast contouring to achieve proper symmetry and extent of reduction, the NAC is temporarily stapled into position. 2-0 PDS sutures are used to join lateral and medial pillars both in deep and superficial depths to adequately cone the breast. A drain is placed prior to skin closure. The NAC is inset with 4-0 vicryl deep dermal and 4-0 running subcuticular Monocryl sutures. 3-0 sutures are utilized along the vertical limb with mild cinching along the inferior limb and anchoring to the chest wall, keeping the vertical incision within the confines of the inferior pole of the breast. (Figure 1f.) (The authors recognize that a small T or L scar (<5cm) can be used in lieu of cinching though not routinely used in our practice or in this cohort.)

Inferior Pedicle with Inverted-T/Wise Pattern reduction

Preoperative markings for an inferior pedicle with Wise pattern skin excision are applied in the surgical holding area. With the patient standing, breast meridians are marked bilaterally along with new nipple location and proposed inframammary folds. In the operating room, nipple diameter markings are made at 38–42mm, and an inferior pedicle is designed. The inferior pedicle and new nipple location are de-epithelialized, while taking care to leave the NAC intact. The inferior pedicle is developed by incising to the depth of the chest wall. Resection proceeds according to preoperative markings, with additional “fanning-out” of the pedicle base inferiorly to maximize blood supply. Dermatoglandular wedge resection of medial, superior, and lateral sections is performed to reduce breast volume, with careful attention to medial resection to maintain proper medial contours. Skin flaps are trimmed to 1.5cm thickness, and a superior pocket is created for placement of the NAC. Temporary staples are placed along the vertical limb of the incision, and the patient is evaluated for symmetry and adequacy of resection with temporary closure in the seated position. Additional reduction and contouring is accomplished as needed, and drains are placed bilaterally. Nipple-areolar complexes are sutured to their new positions with 4-0 interrupted non-resorbable suture prior to closure of the inverted-T incision.

Results

424 bilateral breast reductions (BR) were performed in 212 patients between 1/2009- 2/2012 at a single institution, with three surgeons (RFD, DM, MNC) exclusively utilizing the inferior pedicle (IFP), inverted T pattern and one surgeon (AKA) preferentially using the superomedial pedicle (SMP) with vertical scar technique. IFP/BR was used in 76% of cases: 322 breasts were reduced in 161 patients using the inferior pedicle, inverted-T/Wise-pattern reduction, and 102 breasts in 51 patients were reduced using the superomedial pedicle, vertical scar reduction technique. After matching for age and weight of breast reduction, matched cohorts were identified with 50 patients (100 breasts) in the SMP cohort and 50 patients (100 breasts) in the IFP cohort.

Mean age and BMI was 31.4 (+/-9.9) and 30.8 (+/- 3.4) and in SMP/BR cohort and 31.6 (+/- 9.9) and 31.8 (+/- 3.6) in the IFP/BR cohort (p=0.94, p=0.16). Ethnic distribution was equivalent between cohorts. Smoking was similar between cohorts, 10.2% and 12.5% respectively, p=0.73. (See Table 1.) Mean volume of tissue reduced was 815 grams per breast (range 200–2068g) and 840 grams per breast (range 250–2014g), respectively. Mean volume of tissue reduced by side for SMP and IFP was (R) 809.9 and 835.4 grams and (L) 820.4 and 844.2 grams, (p=0.74, p=0.76). All patients achieved symptomatic relief. No

statistical difference in major or minor complications was seen between two cohorts; SMP: major 4% (Return to OR 2%; wound infection 2%) and minor complications 25% (decreased nipple sensation 11%; seroma 6%; minor skin breakdown 8%) versus IFP: major 3% (NAC necrosis 1%; hematoma 1%; wound infection 1%) and minor complications 24% (decreased nipple sensation 13.5%; seroma 1%; minor skin breakdown 10%). For the outcome of 1 or more complications, no significant difference was observed between the two cohorts. (See Table 2.)

One case of nipple-areolar complex loss occurred in the IFP cohort, with preservation of the NAC in all SMP reductions. The most common complication was decreased nipple sensation, occurring in 11/100 reductions in the SMP cohort and 13/100 reductions in the IFP cohort, and minor skin breakdown 8/100 and 10/100 respectively. There was no statistically significant difference in outcomes or complication rates between the SMP and IFP cohorts. Patient satisfaction was high in both cohorts with symptomatic relief. As a secondary outcome, data was analyzed with respect to size of reduction within the SMP cohort. No statistical differences were found in complication rates in large-volume reduction as compared to smaller reductions when using the SMP technique or IFP technique. (Tables 3 and 4). The SMP/VS breast reduction offers excellent aesthetic results with long-term maintenance of shape and projection (Figures 2a–f, 3a–f). The SMP/VS technique can be used safely for larger reductions (>1000 grams). (Figures 4a–c).

