

Achieving Predictability in Augmentation Mastopexy: An Update

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Background: One-stage augmentation mastopexy is a challenging procedure, with the highest cited revision rates in plastic surgery. This is because when mastopexy and augmentation are performed together, they lead to opposing forces, which must be balanced carefully to avoid complications. The goal of this study was to revisit a previously described predictable and safe approach to one-stage augmentation mastopexy, and provide long-term updated results.

Methods: One hundred seventy-one patients who underwent augmentation mastopexy, performed by a single surgeon (R.J.R.), were included in this retrospective review between January 2005 and January 2019. Wise pattern mastopexy with wide pedicle was performed before placement of a small subpectoral implant. Demographic information, preoperative breast measurements, intraoperative technique, implant choice, and postoperative complications were analyzed. Specifically, postoperative measurement of vertical limbs was performed to assess long-term elongation of the lower breast pole.

Results: Cumulative complication rate was 11.7%. This rate decreased to 6% in the last 88 patients in this series as the technique matured. The most common complication was revision for implant size exchange. Long-term follow-up demonstrated elongation of nipple-to-inframammary fold distance by 1.0–2.2 cm. There was no recurrence of ptosis requiring reoperation.

Conclusions: This one-stage augmentation mastopexy technique provides a safe and reliable surgical approach with predictable and minimal elongation of the lower breast pole. The reoperation rate of this technique is less than half of >20% revision rate currently cited in the literature. (*Plast Reconstr Surg Glob Open* 2020;8:e2784; doi: 10.1097/GOX.0000000000002784; Published online 21 September 2020.)

INTRODUCTION

Concurrent augmentation mastopexy has been challenging for plastic surgeons since its introduction by Gonzalez-Ulloa¹ and Regnault.² Designed as a solution to management of the deflated ptotic breasts, the method requires a careful balance of an expansive force with a reductive one, all in setting of compromised blood supply. Early studies demonstrated poor predictability^{3,4} and high complication rates, ranging from 8% to 16%,^{4,5} including devastating complications, such as nipple/skin necrosis, and high patient dissatisfaction and litigation. Despite a long history of being a challenging operation, the debate continues over the ideal technique and need for staging.

In 2014, Beale et al⁶ published the senior author's (R.J.R.) experience, delineating a reliable, predictable, and safe approach to this operation. The 5 key principles include precise preoperative markings, 8-cm vertical limbs with a broad-based pedicle, limited undermining of thick skin flaps, small subpectoral implants, and nipple elevation no more than 4 cm. This article is a follow-up study with a modification of the technique, further enhancing the postoperative outcome. Specifically, long-term elongation of the vertical limb is assessed.

PATIENTS/METHODS

A retrospective chart review was conducted for single-stage augmentation mastopexy performed by the senior

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author (R.J.R.) from January 2005 to January 2019. Inclusion criteria included hypoplasia of breasts with ptosis. Exclusion criteria included active smokers and those requiring 2-stage procedure (Table 1). Preoperative data collection included age, comorbid conditions, history of previous breast surgery (augmentation, implant capsular contracture based on Baker classification⁷), degree of breast ptosis based on Regnault classification,⁸ and standard breast measurements (sternal notch-to-nipple distance, base diameter, nipple-to-inframammary fold distance). Operative data included volume and type of preexisting implants (if applicable), volume and type of new implants, glandular volume removed, and mastopexy pattern. Postoperative data included follow-up duration, minor complications (hematoma, seroma, infection, and skin sloughing), and major complications (need for readmission, reoperation, and major flap/nipple loss). Vertical limb length (from inferior edge of areola-to-inframammary fold) was measured over follow-up period to assess long-term elongation. Continuous variables are expressed as means \pm SD, and differences between categorical groups were assessed for statistical significance with 2-tailed Fisher exact test, with P value ≤ 0.05 set as significant.

Operative Technique

Details of operative technique were previously published in 2014 (See Video 1 [online], which displays the surgical technique for augmentation mastopexy).⁶ Preoperative markings (Fig. 1) included 8-cm vertical limbs, new nipple location along breast meridian at Pitanguy's point (anterior transposition of inframammary fold) with elevation of <4 cm, and a wide central pedicle. As previously reported, wetting solution (0.25% lidocaine with epinephrine solution) was injected into each breast, avoiding the pedicle. Tissue removal included medial and lateral segments to obtain symmetry between the 2 breasts if a size discrepancy existed.

One major modification to previous technique is identification of the pectoralis major muscle laterally, which is readily visible during lateral parenchymal resection. The muscle is split parallel to muscle fibers along the lateral 2/3, and a subpectoral pocket is created. The inferior muscle edge was disinserted to allow natural implant positioning. A sizer was inserted based on preoperative measurements (based on breast base width, usually <300 mL in volume).

