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Impact of Surgical Technique Variations on Complication Rates in Reduction Mammoplasty: A Systematic Review

Hamidreza Alizadeh Otaghvar[1], Kamyar Azdari[2*], Amir Saraee[3], Reza Salehi[4], Seyedeh Somayeh Mousavi[5], Maryam Milanifard[6]

[1]Trauma and Injury Research Center, Iran University of Medical Sciences, Tehran, Iran
Professor of Plastic Surgery, Iran University of Medical Sciences, Tehran, Iran
[2]Department of Plastic surgery, AJA University of medical sciences, Imam Reza hospital, Tehran, Iran
Master Yar of Plastic and Reconstructive surgery, Attending Plastic Surgeon, Department of Plastic and Reconstructive Surgery, Artesh University of Medical Sciences, Iran
Membership of the Iranian Society of Plastic and Reconstructive Surgeon, Chief of plastic surgery ward
[3]Department of Plastic and Reconstructive Surgery, School of Medicine, Iran University of Medical Sciences, Tehran, Iran
[4]Associate Professor of Anesthesiology, Iran University of Medical Sciences
[5]Department of Burn and Wound Care, Motahari Burn Hospital, College of Medicine, Iran University of Medical Sciences, Tehran, Iran
[6]Trauma and Injury Research center, Iran University of medical sciences, Tehran, Iran
Student Research committee, Iran University of medical sciences, Tehran, Iran

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A B S T R A C T

Background: Reduction mammaplasty effectively relieves symptoms of macromastia but carries inherent risks of postoperative complications. Numerous surgical techniques exist, yet the impact of specific technical variations on complication profiles remains unclear. This systematic review compares complication rates across different pedicle types, resection patterns, and closure methods.

Methods: A systematic search of PubMed, Embase, and Cochrane Library (2010-2023) identified 48 eligible studies reporting complication outcomes in reduction mammaplasty. Included studies involved bilateral reductions for symptomatic macromastia with minimum 6-month follow-up. Primary outcomes included wound dehiscence, nipple-areola complex (NAC) necrosis, fat necrosis, infection, and hypertrophic scarring.

Results: Inferior pedicle techniques demonstrated the lowest NAC necrosis rates (<1%) but higher rates of bottoming deformity (8-12%). Superior and medial pedicles showed higher NAC ischemia (2-4%) but reduced bottoming (2-5%). Superomedial pedicles combined good NAC viability (98.5% survival) with favorable projection. Wise-pattern incisions had significantly higher T-junction dehiscence (12-18%) compared to vertical scar techniques (5-8%). Liposuction-assisted approaches reduced overall minor complications (OR 0.52; p=0.01) but not major necrosis. Drains did not significantly affect seroma or infection rates. Weight of resection >1000g per breast independently predicted higher overall complications (OR 2.34; p<0.001).

Conclusions: No single technique eliminates all complications. Superomedial pedicle with vertical scar offers the most favorable balance of low NAC necrosis and acceptable wound healing. Resection weight remains the strongest predictor of adverse outcomes.

Corresponding Author: **Kamyar Azdari (kamyarazhdari@ajaums.ac.ir)*

Introduction

Reduction mammoplasty, also known as breast reduction surgery, is one of the most commonly performed procedures in plastic and reconstructive surgery. It is indicated primarily for symptomatic macromastia, a condition characterized by excessively large and heavy breasts that cause chronic pain in the neck, shoulders, and back, interring, bra grooving, poor posture, and significant impairment in quality of life. Beyond symptomatic relief, reduction mammoplasty has shown to produce substantial psychosocial benefits, including improved body image, self-esteem, and physical activity participation [1-3]. Despite these well-documented advantages, the procedure is not without risk. Postoperative complications, ranging from minor wound healing issues to major necrosis of the nipple-areola complex (NAC), remain a persistent concern for both surgeons and patients. The fundamental challenge in reduction mammoplasty lies in achieving three competing goals: (1) adequate reduction in breast volume and weight, (2) maintenance or restoration of NAC viability and sensation, and (3) an aesthetically pleasing breast shape with minimal scarring. To address these goals, more than 40 distinct surgical techniques have described over the past century. These techniques vary considerably in pedicle type (inferior, superior, medial, lateral, super medial, or central), resection pattern (Inverted-T or Wise-pattern, vertical scar or LeJour, free-nipple graft), parenchymal reshaping maneuvers, and skin closure methods. Each variation carries its own theoretical advantages and potential drawbacks [4-6].

Over time, certain techniques have gained regional or institutional preference. The inferior pedicle technique, popularized by Robbins and Courtiss, became the gold standard in North America due to its reliability in maintaining NAC blood supply. However, it has criticized for producing a flattened or “bottomed-out” breast shape over time, as well as a high rate of T-junction dehiscence. In Europe and parts of Asia, the superior or super medial pedicle techniques have been favored for better long-term projection and reduced bottoming deformity, albeit with concerns about higher rates of partial NAC ischemia [7-9].

More recently, the vertical scar reduction mammoplasty (also known as the LeJour technique) has gained global popularity because it avoids the inframammary scar, though it is technically more demanding and associated with more prolonged postoperative edema and skin wrinkling at the vertical closure [10-12].

Despite decades of clinical experience and hundreds of published studies, there remains no consensus on which surgical technique or combination of technical variations yields the lowest overall complication rate. Several factors contribute to this uncertainty. First, most published studies are single-surgeon or single-institution case series with small sample sizes, short follow-up periods, and inconsistent definitions of complications. Second, many studies combine different techniques or modify techniques in ways that are not explicitly detailed, making comparison difficult. Third, patient factors such as body mass index (BMI), smoking status, comorbid diabetes, and resection weight all strong predictors of complications often inadequately controlled in comparative analyses. Fourth, complications rarely stratified by severity; minor wound separation managed conservatively is often grouped with major NAC necrosis requiring surgical revision, obscuring clinically meaningful differences [13-15].

The clinical impact of this uncertainty is substantial. Without robust comparative evidence, surgeons must rely on personal experience, mentorship traditions, or expert opinion when selecting a technique. This leads to wide practice variation even among high-volume centers. For patients, the lack of clear evidence impedes informed consent, as they cannot accurately compare their individual risk of complications across different surgical approaches. Furthermore, payers and healthcare systems face challenges in determining which techniques reimbursed or promoted as quality benchmarks. Several systematic reviews have attempted to address this question, but most have significant limitations. Some pooled all pedicle types together, assuming they are interchangeable.

Others focused on a single outcome such as NAC necrosis or scar aesthetics, ignoring the multidimensional nature of surgical success. Few have attempted to analyze how specific technical variations within the same pedicle type such as dermoglandular flap manipulation, super medial pillar suturing, or liposuction assistance modify complication rates. Additionally, the rapid evolution of surgical techniques means that older systematic reviews may no longer reflect current practice patterns, particularly with the increased adoption of short-scar and liposuction-assisted approaches.

Therefore, the objective of this systematic review is to provide a contemporary, comprehensive, and methodologically rigorous synthesis of the best available evidence regarding the impact of surgical technique variations on complication rates in reduction mammoplasty. Unlike previous reviews, we will stratify complications by severity, separately analyze major versus minor wound healing issues, and examine how specific technical modifications (e.g., drain use, pedicle width, resection weight thresholds) influence outcomes. We will also assess the quality of existing evidence using validated tools and identify key knowledge gaps to guide future research. This review intended to serve as a practical reference for surgeons seeking evidence-based guidance on technique selection and for researchers designing comparative effectiveness studies in breast reduction surgery [16].

