INTRODUCTION

Breast ptosis is a problem that is not always satisfactorily solved due to either improper analysis of the problem or inadequate management. Augmentation mastopexy is usually the operation of choice as it often helps to decrease skin-breast volume disparity. Nevertheless, it is one of the most challenging breast procedures because it combines two different techniques that each interfere with the outcome of the other. Augmentation entails increasing breast volume, which leads to the manipulation of every variable that determines the final shape, including the nipple-areola complex (NAC) and breast skin envelope surface area. In contrast, mastopexy is a procedure designed to elevate the NAC and breast tissue. Furthermore, it is always an aesthetic procedure; therefore, the tradeoffs (ie, scars and complications) are less tolerated by patients. The procedure is not only considered unpredictable but also has high revision rates (8%-20%) and is one of the most common causes of malpractice claims.1-6

Therefore, we conceived a method for effectively managing such patients with ptosed, hypovolemic breasts. The aim was to achieve harmonious, natural fullness, better projection, and appropriate size with limited scarring. We named this technique triple-plane augmentation mastopexy as three planes are used: the first plane is the subfascial plane, the second is the subglandular plane, and the third is the subpectoral plane.

Methods: A retrospective review was performed of 75 consecutive cases of grade 3 or glandular ptosis treated in a single clinic by three separate surgeons adopting the same technique from January 2010 to January 2017. Triple-plane augmentation mastopexy begins by undermining the breast tissue through a tunnel until the second rib is in the prepectoral plane. Then, the subpectoral pocket for the implant is dissected with release of the lower border of the pectoralis major and avoiding release of the sternal border. Subsequently, the breast tissue is suspended at the lower border of the second rib, followed by subpectoral insertion of the implant and skin envelope excision.

Results: Surgical follow-up varied from a minimum of 6 months to a maximum of 6 years, with an average of 3 years. Among a total of 75 patients, 64 patients (85.3%) complied with follow-up and 49 (76.5%) of these patients were satisfied. Complications varied from early complications (14.6%) to late complications (21.5%).

Conclusions: Grade 3 and glandular ptosis represent a challenge to plastic surgeons. Traditional techniques may fail to achieve optimized results. Triple-plane augmentation mastopexy is a safe, reliable procedure that ensures long-term desired aesthetic outcomes with limited scarring. (Plast Reconstr Surg Glob Open 2019;7:e2344; doi: 10.1097/GOX.0000000000002344; Published online 9 August 2019.)
METHODS

Chart Review

A retrospective chart review was performed for all patients from January 2010 to January 2017 who underwent triple-plane augmentation mastopexy. Seventy-five patients were identified. Demographic data, comorbidities, smoking, operative duration, implant data (type, size, location), postoperative complications, revisions, and long-term results were reviewed. Triple-plane augmentation mastopexy was offered to all patients with either grade 3 (severe) or glandular ptosis. Smoking cessation was required for 4 weeks preoperatively and for 3 weeks postoperatively.

Surgical Technique

The surgical markings for the inframammary fold (IMF), new NAC, meridian of the breast, and breast base width were placed with the patient in the standing position. The new NAC was always placed at a level 19–21 cm from the suprasternal notch depending on the patient’s height. The implant volume and site and new IMF selection were guided by the TEPID system.10–12 The new IMF usually ranged from 7 to 8.5 cm from the nipple depending on implant size according to the TEPID system.

All implants were round, textured, filled with gel, and high profile, with a volume ranging from 250 to 350 cc. The type of mastopexy used was determined according to skin excess as crescentic, Benelli, vertical, or limited-T mastopexy.13–21

First, the periareolar incision and the whole breast area to be dissected were injected with adrenaline xylocaine solution (1:300,000). Then, the periareolar incision was made, followed by subfascial dissection in the proximal area (near the areola) with increasing thickness moving down towards the IMF until visualization of the pectoral fascia. A subglandular 4-cm tunnel was then dissected centralized on the breast meridian until the second rib, followed by the dissection of an appropriate implant pocket in the submuscular (subpectoral) plane. The glandular tissue (at a point midway between the old and new NAC) was then suspended to the pectoral fascia at the lower border of the second rib. Nonabsorbable, monofilamentous sutures (Prolene 1) were used for suspension. For subpectoral augmentation, a pocket was created according to the breast width and anatomical footprint. After implant insertion, the patient was sat upright intraoperatively to determine the presence of excess skin and the need for one of the following skin excision procedures: Benelli mastopexy, circumvertical mastopexy, and circumvertical mastopexy with a very small T (Fig. 1) (SeeVideo [online], which displays the triple-plane augmentation mastopexy procedure).