Medial and lateral breast flaps are developed approximately 2 cm in thickness and approximately 4–5 cm, respectively, enough to obtain tension-free closure. Hemostasis is then obtained. The pocket is irrigated with triple antibiotic solution, transexamic acid solution, and betadine. A 15-French drain is placed followed by the

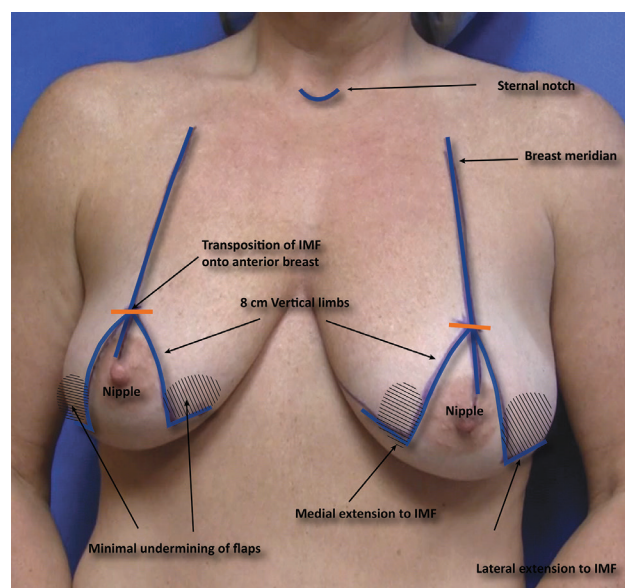


Fig. 1. Preoperative marking. Republished with permission from Beale et al.⁶

implant using standard sterile technique. Closure is then obtained in layers. New nipple–areolar complex measuring 38 mm is marked along the vertical limb at a distance of 4 cm from the inframammary fold to inferior areolar border. New nipple–areolar complex marking should be down and out at the end of the case, with 2/3 of the complex lateral to the meridian. This is to accommodate for long-term changes to breast change.

RESULTS

Over this new study period (2014–2019), additional 88 patients met inclusion/exclusion criteria, bringing the total number of patients to 171 patients. Mean age was 38 years \pm 8.5 years. Mean follow-up was 52 months. Average sternal notch-to-nipple distance was 23 cm, nipple-to-inframammary fold distance 8.5 cm, and base diameter 13.1 cm. Most common type of mastopexy performed was Wise pattern (86%), followed by vertical (8%) and crescentic (6%) (Table 2).

Most common implant type was silicone (63%). All implants are smooth and round. Mean implant size was 260 cc (range, 210–325 cc). Of the patients included, 35 (20.5%) had history of augmentation and underwent implant exchange with concurrent mastopexy. All implants were placed in the subpectoral plane to minimize disruption to nipple perfusion. The mean glandular resection was 111.2 ± 134.2 g (Table 2).

Major complications included 20 revisions (11.7%) and 1 readmission, which was previously reported in our 2014 study.⁶ Minor complications included 3 cases of hematoma, 1 case of seroma, 3 cases of infection that resolved without the need for surgical intervention, and 5 cases of superficial skin sloughing (most commonly at the T-junction, requiring conservative wound care). Of the 20 cases of revision, 4 cases occurred during the new study period; all were revised for implant size exchange where patients desired larger implants (Table 2).

Table 1. Study Inclusion and Exclusion Criteria

	No. Patients
Inclusion criteria	
Hypoplasia with ptosis	171
Exclusion criteria	
Two-stage augmentation	197
Smokers	
Total	368

Table 2. Data Collected (n = 171)

	Mean Value (%)
Age (y)	38 ± 8.5
Preoperative breast measurements (cm)	
Sternal notch-to-nipple distance	23
Base diameter	13.1
Nipple-to-inframammary fold distance	8.5
Operative data	
Volume of implant implanted (mL)	260 ± 52
Type of implant implanted	
Silicone	108 (63)
Saline	63 (37)
Gland volume removed (g)	111.2 ± 134.2
Mastopexy pattern	
Wise	147 (86)
Vertical	13 (8)
Crescentic	11 (6)
Postoperative data	
Nipple-to-inframammary fold elongation (cm)	1.3 ± 0.6
Complications	
Major	
Readmission	2
Reoperative/revision	20
Major flap or nipple loss	0
Minor	
Hematoma	3
Seroma	1
Infection	3
Skin slough	5
Follow-up (mo)	52 ± 24

Table 3. Indications for Revision

Indications	No.
Implant size change	8
Scar revision	5
Contracture	4
Infection	2
Implant deflation	1
Hematoma	1
Bottoming out	1
Other	1

With the updated patients, complication rate decreased from 19.3% (major, from previous study) to 11.7%. As may be expected with maturation and modification of technique, complication rate for the last 88 patients was 6%. The most common revision was performed in massive weight loss patients desiring implant size change.