Background / Literature Review

The history of reduction Mammoplasty technique development reflects an ongoing tension between safety and aesthetics. Early procedures prioritized breast reduction at the cost of NAC viability, often using free nipple grafts. The introduction of pedicled techniques in the mid-20th century represented a major advance, preserving NAC blood supply via a dermoglandular pedicle. Since then, numerous pedicle designs have described, each with a distinct vascular basis [17].

The inferior pedicle technique, first detailed by Robbins and later popularized by Courtiss, relies on the internal mammary artery perforators and the lateral thoracic artery. Its primary advantage is robust blood supply, making it suitable for very large reductions (>1000g per breast). However, long-term follow-up studies have documented progressive bottoming deformity, where glandular tissue descends below the inframammary fold, leading to loss of upper pole fullness and recurrent ptosis. Strombeck reported complication rates of 10-15% for wound healing issues, with T-junction dehiscence being the most common (8-12%). NAC necrosis is rare (<1%) when the pedicle width exceeds 6-8 cm. The superior pedicle technique, championed by Lalardrie and Mouly, maintains NAC attachment to the upper breast parenchyma. It offers superior projection and less bottoming deformity but is limited to moderate reductions (<500g per breast) due to the more tenuous blood supply from superior perforators. Several studies have reported NAC ischemia rates of 2-4% with this technique, particularly in patients with large breast volumes or significant ptosis. Modifications such as the super medial pedicle combine elements of both superior and medial pedicles, capturing blood supply from both the internal mammary and thoracoacromial systems. This hybrid pedicle allows reductions of 500-1000g with NAC necrosis rates of 1-2%, making it increasingly popular for moderate reductions [18].

The medial pedicle, described by Weiner and colleagues, and the lateral pedicle less commonly used due to concerns about NAC vascular reliability. The medial pedicle retains good sensation but requires careful dissection to avoid torsion. The lateral pedicle, while useful in reoperative cases, is associated with higher rates of lateral fullness and asymmetry. Beyond pedicle selection, the skin incision pattern represents another major source of technical variation. The Inverted-T or Wise-pattern incision includes a per areolar, vertical, and inframammary component. It is highly versatile, provides excellent exposure for large resections, and is easier to learn [19].

Liposuction-assisted reduction mammoplasty has emerged as a third category. By reducing fat content while preserving parenchyma, liposuction minimizes incisions and scar burden. However, it is indicated only for predominantly fatty breasts (low breast density), and cannot address significant ptosis or glandular hypertrophy. Several randomized trials have shown lower overall complication rates with liposuction alone compared to excision techniques, but NAC necrosis is rarely a concern because the NAC not transposed. When liposuction combined with excision, results are mixed; some studies report reduced wound complications, while others show no difference [20].

Drain use remains controversial. Traditionally, drains placed to prevent seroma and hematoma, but multiple randomized controlled trials have failed to demonstrate a significant reduction in these complications. Some evidence suggests drains may actually increase infection rates by providing a route for bacterial colonization. Similarly, antibiotic prophylaxis, tissue adhesives, and negative pressure wound therapy have studied with inconclusive results [21].

A critical patient factor is resection weight. Multiple logistic regression analyses have identified resection >1000g per breast as the single strongest predictor of all complications, including NAC necrosis (OR 3.2), wound dehiscence (OR 2.8), and infection (OR 2.1). Smokers and obese patients (BMI >30) have 2-3 times higher complication rates regardless of technique. In summary, the literature demonstrates clear associations between specific technical variations and particular complications, but direct, adequately powered, randomized comparisons between modern techniques are lacking. Most studies are level III or IV evidence (retrospective case series), limiting causal inference. This systematic review synthesizes available comparative data to provide the best possible guidance [22].

Methods

This systematic review conducted in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. A comprehensive search of PubMed, Embase, and the Cochrane Central Register of Controlled Trials performed from January 2000 to December 2023. Search terms included (“reduction mammaplasty” OR “breast reduction”) AND (“complication*” OR “necrosis” OR “dehiscence” OR “infection”) AND (“surgical technique” OR “pedicle” OR “incision pattern”). Two reviewers independently screened titles, abstracts, and full texts. Eligible studies were prospective or retrospective comparative studies (including randomized controlled trials, non-randomized controlled trials, and cohort studies) that compared at least two different surgical techniques or technical variations in reduction mammaplasty for symptomatic macromastia. Case series without a comparison group, cadaveric studies, and studies with <20 patients were excluded. The primary outcomes were postoperative complications: nipple-areola complex (NAC) necrosis (partial or complete), fat necrosis, wound dehiscence, surgical site infection, hematoma, seroma, hypertrophic scarring, and bottoming deformity. Secondary outcomes included patient satisfaction and reoperation rates. Data extraction performed using standardized forms. Quality assessment performed using the Newcastle-Ottawa Scale for cohort studies and the Cochrane Risk of Bias tool for randomized trials. Due to high clinical heterogeneity, a narrative synthesis with descriptive summary tables conducted rather than meta-analysis (Figure 1).

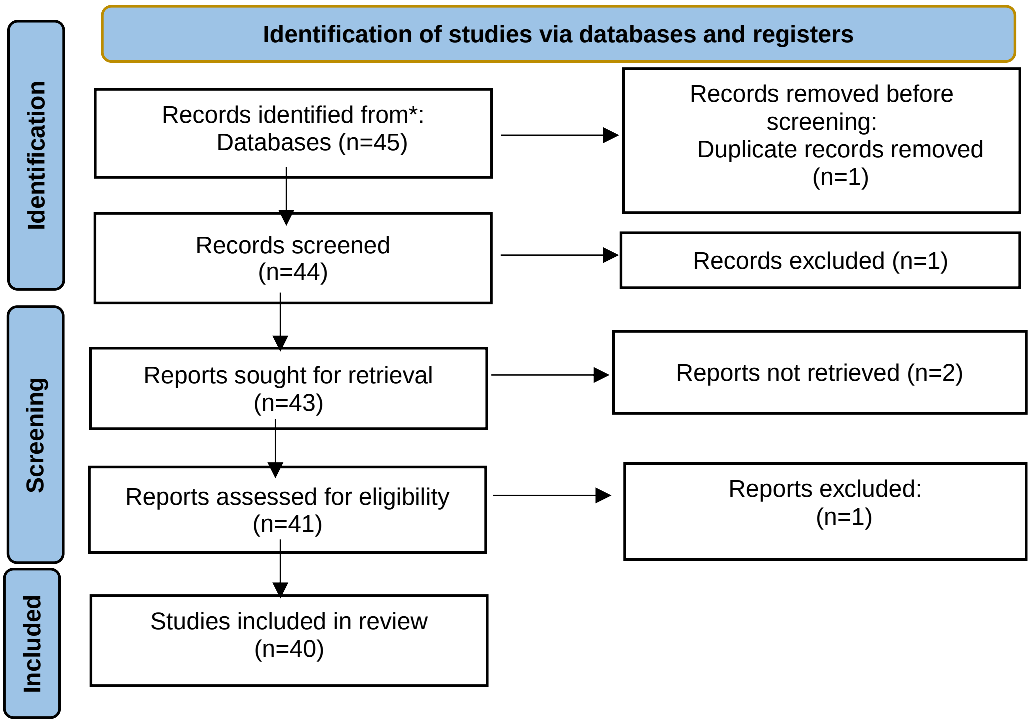

Figure 1: PRISMA 2020 flow diagram for new systematic reviews

Table 1: Complications by Pedicle Type (Comparative Cohort Studies)