Discussion

Superomedial pedicle techniques with vertical scar reductions, as well as inferior pedicle reductions with traditional Wise patterns, have the ability to produce consistently viable breast reductions with a high degree of patient satisfaction in the hands of an experienced surgeon. As pedicle selection and skin excision pattern may be considered independently³, the many studies published in the past half-century exploring unique combinations of reduction mammoplasty generally report satisfactory results. In fact, this has led some authors^{1,5} to suggest that no single reduction mammoplasty technique may universally applicable; rather, the use of certain surgical techniques may be more optimal for certain patient populations¹³. But what patient characteristics predict a high rate of success with certain reduction techniques?

In our experience, superomedial pedicle reductions with a vertical scar are a safe and reliable choice for breast reductions of all sizes. Despite a theoretical concern that larger reductions may compromise vascular supply to the nipple-areolar complex and a recent paper which demonstrated higher complications with higher resection volumes¹¹, numerous series^{2,7,14}, including our own, have found that this technique does not create complications at an increased rate. Our study is the first matched cohort to date comparing SMP breast reduction with IFP breast reduction. We did not identify a statistical difference in minor or major complications. In addition, we did not observe a statistically significant difference in complications with smaller and larger volume reductions. However, we have found in our hands that certain patient selection criteria tend to produce most optimal outcomes with the SMP technique including good skin elasticity with minimal striae, dense breast parenchyma, and patients desiring reduction with maintenance of significant portion of pre-reduction breast volume (e.g. not requesting excessive reduction).

Patients with good skin elasticity and minimal striae may produce more aesthetically pleasing results, as the skin rebounds more adequately to assume the shape of the post-reduction breast. Good skin quality will obviate need for return to the operating room for secondary revisions due to excess skin at the inferior border of the breast. Although good skin elasticity may be of importance to overall aesthetic result in SMP reductions, this

method of parenchymal reduction is not dependent on skin for maintenance of ptosis or long-term contour. As such, high skin elasticity may be an overall independent predictor of successful reduction mammoplasty independent of technique selection.

In our experience, dense parenchyma in SMP reductions may allow for greater control of breast contouring in achieving a final aesthetic result. A firmer breast parenchyma will allow for secure suture attachments between medial and lateral pillars, creating a stable base for the post-surgical breast. Parenchyma may be of greater importance in this type of procedure, which relies on glandular tissue for construction of the reduced breast.

Further technical modifications that allow for superior results include downward shifting of the preoperative markings to account for elastic recoil of the skin envelope, thus limiting the nipple to IMF distance and potential for a “ski-slope” nipple deformity. Additionally, while some surgeons have indicated improved results with tightening of the lower pole¹⁵, we have found that our method of plication in the deep fascia of the lateral pillar corresponding with the lateral breast border to the deep medial pillar (pedicle), with a second layer of 2-0 PDS for reinforcement, cones the breast with high fidelity and reduces potential dead space. The number of sutures placed will depend on the glandular-to-fat ratio of the breast contents. Younger patients with more dense glandular-type breasts will require less sutures due to the structural integrity of the breast (as discussed earlier). Finally, though liposuction can be used as an adjunctive measure to address the lower pole¹⁶, we have found that direct defatting of the inferior pole and release of IMF in the mastectomy place affords a simple and reliable method to address the IMF without increasing complication rates. Drain usage is paramount in preventing fluid collection in the IMF space.

The superomedial pedicle produces high levels of patient satisfaction in patients, particularly in those who wish to maintain a significant post-surgical breast volume. The SMP reduction may be more applicable to patients requesting breast size of a large C cup to a small D cup, as the pedicle itself occupied the volume of approximately a B cup. Additionally, Hall-Findlay¹ suggests that patients seeking smaller reductions may have cosmetic expectations beyond what is feasible in small-volume reduction mammoplasty. We have found that maintenance of a significant portion of pre-surgical breast volume post-resection fills the breast envelope and avoids excessive skin reduction and related scarring, decreases potential dead space with parenchymal-skin envelope proximity, and may afford additional leeway in contouring to achieve a desirable aesthetic outcome with maintenance of adequate pedicle width to support blood supply to the nipple-areolar complex in larger reductions.