Long-term follow-up demonstrated that nipple-to-inframammary fold distance elongated overtime by 1.0–2.0 cm, as natural progression of ongoing age-related breast ptosis. This change was seen as early as 3 months postoperatively and was maintained. Postoperative measurements were taken in 62 patients, who demonstrated average elongation of 1.3 cm (range, 1.0–2.3 cm; follow-up, 52 months ± 24) (Table 2).

Table 4. Revision Rates by Category as Compared by Fisher Exact Test (n = 20)

	Total Patients	Revision (%)	No Revision (%)	P
Implant size				
Small (≤200 mL)	53	9 (17)	44 (83)	0.14
Large (>200 mL)	118	11 (9)	107 (91)	
Degree of ptosis				
Grades 1 and 2	65	6 (9)	59 (91)	0.81
Grade 3	95	10 (11)	85 (89)	

Table 5. Five Key Points in Augmentation Mastopexy

Precise preoperative markings
8-cm vertical limbs with broad pedicle base
Limited undermining of thick skin flaps
Small subpectoral implants
Movement of nipple no more than 4 cm

Table 3 demonstrated the reasons for revision in this patient cohort. Most common reason was implant size change (8 of 20 patients), followed by scar revision and capsular contracture. Detailed analysis assessing impact of implant size and degree of preoperative ptosis on revision rate (Table 4) did not demonstrate any statistical significance. Although all 4 cases of revision in the new patient cohort (n = 88) were due to need for implant size change in patients requesting to be larger; the collective analysis did not demonstrate any trend toward implant size as a factor affecting revision rate.

DISCUSSION

The goal of single-stage augmentation mastopexy is to convert deflated ptotic asymmetric breasts to youthful conical symmetrical ones, using a reliable technique that augments the volume while restoring nipple position.⁶ This requires a fine balance between 2 opposing forces due to skin reduction and concurrent volume enhancement. Due to this inherent contradiction, there are more chances for complications, sometimes disastrous ones. Many surgeons opt for a more cautious staged approach. This study demonstrates that single-staged approach can be safe and predictable, as long as the priorities of surgery are maintained—safety first, optimize breast shape, tension-free closure, nipple preservation, and predictable long-term results.

Principles for Safety and Reliability

In our previous study, we introduced the 5 key surgical principles of one-stage augmentation mastopexy (Table 5). Precise preoperative marking and intraoperative commitment to these markings are essential to optimize surgical outcome and minimize intraoperative time. Marking should include wide central pedicle. As Wise pattern skin excision is often required in this patient group, vertical limbs that are at least 8 cm in length with narrow splay angle hugging the areolar border guarantee a conservative but adequate skin excision. Nipple elevation should be <4 cm. To minimize perfusion complications, skin flaps should be thick and undermining is performed only as needed to allow tension-free redraping of the skin (Fig. 1).