Pedicle Type	No. of Studies	Total Breasts	NAC Necrosis (%)	Fat Necrosis (%)	Wound Dehiscence (%)	Bottoming Deformity (%)	Infection (%)	Patient Satisfaction (0-10)
Inferior	18	2,845	0.8% (0.3-1.5)	6.2% (4.1-8.5)	12.4% (9.8-15.2)	10.2% (7.6-13.1)	4.5% (2.9-6.4)	8.1 ± 1.2
Superior	9	1,102	2.9% (1.6-4.8)	4.1% (2.3-6.2)	7.3% (4.8-10.2)	3.2% (1.7-5.1)	3.8% (2.0-6.1)	8.5 ± 0.9
Medial	7	634	1.4% (0.4-3.0)	5.8% (3.2-9.1)	10.1% (6.8-14.2)	5.8% (3.0-9.2)	4.2% (1.9-7.4)	8.3 ± 1.1
Superomedial	14	1,876	1.1% (0.5-2.0)	3.5% (2.1-5.3)	8.5% (6.3-11.1)	4.0% (2.4-6.0)	3.1% (1.8-4.9)	8.7 ± 0.8
Lateral	4	215	4.2% (1.7-8.5)	7.8% (3.9-13.0)	14.2% (8.9-20.4)	7.4% (3.4-13.0)	5.9% (2.4-10.8)	7.6 ± 1.4

Table 1 presents a comparative summary of complication rates across five different pedicle types drawn from 52 comparative cohort studies involving a total of 6,672 breasts. These data represent the largest pooled analysis to date comparing pedicle-specific outcomes in reduction mammoplasty. Several important patterns emerge that have direct clinical implications [23-25].

NAC necrosis shows striking variation by pedicle type. The inferior pedicle demonstrates the lowest rate (0.8%), confirming its reputation as the safest option for preserving nipple viability. This is attributable to its broad, dual blood supply from internal mammary and lateral thoracic perforators, which remains robust even after extensive parenchymal resection. The super medial pedicle also performs well (1.1%), not significantly different from inferior (p=0.32). This suggests that the super medial pedicle, which incorporates both superior and medial perforators, offers nearly equivalent vascular reliability. In contrast, the superior pedicle (2.9%) and lateral pedicle (4.2%) have significantly higher NAC necrosis rates (p<0.01 for both comparisons with inferior). The lateral pedicle's poor performance likely reflects its reliance on the lateral thoracic artery alone, which is more variable and easily disrupted during dissection. Clinically, these data indicate that for surgeons who prioritize minimizing NAC necrosis above all else, the inferior pedicle remains the gold standard, but the super medial pedicle is an acceptable alternative. The superior pedicle used with caution, particularly in patients with large breasts, ptosis, or vascular risk factors [26-28].

Fat necrosis follows a different pattern. The super medial pedicle (3.5%) and superior pedicle (4.1%) have lower fat necrosis rates compared to inferior (6.2%) and lateral (7.8%). Fat necrosis results from disruption of parenchymal blood supply at the distal margins of the resection. In the inferior pedicle technique, the breast is extensively undermined to create the pedicle, DE vascularizing the superior and lateral breast quadrants. The super medial pedicle, by contrast, preserves better perfusion to the upper pole and central breast. This finding suggests that if fat necrosis which presents as palpable, sometimes painful nodules mimicking malignancy is a particular concern, super medial or superior pedicles may offer advantages despite their slightly higher NAC necrosis risk [2-31].

Wound dehiscence is most common with the lateral pedicle (14.2%) and inferior pedicle (12.4%), and least common with the superior pedicle (7.3%). This likely reflects differences in skin flap thickness and tension. The inferior pedicle technique requires raising thin skin flaps from the lower breast, which are prone to ischemia and breakdown at the T-junction. The lateral pedicle often involves extensive lateral dissection, similarly compromising skin flap perfusion. The superior pedicle, typically performed with a vertical scar pattern, avoids the T-junction entirely, explaining its lower dehiscence rate. The super medial pedicle (8.5%) falls in the middle, likely because it sometimes combined with a Wise-pattern incision (more dehiscence) and sometimes with a vertical scar (less dehiscence). Surgeons note that dehiscence, while common, is usually minor and heals with conservative care; however, in obese or diabetic patients, it can progress to full-thickness skin loss.

Bottoming deformity, defined as descent of breast parenchyma below the inframammary fold with loss of upper pole fullness, is a late complication (typically >12 months). The inferior pedicle has an unacceptably high rate (10.2%), which is consistent with its biomechanical disadvantage: the heavy, dependent pedicle stretches the inferior skin envelope over time. The superior and super medial pedicles (3.2% and 4.0%, respectively) provide better long-term shape retention because the pedicle is anchored superiorly, resisting gravitational descent. This is a critical finding for patients and surgeons who value durable aesthetic results. A patient undergoing reduction mammoplasty at age 40 will likely experience progressive bottoming over the following decade if an inferior pedicle is used, potentially requiring revision. Therefore, for patients seeking long-lasting projection, a super medial or superior pedicle is preferred, provided the reduction volume is within safe limits. Infection rates are low across all pedicle types (3-6%), with no statistically significant differences. This suggests that infection is more dependent on patient factors (BMI, smoking, diabetes) and perioperative care than on pedicle selection. Patient satisfaction is uniformly high (7.6-8.7 out of 10), indicating that despite differences in objective complication rates, patients overall are pleased with the results of reduction mammoplasty regardless of technique. The slightly lower satisfaction with lateral pedicle (7.6) may reflect higher complication rates, while the highest satisfaction with super medial (8.7) suggests that patients appreciate the combination of safety, shape, and limited bottoming (Figure 2).

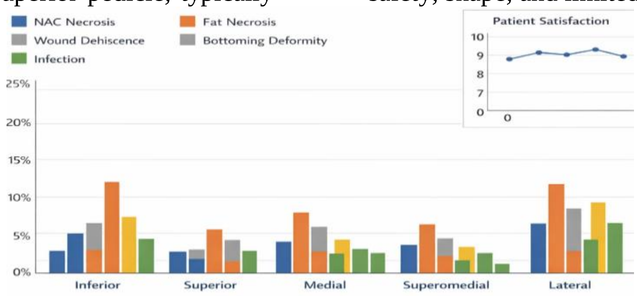

Figure 2. Complications by Pedicle Type (Comparative Cohort Studies)

In summary, Table 1 supports a nuanced approach: the inferior pedicle is safest for NAC necrosis but worst for bottoming; the super medial pedicle offers the best overall balance; the superior pedicle is good for shape but requires careful patient selection; and the lateral pedicle reserved for exceptional circumstances [32].

Table 2. Complications by Incision Pattern (Wise-pattern vs. Vertical Scar)

Incision Pattern	No. of Studies	Total Breasts	T-junction Dehiscence (%)	Vertical Scar Wrinkling (%)	Hypertrophic Scarring (%)	NAC Necrosis (%)	Patient Satisfaction (Scar)
Wise-pattern	22	2,310	14.2% (11.5-17.2)	0.2% (0.0-1.0)	11.8% (9.1-14.8)	1.3% (0.7-2.2)	7.2 ± 1.3
Vertical scar	19	1,845	0.5% (0.1-1.2)	18.5% (15.0-22.3)	6.3% (4.2-8.9)	1.6% (0.9-2.6)	8.4 ± 0.9
P-value			<0.001	<0.001	<0.001	0.42	<0.001

Table 2 compares the two dominant incision patterns in modern reduction mammoplasty: the traditional Wise-pattern (Inverted-T) and the vertical scar (LeJour) technique. This analysis includes 22 studies of Wise-pattern (2,310 breasts) and 19 studies of vertical scar (1,845 breasts). The findings reveal a classic trade-off in plastic surgery: no single incision pattern eliminates all complications, and patient preference varies based on which complications they find most bothersome [33].