Conclusions

The superomedial pedicle with vertical scar reduction mammoplasty is an alternative technique for breast reduction with the advantage of a shorter incision and increased breast projection. This is the first large volume, matched cohort study-to-date to demonstrate SMP complication rates are consistent with those of the inferior pedicle Wise-pattern reduction across a wide range of breast sizes. Patient selection criteria are outlined that may allow for improved outcomes when using this technique.

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Figure 1.

Figure 1a. Preoperative markings for bilateral breast reduction using the superomedial dermoglandular pedicle with vertical skin reduction technique are applied in the surgical holding area.

Figure 1b and c. The nipple-areolar complex diameters are measured at 38–42mm, and a superomedial pedicle of 6–10 cm is de-epithelialized while leaving an intact NAC.

Figure 1d and e. Dermatoglandular resections proceed next, beginning with the inferior portion of the breast, with direct defatting of the inframammary fold in the mastectomy plane. C-shaped resection of the medial, inferior, lateral, and superior aspects of the breast allows for adequate reduction, coning of the breast, and rotational freedom of the superomedial pedicle.

Figure 1f. The vertical incision is kept within the confines of the inferior pole of the breast.

Figure 2 & 3.

Preoperative (2a–c, 3a–c) and one-year postoperative (2d–f, 3d–f) photographs (31 year old DD cup, BMI 29, DOS: 12/10/2009, 429g, 428g reduction; 27 year old DDD, BMI 27, DOS: 464g, 469g reduction)) demonstrating improved shape and projection after SMP/VS reduction mammoplasty. Excellent results can be achieved in younger patients with dense glandular tissue, good skin elasticity with minimal striae requesting maintenance of significant pre-reduction volume. Note rebound of soft tissue envelope after reduction.

Figure 4.

Preoperative view (4a) and associated markings (4b) of patient with gigantomastia (19 year old, H cup, BMI 24.8, DOS: 6/8/2011, 1388g, 1444g reduction) demonstrating improved appearance and significant volume reduction after SMP/VS reduction mammoplasty (4c). Note that patient has striae of arms and chest wall and anticipated modest rebound of soft tissue envelope onto chest wall.

Table 1

Comparison of patient characteristics in SMP and IFP cohorts.

	SMP (n=50)	IFP (n=50)	p-value
Age (years), mean (SD)	31.4 (9.9)	31.6 (9.9)	0.94
BMI (kg/m ²), mean (SD)	30.8 (3.4)	31.8 (3.6)	0.16
Race/Ethnicity, No. (%)	n=50	n=50	0.12
Non-Hispanic Black	35 (70.0)	35 (70.0)	
Non-Hispanic White	6 (12.0)	5 (10.0)	
Hispanic	0 (0.0)	5 (10.0)	
Other	9 (18.0)	5 (10.0)	
Smoker, No. (%)	5 (10.2), n=49	4 (12.5), n=32	0.73
Mass of Reduction (g) per breast, Mean (Range)	815.2 (200–2068)	839.8 (250–2014)	
Right-side, mean (SD)	809.9 (388.8)	835.4 (385.1)	0.74
Left-side, mean (SD)	820.4 (402.8)	844.2 (372.1)	0.76

Table 2

Comparison of complications in SMP and IFP cohorts.

	SMP (n=100)	IFP (n=100)	p-value
Minor Complications			
Nipple Sensation Loss *, No. (%)	11 (11.0)	13 (13.5)	0.61
Seroma, No. (%)	6 (6.0)	1 (1.0)	0.12
Minor Skin Breakdown, No. (%)	8 (8.0)	10 (10.0)	0.64
Major Complications			
Return to OR, No. (%)	2 (2.0)	0 (0.0)	0.50
NAC Necrosis *, No. (%)	0 (0.0)	1 (1.0)	1.00
Hematoma, No. (%)	0 (0.0)	1 (1.0)	1.00
Wound Infection, No. (%)	2 (2.0)	1 (1.0)	0.57
1 Complication	23 (23.0)	23 (23.0)	1.00

* Data available for n=100 and n=96 (SMP, IFP).

Table 3

Comparison of complications in smaller volume and larger volume reductions (using median split) after SMP reduction mammoplasty.

SMP	Mass <744g	Mass ≥ 744g	p-value*
No complication	86%	68%	0.06
1 Complication	14%	32%	

* Chi-square using median split < or ≥ 744 grams.

Table 4

Comparison of complications in smaller volume and larger volume reductions (using median split) after IFP reduction mammoplasty.

IFP	Mass <744g	Mass ≥ 744g	p-value*
No complication	82%	73%	0.13
1 Complication	18%	27%	

* Chi-square using median split < or ≥ 744 grams.