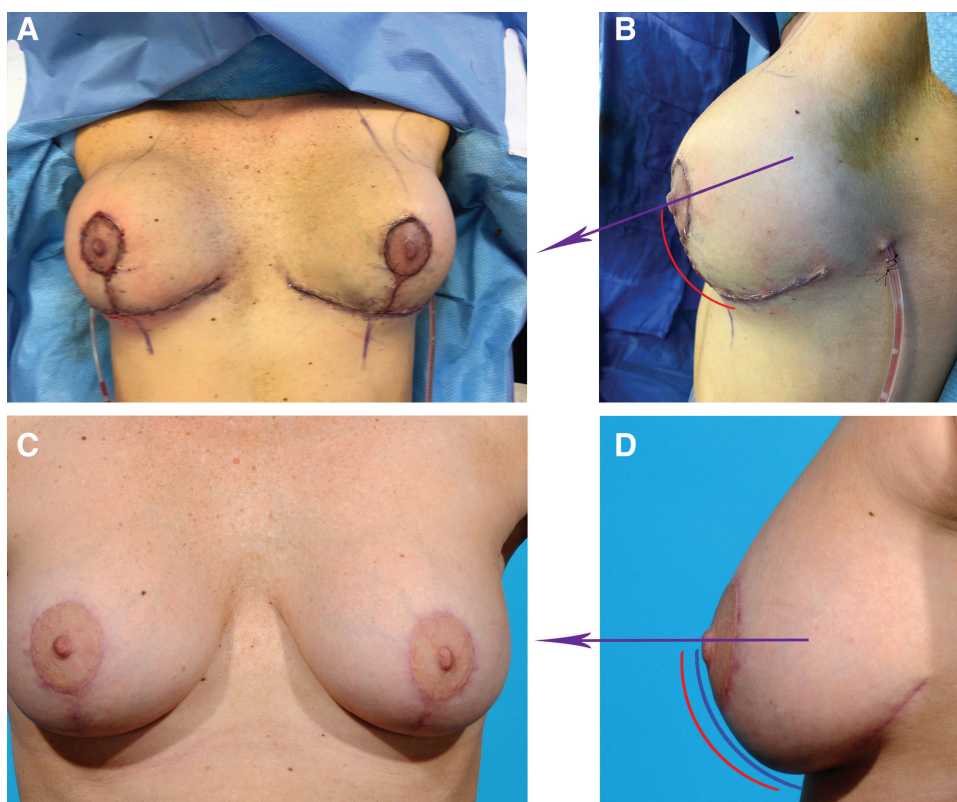


Fig. 2. New nipple position should be down and out intraoperatively (A and B). New nipple-to-inframammary fold distance is purposefully shortened by 1–2 cm to accommodate for postoperative elongation (C and D) by 7 months. Notice that both the vector of the nipple and inferior pole length change over time as well.

Implant placement is subpectoral by splitting the pectoralis major muscle longitudinally at the lateral 2/3 of the muscle. This allows reliable control of pocket creation without compromising blood supply to the breast parenchyma and nipple. As previously discussed,⁶ implant dimension is determined by the base width of the breast. We have updated recommendation for implant volume from <200 mL to <300 mL because our analysis did not demonstrate any significant difference in rate of revision when comparing those with implants <200 mL to those with >200 mL (Table 4).

Implant Selection

In this approach, mastopexy is performed before augmentation because the primary objective is to reshape the breast to improve ptosis. It is important to understand that because of the need to balance 2 opposing forces on the tissue, implant selection depends on the skin envelope after mastopexy. Implant is used to improve superior pole fullness, not volume augmentation. Many favor prioritizing augmentation before mastopexy. This often leads to selection of a large implant that may not be appropriate for the tissue envelope. A large implant limits degree of skin tightening, thereby compromising the result of the mastopexy. In addition, large implants may lead to excessive pressure affecting nipple blood supply, excessive

tension leading to hypertrophic scarring, and excessive weight increasing change of bottoming out in the long run.

Because of the unique set of limitations, management of patient expectations is a key. It is routine practice for the senior author to discuss the patient's goal of surgery—size versus shape. If patient's primary goal is to augment, a staged procedure starting with augmentation as first stage is more appropriate. Any residual ptosis can then be addressed as a second stage. One-staged augmentation/mastopexy is designed for those mainly interested in restoring shape. For this subset of patient, discussion must be clear that long-term superior fullness cannot be achieved without an implant. For patients who require significant elevation of nipple-areolar complex (>4 cm), staged procedure should be strongly considered, to prevent potential nipple perfusion complications. In this patient group, mastopexy would be performed first, followed by augmentation as needed as a second procedure (Fig. 2).

Long-term Breast Change

Expectedly, as natural progression of skin and breast aging, postoperative changes in breast are expected with time. In patients with available data (n = 62), the change in nipple-to-inframammary fold distance was measured with a mean follow-up of 15 months (range,