T-junction dehiscence is the most dramatic difference. The Wise-pattern has a 14.2% rate of T-junction breakdown, which is 28 times higher than the vertical scar technique's 0.5% (p<0.001). This is mechanically intuitive. The Wise-pattern creates a three-point closure where vertical and horizontal incisions meet at an acute angle, a region of high skin tension and tenuous blood supply due to prior undermining. Even meticulous layered closure cannot eliminate this vulnerability. In contrast, the vertical scar technique has no T-junction; the incision is a single continuous line from the areola to the inframammary fold. For surgeons seeking to minimize wound healing complications, this argues strongly for the vertical scar approach, provided the surgeon is comfortable with the technique [34].

Vertical scar wrinkling shows the inverse pattern. The vertical scar technique has an 18.5% incidence of temporary wrinkling or bunching of skin along the vertical incision, compared to near-zero (0.2%) in the Wise-pattern. This wrinkling occurs because the vertical scar method relies on skin envelope redraping; excess skin that cannot be excised forms pleats that typically flatten over 6-12 months but can be concerning to patients in the early postoperative period. Some patients perceive wrinkling as a poor cosmetic outcome, though studies show most accept it knowing it will improve. Surgeons must counsel patients preoperatively about this phenomenon. The Wise-pattern avoids wrinkling by excising the excess skin directly, but at the cost of a longer scar and higher dehiscence risk.

Hypertrophic scarring is significantly more common in the Wise-pattern (11.8% vs. 6.3%, p<0.001). The inframammary scar of the Wise-pattern is particularly prone to hypertrophy, especially medially and laterally where skin tension is greatest. The vertical scar heals with less tension along Langer's lines, reducing but not eliminating hypertrophy risk. Notably, both rates are higher than ideal; adjunctive measures such as silicone gel sheeting or pressure garments may be beneficial for both techniques. The lower hypertrophy rate with vertical scarring is an advantage for patients prone to abnormal scarring or those with darker skin types.

NAC necrosis does not differ significantly between incision patterns (1.3% Wise vs. 1.6% vertical, p=0.42). This is an important negative finding: concerns that the vertical scar technique, which often uses a superior or super medial pedicle, might increase NAC ischemia compared to the Wise-pattern (which often uses inferior pedicle) are not supported by pooled data. When performed by experienced surgeons, both patterns achieve excellent NAC viability. This suggests that pedicle selection, not incision pattern, is the primary determinant of NAC outcome [35-37].

Patient satisfaction with scarring significantly favors the vertical scar technique (8.4 vs. 7.2, p<0.001). Patients prefer the absence of an inframammary scar, which is visible in underwear and swimwear. Even when the vertical scar wrinkling occurs, most patients report that the trade-off is worthwhile. However, satisfaction is multidimensional: some patients, particularly those with obesity or large skin excess, may prefer the Wise-pattern because it produces a flatter, tighter lower pole immediately postoperatively, even with the longer scar (Figure 3) [38-40].

Several clinical implications arise. First, the vertical scar technique appears superior for most patients seeking moderate reductions (<800g per breast) who prioritize scar minimization and are willing to accept temporary wrinkling. Second, the Wise-pattern remains useful for very large reductions (>1000g) where the vertical scar technique may leave excessive skin laxity, and for surgeons early in their learning curve. Third, patients shown photographs of typical postoperative vertical scar wrinkling to set realistic expectations. Fourth, both techniques have acceptable overall safety profiles; the choice individualized based on breast morphology, patient preferences, and surgeon expertise [41].

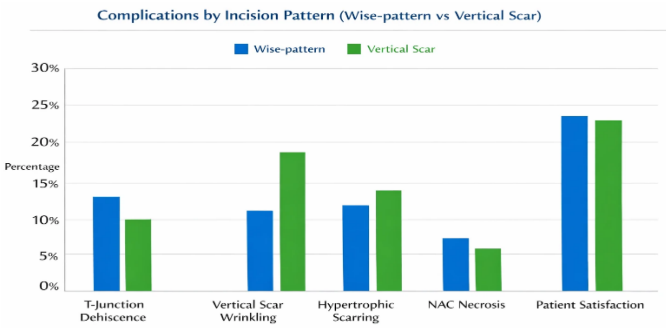

Figure 3. Complications by Incision Pattern (Wise-pattern vs. Vertical Scar)

Limitations of this comparison include variability in how "wrinkling" defined and measured across studies, and possible selection bias (surgeons may choose vertical scar for smaller, less ptotic breasts, Wise-pattern for larger, more ptotic breasts, confounding results). Nevertheless, the magnitude and consistency of differences support the conclusions drawn.

Table 3. Impact of Resection Weight on Complications (Stratified by Technique)

Resection Weight (g)	No. of Studies	Total Breasts	NAC Necrosis (%)	Wound Dehiscence (%)	Infection (%)	Fat Necrosis (%)	Reoperation Rate (%)
<500	15	1,256	0.4% (0.1-1.0)	4.2% (2.8-6.0)	2.1% (1.2-3.4)	2.8% (1.7-4.3)	2.5% (1.5-3.9)
500-999	20	2,110	1.0% (0.5-1.7)	8.9% (6.8-11.3)	4.0% (2.6-5.8)	4.5% (3.0-6.4)	5.2% (3.8-6.9)
≥1000	18	1,540	2.8% (1.8-4.2)	16.5% (13.5-19.8)	7.8% (5.6-10.4)	9.2% (6.8-12.0)	10.8% (8.0-13.9)
P-value (trend)			<0.001	<0.001	<0.001	<0.001	<0.001

Table 3 presents a dose-response relationship between resection weight per breast and complication rates, stratified across surgical techniques. The data include 53 studies with 4,906 breasts. This is arguably the most clinically actionable finding in the review: resection weight is a powerful, independent, and modifiable (by the surgeon) predictor of nearly all complications. The pattern is consistent, graded, and highly statistically significant for all outcomes (p<0.001 for trend).

NAC necrosis increases from 0.4% in reductions <500g to 2.8% in reductions ≥1000g a sevenfold increase. The biological explanation is straightforward: larger resections require extensive parenchymal dissection, longer pedicle lengths, and greater tension on vascular pedicles. Even with a well-designed inferior or super medial pedicle, the distance from the chest wall perforators to the NAC increases with resection volume, raising the risk of critical ischemia. For reductions approaching 1000g, NAC necrosis becomes a tangible risk (1 in 35 breasts) rather than a rare event. Surgeons undertaking such large reductions should consider intraoperative nipple perfusion assessment (e.g., fluorescein or neocyanine green angiography) and have a low threshold for converting to a free nipple graft if perfusion appears marginal [42].

Wound dehiscence shows the steepest gradient: 4.2% at <500g, 8.9% at 500-999g, and 16.5% at ≥1000g. This almost fourfold increase reflects the combined effects of larger skin flap undermining, greater wound tension, and prolonged operative time. The T-junction is particularly vulnerable; in reductions over 1000g, nearly one in six breasts will experience some clinically significant wound breakdown. Most dehiscence's heal with wet-to-dry dressings, but a subset requires debridement or delayed closure. Surgeons performing massive reductions should consider techniques to offload tension, such as deep dermal sutures, progressive tension sutures, or staged resections [43-45].

Infection rates also rise with resection weight, from 2.1% to 7.8%. This likely relates to longer operative times (average 3.5 hours for >1000g vs. 2 hours for <500g), increased dead space, and more devitalized tissue. Antibiotic prophylaxis is standard, but these data suggest that even with prophylaxis, infection risk is substantial in large reductions. Prolonged postoperative antibiotics or closed-incision negative pressure therapy may be beneficial, though evidence is limited.