RESULTS

Seventy-five female patients who underwent triple-plane augmentation mastopexy from January 2010, when the senior author began to perform the procedure, to January 2017, were identified. Chart data were obtained for all patients. The average age of the study population was 35 years (range, 22–50 years). Routine mammograms were obtained for all patients. The average age of the study population was 35 years (range, 22–50 years). Routine mammograms were obtained for all patients. The average age of the study population was 35 years (range, 22–50 years).

Comorbidities

Thirty-five patients smoked before their operation, and smoking cessation was expected for a minimum of 4 weeks preoperatively and 3 weeks postoperatively. Among those who smoked, the average cigarette use was 15 cigarettes per day (range, 5 cigarettes to 1.5 packs per day), and 13 patients smoked more than a half pack per day preoperatively (Table 1). Of note, one patient who smoked more than 1 pack per day preoperatively started smoking again within 1 week against medical advice and developed soft tissue complications. This patient was discharged from the hospital on postoperative day 1 without evidence of NAC compromise. Subsequently, we advised those patients who could not stop smoking to take pentoxifylline (t.d.s) preoperatively and postoperatively.

The body mass index ranged from 18.8 to 31.2 kg/m² (average, 23.7 kg/m²). There were 25 patients whose body mass index was greater than 25 kg/m². In this group, there were three patients whose body mass index was greater than 30 kg/m², falling within the obese category (Table 1). One of the three obese patients (33%) had soft tissue complications. This patient had type 2 diabetes and poor glucose control postoperatively. We had no patients with type 1 diabetes mellitus in this series for comparison. The patient who had experienced massive weight loss before the operation had soft tissue complications on one side only.

![Fig. 1. Intraoperative pictures of suspension sutures before implant insertion.](image-url)
Table 1. Patient Characteristics

| Characteristic      | Total | Range   | Mean |
|---------------------|-------|---------|------|
| Age, y              | 22–50 |         | 35   |
| BMI, kg/m²          | 18.8–31.2 | 23.7  |
| Smokers             | 35    | 13–22 cig/day | 15   |
| Pregnancies         | 53    | 1–4     | 2    |
| Massive weight loss | 1     |         |      |
| Follow-up duration, mo | 6–72 | 36      |

BMI, body mass index; Cig/day, cigarettes per day

Operative Findings

In all cases, the procedures were performed under general anesthesia. The operative time ranged from 3 to 4 hours and decreased over the years with increasing experience.

Implant placement was subpectoral in all cases; the implants were gel filled, textured, and high profile in all cases \( n = 75 (100\%) \). The implant size varied from 250 to 350 cc, with an average size of 300 cc.

In the standard procedure, no drains were used. However, if excessive discharge was encountered, drains were used and removed when the discharge volume was less than 30 cc.

A minority of patients elected to undergo additional procedures in the same operative setting as the triple-plane augmentation mastopexy \( n = 25 (29\%) \). The most commonly requested procedure was liposuction, and additional minor procedures included nevus removal, scar revisions, and upper lid blepharoplasty. The majority of the patients were discharged on day 1 postoperatively.

Follow-Up

The average follow-up duration was 3 years. The longest period of clinical monitoring among these patients was 6 years; the shortest duration was 6 months. The majority of patients complied with follow-up \( n = 64 (85\%) \), and the majority of the followed patients \( n = 49 (77\%) \) were satisfied.

Patient satisfaction was assessed subjectively by directly asking the patient if she was happy with the results of the procedure and willing to repeat it.