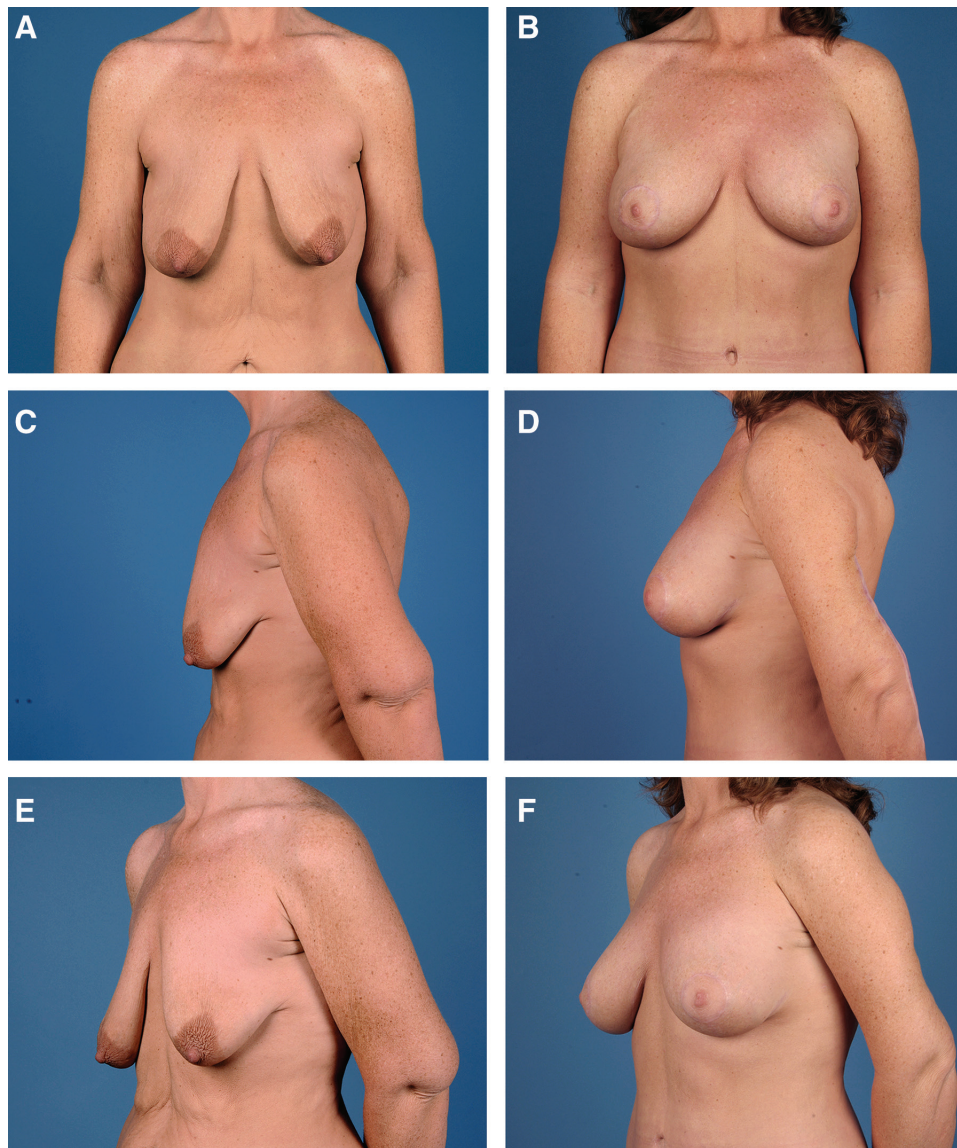


Fig. 3. A 48-year-old woman presented with deflated ptotic breasts, desiring restoration of youthful breasts. She underwent Wise pattern augmentation mastopexy with resection of 112 and 125 g of breast tissue, and placement of 275 mL subpectoral implants for superior pole fullness. Anterior, lateral, and oblique views are shown preoperatively and 6 months postoperatively. Anterior, lateral, and oblique views show preoperative (A, C, E) and 6 months postoperative (B, D, F).

6 to 30 months). We found that this distance elongates by a mean of 1.3 cm (range, 1–2.3 cm) (Table 4). The senior author's technique purposefully set this distance 1–2 cm shorter intraoperatively to accommodate for this change. New nipple location should be down and out at the end of the case (Fig. 3). In addition, knowing that larger implants are heavier, thereby place more stretch on the skin, implant selection should be <300 cc to avoid excess elongation.

A systematic review of 23 studies (3865 patients) in single-staged augmentation mastopexy⁹ demonstrated a pooled complication rate of 13.12%, with recurrent ptosis as the most common complication (5.2%). The volume of implants used was not analyzed, nor the order of the

2 procedures performed. However, we postulate that performing augmentation with a large implant before mastopexy most likely contributed to the recurrence of ptosis. In our own series, the most common reason for reoperation was implant size exchange (4.7%), in the setting of an overall revision rate of 11.7%. In the last 88 patients (over the most recent 5 years), there were 4 cases of revision (4.5%), all of which were implant size exchange for a larger size. This is similar to large studies in the current literature.^{10,11} As previously discussed, preoperative patient education is essential. All patients were told the purpose of implant is not to create larger breasts, but to provide superior fullness, which is not achievable reliably by the mastopexy alone. In the small subset of patients desiring

significantly larger and lifted breasts, an implant exchange is very acceptable as a secondary day-surgery procedure with minimal risk and down-time.

CONCLUSIONS

One-stage augmentation mastopexy can be reliable and safe with minimal complications when diligent pre-operative planning is combined with conservative technique. Performing mastopexy before placement of a small implant ensures optimal correction of breast ptosis and restoration of youthful breast fullness.

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