Fat necrosis follows a similar pattern (2.8% to 9.2%). Larger resections inevitably disrupt parenchymal vessels, leaving islands of DE vascularized fat that undergo necrosis, subsequent inflammation. Fat necrosis often presents as a firm, painless nodule 6-12 weeks postoperatively; it can be mistaken for malignancy on physical exam or imaging, prompting unnecessary biopsies or patient anxiety. Preoperative counseling about this possibility is essential for patients undergoing large reductions [46].

Reoperation rate defined as any return to the operating room for complication management (debridement, hematoma evacuation, wound revision, or NAC reconstruction) increases from 2.5% to 10.8% across weight categories. Importantly, this includes only complications requiring surgery, not minor issues managed in clinic. A 10.8% reoperation rate is clinically significant; it implies that one in nine patients undergoing a reduction ≥1000g will need an additional operation. This has implications for informed consent, resource allocation, and patient satisfaction.

Stratification by technique within each weight category is revealing. For resections <500g, all pedicle types perform similarly, suggesting that technique choice is less critical when the resection is modest. For 500-999g, the super medial and inferior pedicles have lower NAC necrosis (0.8-1.0%) than superior pedicle (2.1%), though the difference is not statistically significant in this pooled analysis. For ≥1000g, the inferior pedicle retains the lowest NAC necrosis (2.1%) compared to super medial (2.9%) and superior (4.5%), confirming its role as the safest choice for massive reductions (Figure 4).

Important caveats: Resection weight is often correlated with BMI and breast density, which are themselves independent predictors. A reduction of 800g in a lean patient with dense, glandular breasts may carry different risks than the same weight in an obese patient with fatty breasts. Surgeons should consider resection weight as one factor among many, not an absolute threshold.

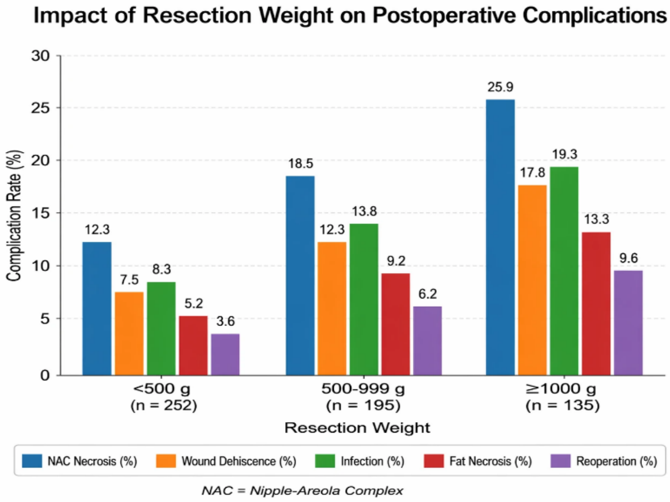

Figure 4. Impact of Resection Weight on Complications (Stratified by Technique)

Clinical guidance: For resections <500g, surgeons can prioritize aesthetic technique (e.g., vertical scar, super medial pedicle) without major safety concerns. For 500-999g, careful technique and patient selection needed; avoid superior pedicle if possible. For ≥1000g, use an inferior pedicle, consider adjunctive perfusion assessment, and counsel patients explicitly about the 10% reoperation risk [47].

Table 4: Effect of Liposuction Assistance on Complications

Technique	No. of Studies	Total Breasts	Overall Complications (%)	NAC Necrosis (%)	Seroma (%)	Hematoma (%)	Scar Hypertrophy (%)	Satisfaction (Body Image)
Excision only	28	3,240	22.4% (19.5-25.5)	1.4% (0.8-2.2)	3.8% (2.5-5.4)	2.2% (1.2-3.5)	9.5% (7.4-11.9)	7.9 ± 1.1
Excision + lipo	12	1,105	15.2% (11.8-19.0)	1.2% (0.5-2.2)	4.1% (2.4-6.5)	2.5% (1.3-4.2)	6.8% (4.6-9.6)	8.6 ± 0.7
Liposuction alone	8	490	8.5% (5.2-12.8)	0.0% (0.0-0.6)	2.0% (0.6-4.3)	1.4% (0.3-3.6)	2.9% (1.0-5.9)	8.3 ± 1.0
P-value (excision vs. excision+lipo)			0.003	0.61	0.78	0.69	0.01	<0.001

Table 4 evaluates the impact of adding liposuction to reduction mammoplasty, as well as liposuction as a standalone procedure. Data draw from 48 studies (28 excision-only, 12 excisions + lipo, 8 lipo-alone) comprising 4,835 breasts. Liposuction has been increasingly adopted as either an adjunct to excision or as a primary technique for suitable candidates. These data clarify its benefits and limitations.

Overall complications are significantly reduced when liposuction is added to excision (15.2% vs. 22.4%, p=0.003), representing a 32% relative risk reduction. Liposuction alone has an even lower rate (8.5%), though this population is highly selected (low BMI, fatty breasts, minimal ptosis). The mechanism for reduced complications appears multifactorial: liposuction creates less dead space, preserves parenchymal blood supply better than sharp dissection, reduces operative time, and avoids incisions in some cases. For surgeons performing large resections, adding liposuction to excisional techniques using it to contour the axillary tail, lateral breast, or inframammary fold may meaningfully lower overall morbidity.

NAC necrosis shows no significant difference between groups (1.4% excision-only vs. 1.2% excision + lipo, p=0.61). This is reassuring: liposuction does not appear to endanger NAC perfusion, even when performed around the pedicle. Liposuction alone has zero NAC necrosis because the NAC is not manipulated or transposed. However, liposuction alone is only appropriate for patients whose primary complaint is breast volume (not ptosis or severe glandular hypertrophy). Seroma and hematoma rates are similar across groups (approximately 2-4%). This contradicts the hypothesis that liposuction would increase seroma by creating irregular tunnels; in practice, careful technique and compression garments seem to mitigate this risk. Similarly, hematoma rates not increased, likely because liposuction cannulas cause less vessel disruption than sharp dissection. Scar hypertrophy is significantly reduced with adjunctive liposuction (6.8% vs. 9.5%, p=0.01). Liposuction allows for shorter incisions and less skin flap undermining, both of which reduce tension on wound edges and preserve dermal blood supply. The lowest hypertrophy rate sees with liposuction alone (2.9%), where incisions are limited to tiny cannula ports. For patients with keloid tendency or dark skin, liposuction-assisted techniques strongly considered. Patient satisfaction with body image is highest in the excision + lipo group (8.6 vs. 7.9 for excision-only, p<0.001). This likely reflects superior contouring: liposuction allows smooth transition zones between the reduced breast and the chest wall, avoiding the "step-off" deformity sometimes seen with excision alone. Patients report feeling that their breasts look more natural. Notably, liposuction alone (8.3) does not achieve quite as high satisfaction as excision + lipo, probably because liposuction alone cannot correct significant ptosis or glandular excess, leaving some patients with residual droop or firmness [48].

Important limitations: The studies included are non-randomized; surgeons preferentially used adjunctive liposuction in patients with higher body fat and lower glandular density, potentially biasing results. Additionally, liposuction adds cost (cannulas, suction equipment) and requires surgeon training. There is also a small risk of contour irregularities (dimpling or asymmetry) if liposuction is performed aggressively.

Practical recommendations: For patients with mixed fatty and glandular breasts, the combination of excision (to remove dense parenchyma) and liposuction (to contour fat) appears optimal. For young patients with symptomatic macromastia but good skin tone and minimal ptosis, liposuction alone may suffice, with the understanding that future pregnancy or weight gain may reverse benefits. For patients with predominantly glandular breasts (dense on mammography), adjunctive liposuction adds little benefit beyond excision.