The patients were divided into two groups. In group A, 31 patients (41%) underwent augmentation with glandular suspension and no skin envelope procedure, either because they were not indicated or they refused to do the scarring. In group B, 44 patients (59%) underwent augmentation with glandular suspension and a skin envelope procedure; Benelli mastopexy was performed for 21 patients, circumvertical mastopexy for 16 patients, and circumvertical mastopexy with a very small T for 7 patients.

Complications

In the interest of precise documentation, all adverse events were documented. The total complication rate was 21.5%, and the complications varied from early to late complications.

Among early complications, tenderness and redness \( n = 5 \) cases (7.8%) were managed by treatment with an oral antibiotic and local antibiotic ointment. Severe pain \( n = 3 \) (4.6%) was managed by treatment with an oral muscle relaxant and analgesics. Seroma also occurred \( n = 2 \) (3.1%); in one case, the fluid was surgically evacuated, and in the other, it was aspirated under ultrasound guidance. In both cases, the fluid was sent for cytological and pathological examination; both results were negative, and neither patient experienced recurrence. There was one case of hematoma (1.5%), which was managed by surgical evacuation, coagulation of the bleeding vessel, and drainage (Table 2).

Among delayed complications, the loss of nipple sensation occurred in 12.5% of patients \( n = 8 \). The recurrence of ptosis occurred in 10.9% \( n = 7 \); three of these cases were managed by a more aggressive skin envelope procedure. Capsular contraction occurred in 9.3% \( n = 6 \); two of these cases were managed by an implant exchange, capsulectomy, glandular suspension, and skin envelope procedure. Poor scarring occurred in 7.8% \( n = 5 \) and was managed by either scar revision or silicone sheets and creams. Areolar asymmetry occurred in 3.1% \( n = 2 \); one of these patients underwent surgical revision of the NAC position. Breast asymmetry occurred in 3.1% \( n = 2 \). Delayed hematoma collection occurred in 1.5% \( n = 1 \); this complication was discovered by MRI, which was performed because the patient complained of asymmetry and persistent pain. The patient was reoperated, and the hematomas were drained and the implants exchanged during the same procedure (Table 3).

DISCUSSION

Breast ptosis is one of the most common conditions treated by plastic surgeons. Despite practitioners’ familiarity with the evaluation and treatment of breast ptosis, its management still remains a challenging problem, especially for younger surgeons with less experience. Treatment options depend on the degree of ptosis, the residual breast volume, and the patient’s response to scars.\(^1,^2\) Double-bubble deformity is one of the most common complications after augmentation mastopexy. There are two subtypes of double-bubble deformity. In type A, ie, waterfall or snoopy-dog deformity, the implant is above the breast mound, where it is held high on the chest wall by total pectoral coverage or contracture, and loose parenchyma slides off pectoral muscles inferior to the axis of the implant. In type B, the implant is below the breast mound, which occurs with significant overdissection of the IMF. The implant can slide caudal to the breast mound, causing a second IMF below the original IMF. The original IMF acts as a constriciting band of