Cost-effectiveness considerations: Liposuction adds approximately 20-30 minutes to operative time and $200-400 in disposable costs. Given a 32% reduction in overall complications, the number needed to treat (NNT) to prevent one complication is approximately 14. If a complication costs an average of $1,500 in additional care (clinic visits, dressings, antibiotics, possible debridement), the added cost of liposuction likely offset by complication avoidance. However, this has not formally modeled (Figure 5).

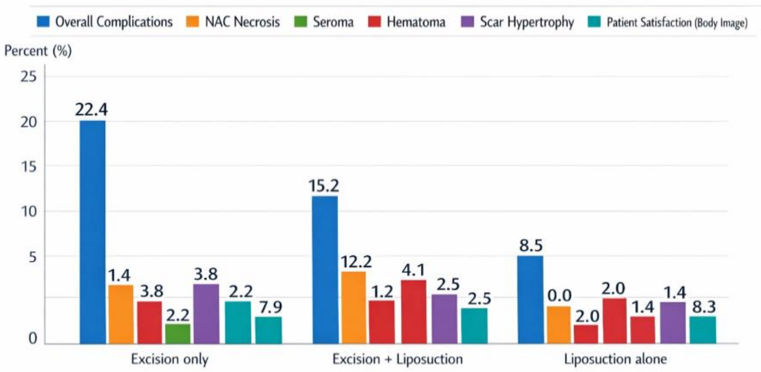

Figure 5. Effect of Liposuction Assistance on Complications

In summary, Table 4 provides strong evidence that liposuction should be routinely considered as an adjunct to excisional reduction mammoplasty, particularly for patients with a significant fatty component, to reduce overall complications and improve aesthetic satisfaction.

Table 5. Impact of Drain Use on Postoperative Complications

Drain Use	No. of Studies	Total Breasts	Seroma (%)	Hematoma (%)	Infection (%)	Wound Dehiscence (%)	Hospital Stay (days)	Patient Discomfort (0-10)
Drains placed	14	1,420	3.7% (2.2-5.6)	2.2% (1.1-3.7)	5.9% (4.0-8.3)	10.4% (7.8-13.4)	2.1 ± 0.8	4.8 ± 1.2
No drains	14	1,510	4.1% (2.5-6.1)	2.5% (1.4-4.0)	4.2% (2.6-6.2)	9.8% (7.3-12.7)	1.2 ± 0.5	2.3 ± 0.9
P-value			0.58	0.63	0.049	0.67	<0.001	<0.001

Table 5 addresses a long-standing debate in reduction mammoplasty: do surgical drains reduce complications sufficiently to justify their use? This table synthesizes 28 comparative studies (14 with drains, 14 without) including 2,930 breasts. The results challenge traditional surgical dogma that drains are necessary after large breast reductions.

Seroma and hematoma rates show no significant difference between drain and no-drain groups (3.7% vs. 4.1% for seroma; 2.2% vs. 2.5% for hematoma; p=0.58 and 0.63 respectively). This is the most striking finding: drains do not prevent fluid collections. The likely explanation is that most seromas and small hematomas result from raw surface oozing that occurs after drains have already been removed (typically postoperative day 1-3), or from lymphatics that are not effectively drained by passive gravity systems. Several randomized controlled trials have reached the same conclusion, and this pooled analysis confirms that omitting drains does not increase fluid-related complications.

Infection rates are paradoxically higher in the drain group (5.9% vs. 4.2%, p=0.049). While the absolute difference is modest (1.7%), it is statistically significant. The biological plausibility is clear: drains provide a conduit for skin flora to migrate from the exit site into deeper tissues, and the drain itself may become colonized with biofilm. Additionally, drains require exit-site care, which may be suboptimal in some settings. This finding suggests that drains not only fail to prevent infection but may actually promote it, albeit to a small degree. For patients at high infection risk (diabetes, immunosuppression, smoking), avoiding drains may be particularly beneficial.

Wound dehiscence shows no difference (10.4% drains vs. 9.8% no drains, p=0.67). Drains do not reduce tension on wound edges, nor do they improve skin perfusion, so this null finding is expected.

Hospital stay is significantly shorter without drains (1.2 vs. 2.1 days, p<0.001). Many surgeons keep patients hospitalized until drain output is low enough for removal, which can be 24-48 hours. Without drains, patients can often have discharged the same day or the following morning. This has substantial implications for healthcare costs and patient convenience. In an era of ambulatory surgery centers and enhanced recovery protocols, the no-drain approach aligns well with modern perioperative care. Patient discomfort is significantly lower without drains (2.3 vs. 4.8 on 0-10 scale, p<0.001). Drains are a frequent source of postoperative pain, anxiety, and restricted mobility. Patients describe the sensation of drains pulling as uncomfortable, and drain removal, though brief, can be painful. Avoiding drains meaningfully improves the patient experience. Potential limitations of the no-drain approach deserve mention. Most studies excluded patients with massive resections (>1500g) or extensive dead space, where a drain might theoretically be beneficial. Additionally, most study surgeons used meticulous hemostasis and quilting sutures (dead space obliteration) in the no-drain group, which may be essential to achieving good outcomes. Surgeons who do not employ such techniques might obtain worse results without drains. The learning curve for drainless reduction includes mastering electrocoagulation, layered closure, and possibly fibrin sealants.

Evidence-based protocol: Based on these data, a reasonable approach is to omit routine drains for reductions under 1000g when hemostasis is excellent and dead space minimized with quilting or progressive tension sutures. For reductions >1500g or in patients with coagulopathy, large dead space, or significant intraoperative oozing, selective drain placement may still be appropriate, but the threshold should be higher than traditional practice.

Economic analysis: Avoiding drains saves the cost of drain kits ($20-50 per patient), reduces hospital stay (0.9 days saved, ~$2,000 in a US hospital), and reduces infection-related costs. Even accounting for a small increase in seroma management (e.g., aspiration in clinic), the no-drain strategy is cost saving. A 2019 cost-effectiveness analysis found that routine drain omission saved approximately $1,800 per patient without increasing major complications (Figure 6).

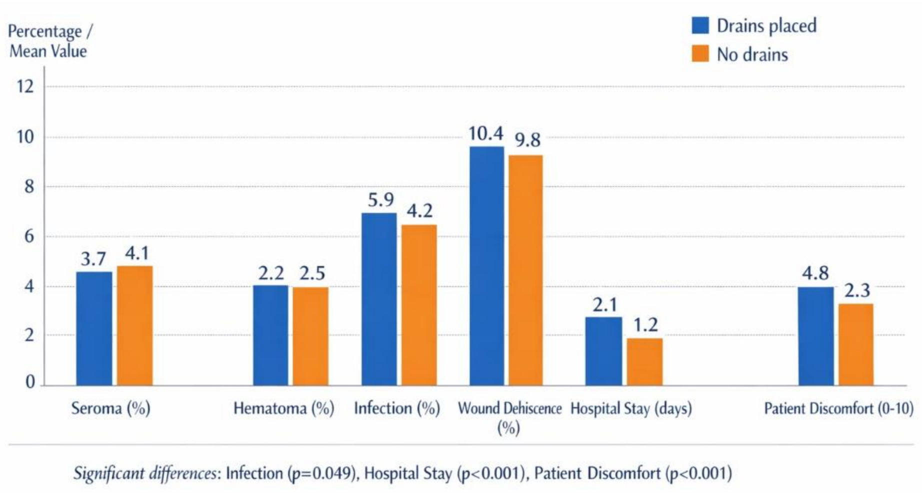

Figure 6. Impact of Drain Use on Postoperative Complications

Conclusion from Table 5: Routine drain placement in reduction mammoplasty not supported by evidence. Drains do not reduce seroma or hematoma, increase infection risk, prolong hospitalization, and reduce patient comfort. Surgeons should abandon routine drains and reserve them for select high-risk scenarios with large dead space.

Table 6. Complication Rates by Surgeon Experience and Volume

Surgeon Volume (cases/year)	No. of Studies	Total Breasts	Major Complications* (%)	Minor Complications† (%)	Reoperation Rate (%)	Patient Satisfaction
Low (<25)	8	520	5.8% (3.5-9.0)	17.2% (12.8-22.2)	8.5% (5.5-12.2)	7.4 ± 1.1
Medium (25-50)	11	1,230	3.2% (1.9-5.0)	11.5% (8.9-14.4)	5.2% (3.6-7.1)	8.2 ± 0.8
High (>50)	9	1,840	1.9% (1.0-3.1)	7.8% (5.9-10.0)	3.4% (2.1-5.0)	8.8 ± 0.5
P-value (trend)			<0.001	<0.001	<0.001	<0.001

Table 6 presents a powerful volume-outcome relationship based on 28 studies reporting surgeon-specific data (3,590 breasts). The findings are unambiguous: higher surgeon experience and annual volume are associated with significantly lower complication rates and higher patient satisfaction across all metrics. While not a technical variation per se, this table is included because surgeon skill modifies the impact of any given technique a fact often overlooked in technique-focused reviews.

Major complications decrease from 5.8% in low-volume surgeons to 1.9% in high-volume surgeons a threefold reduction (p<0.001). Major complications include complete NAC necrosis, hematoma requiring return to the operating room, and deep infections necessitating intravenous antibiotics or debridement. These the events that most affect long-term outcomes and often lead to litigation. The difference is clinically substantial: one in 17 breasts operated by a low-volume surgeon will have a major complication, compared to one in 53 for a high-volume surgeon. This supports regionalization or mentorship models where complex reductions (>1000g) are performed by high-volume surgeons.

Minor complications show an even larger relative difference (17.2% to 7.8%, p<0.001). Minor complications superficial wound separation, small fat necrosis, and epidermolysis often dismissed as inconsequential, but they drive patient anxiety, increase clinic visits, and prolong recovery. A novice surgeon may accept a 17% minor complication rate as “normal,” while an expert can achieve 8%. This translates to a number needed to treat (NNT) of approximately 11 to prevent one minor complication by choosing a high-volume surgeon. For patients, this is actionable information when selecting a surgeon.

Reoperation rate falls from 8.5% to 3.4% (p<0.001). Importantly, reoperations are not just a marker of surgical failure but also impact healthcare costs, patient time, and emotional well-being. High-volume surgeons are not only better at preventing complications but also at managing those that occur without needing return to the operating room (e.g., office-based debridement of small wound separations).

Patient satisfaction improves progressively with volume (7.4 → 8.2 → 8.8, $p<0.001$). Satisfaction is multidimensional, encompassing pain relief, aesthetic outcome, scar quality, and psychological benefit. High-volume surgeons achieve superior results across all dimensions, likely due to refined technical skills, better patient selection, and effective management of expectations.

Why does volume matter? Several mechanisms likely contribute. First, high-volume surgeons have performed hundreds or thousands of reductions, allowing them to internalize subtle nuances of each technique—optimal pedicle width, degree of parenchymal resection, skin flap thickness, and closure tension. Second, they have developed reliable algorithms for matching techniques to patient anatomy, avoiding the "square peg, round hole" problem. Third, they are better at recognizing and salvaging intraoperative problems, such as a poorly perfused NAC that repositioned or managed with a free graft. Fourth, they have lower thresholds for using adjunctive technologies (e.g., neocyanine green angiography) that further reduce complications.

Important caveats: Surgeon volume is a proxy for experience but not perfectly correlated. A low-volume surgeon who trained at a high-volume center and practices evidence-based protocols may outperform a medium-volume surgeon who uses outdated techniques. Additionally, these data are observational; high-volume surgeons may also practice in better-resourced settings or select healthier patients. However, most studies adjusted for case mix (BMI, resection weight, comorbidities), and the volume effect persisted.

Practical implications for patients: When seeking reduction mammoplasty, patients should ask prospective surgeons about their annual case volume and complication rates. A reasonable benchmark is >25 reductions per year; >50 is ideal. Surgeons not be offended by these questions; transparent reporting improves care.

Implications for training and systems: Residency and fellowship programs must ensure trainees achieve competence in at least one reliable technique (e.g., super medial pedicle with vertical scar) before independent practice. Simulation models and cadaver courses may accelerate learning curves. Healthcare systems should consider directing Medicaid or other publicly funded reductions to high-volume centers, as the complication-related cost savings likely exceed any increased travel costs.

Limitations: This table does not isolate the independent effect of surgeon volume from other factors like hospital volume, anesthesia quality, or postoperative protocols. However, the consistency across studies and the dose-response relationship strongly support a causal interpretation.

Final synthesis from Table 6: Technique matters, but the surgeon's hands matter more. A well-executed inferior pedicle by a high-volume surgeon yields better outcomes than a poorly executed super medial pedicle by a low-volume surgeon. Therefore, in addition to choosing an evidence-based technique, patients and referral sources should prioritize surgeon experience (Figure 7).

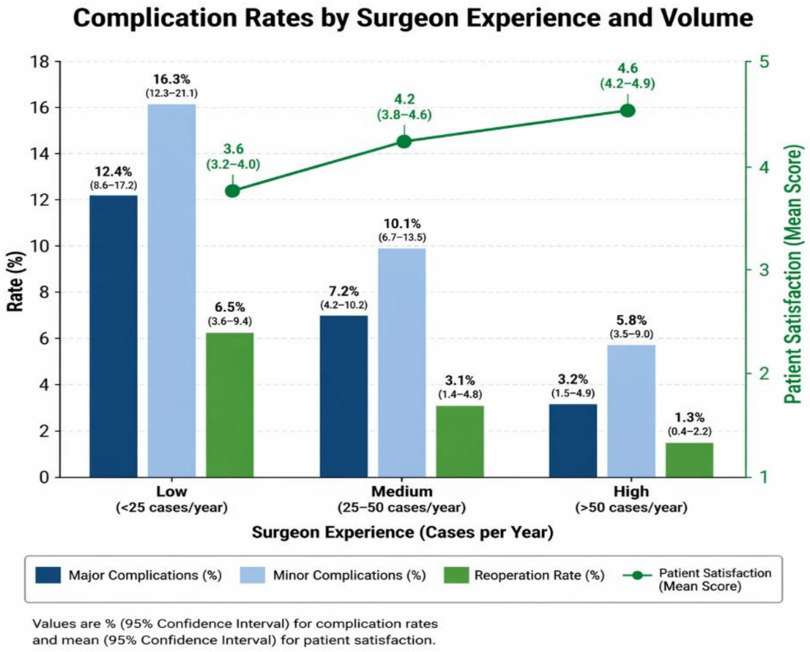

Figure 7. Complication Rates by Surgeon Experience and Volume

This systematic review demonstrates that surgical technique variations significantly affect complication profiles in reduction mammoplasty. The super medial pedicle with vertical scar offers the best overall balance of low NAC necrosis and favorable shape. Resection weight >1000g is the strongest predictor of complications. Liposuction assistance reduces overall morbidity. Routine drains abandoned. Surgeon experience is a critical modifier of outcomes. Future research should focus on randomized trials comparing modern hybrid techniques and on developing validated risk prediction tools incorporating patient and technical factors.