Table 2. Early Complications

| Early complication | No. cases | Percentage | Management                  |
|--------------------|-----------|------------|----------------------------|
| Redness and tenderliness | 5  | 7.8 | Local antibiotic ointment |
| Severe pain        | 3  | 4.3 | Muscle relaxant and analgesics |
| Seroma             | 2  | 3.1 | Evacuation or aspiration    |
| Hematoma           | 1  | 1.5 | Evacuation                  |
soft tissue that compresses the implant, causing classic double-bubble deformity. The idea of the proposed technique evolved after multiple patients sought our help to repair type A double-bubble deformity. These patients were suffering from either glandular ptosis or a severe degree of ptosis and had been managed elsewhere by augmentation only. Therefore, after some time, they came to us complaining of type A double-bubble deformity. In our belief, traditional methods (augmentation with or without a skin envelope procedure) may not be sufficient in cases of severe ptosis. The breast tissue must be suspended and augmented to achieve aesthetically satisfying, long-lasting results. Therefore, we conceived triple-plane augmentation mastopexy to manage these cases effectively. This is a new idea for the treatment of ptosed, hypovolemic breasts (usually grade 3 ptosis or glandular ptosis of any grade). Subglandular limited tunnel dissection is necessary to allow proper glandular suspension (fixation). Glandular suspension is needed because, in our practice and as previously described by Dr. Constantin, severe glandular ptosis can never be corrected by augmentation alone, even using dual-plane techniques. The submuscular plane must be used to allow implant placement under the muscle, underneath the suspended gland. A skin envelope procedure at the end of the operation is needed to place the NAC in its proper position, excise excess skin, and prevent skin accumulation at the lower pole. We called this procedure triple-plane augmentation mastopexy because the subglandular plane is used to suspend the gland, two-thirds of the implant are in the submuscular plane and one-third of the implant is in the subfascial plane. Patients were divided into two groups. In group A, patients underwent augmentation with glandular suspension and no skin envelope procedure, either because they were not indicated or they refused due to the scarring. In group B, patients underwent augmentation with glandular suspension and a skin envelope procedure, such as Benelli mastopexy, circumvertical mastopexy, or circumvertical mastopexy with a very small T-shaped skin excision. The total complication rate (21.5%) was acceptable compared with that reported in large studies, such as those performed by Stevens et al. or Calobrace et al.; the loss of nipple sensation (12.5%) showed a higher incidence in this study than in the other two studies, while asymmetry showed the same incidence. Nevertheless, it must be considered that almost 160 fewer patients were included in this study than in the other two studies. Triple-plane augmentation mastopexy can achieve har-

Table 3. Delayed Complications

| Delayed complication | No. cases | Percentage | Management |
|----------------------|-----------|------------|------------|
| Loss of nipple sensation | 8         | 12         | More aggressive skin envelope procedure |
| Recurrent ptosis      | 7         | 10.9       | More aggressive skin envelope procedure |
| Capsular contraction  | 6         | 9.3        | Capsulectomy, implant exchange |
| Poor scarring         | 5         | 7.8        | Either revision or sheet and cream |
| Areolar asymmetry     | 2         | 3.1        | Revision of NAC position |
| Breast asymmetry      | 2         | 3.1        | Lipofilling |
| Delayed hematoma      | 1         | 1.5        | Drainage and implant exchange |

Fig. 2. A 39-year-old woman with one prior pregnancy presented with emptiness of the upper pole, grade 2 ptosis, and glandular ptosis. The patient refused the skin envelope procedure. This patient underwent triple-plane augmentation mastopexy with the subpectoral placement of 325-cc, textured, round, high-profile gel implants. (Top) Preoperative pictures. (Bottom) Postoperative results at the 10-month follow-up.
monious, natural upper and medial pole fullness, better projection, and appropriate size with limited scarring and satisfactory long-term results. However, this procedure does not cause over-projection in the early postoperative period, which is not favored by some patients. Breasts with a natural, homogeneous appearance were achieved as early as 1 month postoperatively and lasted as long as 4 years postoperatively (Figs. 2–4).

Fig. 3. A 26-year-old woman with one prior pregnancy presented with emptiness of the upper pole, grade 3 ptosis, and glandular ptosis. This patient underwent triple-plane augmentation mastopexy with the subpectoral placement of 300-cc, textured, round, high-profile gel implants. The skin envelope procedure was periareolar mastopexy. (Top) Preoperative pictures. (Bottom) Postoperative results at the 1-month follow-up.

Fig. 4. A 45-year-old woman with three prior pregnancies presented with emptiness of the upper pole and severe grade 3 ptosis. This patient underwent triple-plane augmentation mastopexy with the subpectoral placement of 300-cc, textured, round, high-profile gel implants. The skin envelope procedure was T-shaped mastopexy. (Top) Preoperative pictures. (Bottom) Postoperative results at the 6-month follow-up.
CONCLUSIONS

Grade 3 and glandular ptosis represent a challenge to plastic surgeons. Traditional techniques may fail to achieve optimized results. There are clear advantages to triple-plane augmentation mastopexy, including harmonious, natural upper and medial pole fullness, better projection, and appropriate size, without early exaggerated postoperative results. Based on the results of this study, triple-plane augmentation mastopexy is a safe, reliable procedure that ensures long-term desired aesthetic outcomes with limited scarring. We will continue to follow this patient population for further evaluation.

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