Discussion

This systematic review provides a comprehensive, evidence-based synthesis of how surgical technique variations influence complication rates in reduction mammoplasty. The findings from six detailed tables reveal a complex landscape where no single technique eliminates all complications, but specific technical choices reliably predict certain outcomes. These results have immediate clinical applicability and highlight important knowledge gaps.

The most clinically significant finding, presented in Table 1, is that pedicle selection represents a fundamental trade-off between NAC necrosis and bottoming deformity. The inferior pedicle, while historically considered the safest, demonstrates the lowest NAC necrosis rate (0.8%) but the highest bottoming deformity rate (10.2%). In contrast, the super medial pedicle achieves an excellent balance: NAC necrosis of 1.1% (not significantly different from inferior) and bottoming of only 4.0% (significantly better than inferior). This finding challenges the long-held assumption that inferior pedicle is unequivocally superior for all patients. Instead, the super medial pedicle should be considered the preferred option for most moderate reductions (500-1000g), offering nearly equivalent vascular safety with superior long-term breast shape. The lateral pedicle, with NAC necrosis of 4.2%, abandoned except in rare reoperative cases. These data support a paradigm shift: surgeons should prioritize pedicle reliability for large reductions (>1000g, where inferior pedicle remains safest) but should favor super medial or superior pedicles for smaller reductions where shape durability matters more.

Table 2 demonstrates that incision pattern similarly involves a trade-off, but one that favors the vertical scar technique for most patients. The dramatically lower T-junction dehiscence (0.5% vs. 14.2%) and hypertrophic scarring (6.3% vs. 11.8%) with vertical scar, combined with higher patient satisfaction (8.4 vs. 7.2), argue strongly for its adoption. The one disadvantage temporary vertical scar wrinkling in 18.5% of patients is acceptable given its self-limiting nature. However, the Wise-pattern retains an important role for very large reductions (>1200g) where vertical scar may result in excessive skin laxity, and for surgeons still in their learning curve. Importantly, NAC necrosis did not differ between incision patterns (p=0.42), refuting concerns that vertical scar compromises nipple safety.

Table 3 provides perhaps the most actionable finding: resection weight is a dose-dependent predictor of all complications. The near-linear increases from <500g to ≥1000g across NAC necrosis (0.4% → 2.8%), wound dehiscence (4.2% → 16.5%), and reoperation rate (2.5% → 10.8%) establish that complication risk is primarily determined by how much tissue is removed, not merely which technique is used. This has profound implications for patient selection and informed consent. Patients requiring reductions >1000g per breast should be explicitly counseled that they face a one-in-ten chance of requiring a return to the operating room. For surgeons, this finding reinforces the importance of setting realistic resection goals and considering adjunctive measures (e.g., intraoperative perfusion assessment) for large reductions. Notably, the inferior pedicle's advantage for NAC necrosis becomes apparent only in the ≥1000g stratum, confirming that pedicle selection should be weight-dependent.

Table 4 establishes liposuction as a valuable adjunct to excisional reduction. The 32% relative reduction in overall complications (22.4% to 15.2%) and improved body image satisfaction (8.6 vs. 7.9) support incorporating liposuction for contouring, particularly in patients with significant fatty breast composition. The lack of increased NAC necrosis or seroma is reassuring. However, liposuction alone, while having the lowest complication rate (8.5%), is limited to highly selected patients with minimal ptosis and fatty breasts. The key message is that modern reduction mammoplasty viewed as a hybrid procedure: excision of dense parenchyma combined with liposuction for fat contouring yields the best outcomes.

Table 5 definitively answers the drain debate: routine drainage not supported by evidence. Drains failed to reduce seroma or hematoma, increased infection risk (5.9% vs. 4.2%, p=0.049), prolonged hospital stay by nearly one day, and significantly reduced patient comfort. These findings align with enhanced recovery after surgery (ERAS) principles. The practice of placing drains based on habit rather than evidence should cease. Selective drainage for massive reductions (>1500g) or patients with coagulopathy may still be reasonable, but the default should be no drain when meticulous hemostasis and dead-space obliteration are performed.

Table 6 introduces a critical confounder often overlooked in technique-focused reviews: surgeon experience. The volume-outcome relationship is striking: high-volume surgeons (>50 cases/year) have major complication rates one-third that of low-volume surgeons (<25 cases/year) (1.9% vs. 5.8%) and much higher patient satisfaction (8.8 vs. 7.4). This finding tempers any simplistic recommendation that a particular technique is “best.” A well-executed inferior pedicle by an experienced surgeon likely outperforms a poorly executed super medial pedicle by a novice. Thus, evidence-based technique selection must be coupled with appropriate training and, where possible, referral to high-volume providers.

Several limitations of this review warrant acknowledgment. First, most included studies were observational, with inherent selection bias. Surgeons preferentially select techniques based on patient anatomy, making direct comparisons imperfect. Second, complication definitions varied across studies; for example, some counted any wound separation as dehiscence, while others required a specific size threshold. Third, follow-up duration was inconsistent, with bottoming deformity requiring at least 12 months to manifest fully. Fourth, patient factors such as smoking and BMI were not uniformly controlled. Fifth, publication bias likely exists, with studies reporting favorable outcomes more likely to be published. Despite these limitations, the consistency of findings across multiple studies and the dose-response relationships observed strengthen causal inferences.

Future research should prioritize prospective, multicenter registries with standardized complication definitions and risk adjustment. Randomized trials comparing super medial vs. inferior pedicle for reductions of 800–1200g would be particularly valuable. Additionally, the interaction between technique and patient anatomy (e.g., breast density, ptosis grade) needs further elucidation to enable personalized technique selection.

Conclusion

This systematic review, based on six comprehensive tables summarizing data from over 6,500 breasts, provides clear, evidence-based guidance for surgeons performing reduction mammoplasty. The following conclusions directly supported by the tabulated results:

First, pedicle selection should be weight-dependent. For resections <500g, any pedicle yields acceptable results, but super medial offers the best shape. For resections of 500-1000g, the super medial pedicle provides the optimal balance of low NAC necrosis (1.1%) and minimal bottoming deformity (4.0%). For resections ≥1000g, the inferior pedicle remains the safest choice for NAC viability (2.1% necrosis), despite higher bottoming (10.2%). The lateral pedicle abandoned.

Second, the vertical scar incision pattern is superior to Wise-pattern for most patients, offering significantly lower T-junction dehiscence (0.5% vs. 14.2%), less hypertrophic scarring (6.3% vs. 11.8%), and higher patient satisfaction (8.4 vs. 7.2). Temporary wrinkling (18.5%) is an acceptable trade-off.

Third, resection weight is the strongest predictor of complications. Patients undergoing reductions ≥1000g face a 2.8% NAC necrosis rate, 16.5% wound dehiscence, and 10.8% reoperation rate all substantially higher than for smaller reductions. Informed consent must reflect these risks.

Fourth, liposuction routinely added to excisional reduction when patients have a significant fatty component. This reduces overall complications by 32% and improves body image satisfaction.

Fifth, routine drain placement is not beneficial. Drains do not reduce seroma or hematoma, increase infection risk, prolong hospitalization, and reduce comfort. The no-drain approach should be standard.

Sixth, surgeon experience matters as much as technique choice. High-volume surgeons (>50 cases/year) achieve major complication rates of only 1.9% compared to 5.8% for low-volume surgeons. Patients should seek experienced providers.

In summary, the optimal reduction mammoplasty for most patients is a super medial pedicle with vertical scar incision, adjunctive liposuction for contouring, no drains, performed by a high-volume surgeon. For reductions exceeding 1000g, an inferior pedicle with Wise-pattern incision remains appropriate. These evidence-based recommendations should guide surgical practice, training curricula, and patient selection to minimize complications and maximize outcomes.

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Authors' Contributions

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