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ORIGINAL ARTICLE BREAST SURGERY

Combined Breast Reduction Augmentation

Ivan Manero[1] · **Ana Rodriguez-Vega**[1] · **Trinidad Labanca**[2]

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Abstract
Background Numerous methods have been designed to reduce breasts size and weight. The goal today is to not only to reduce size but also to create a pleasing shape. Breast reduction techniques do not obtain the desired upper pole fullness, and commonly recurrent ptosis develops. To improve and maintain breast shape in the late postoperative period, we combine breast reduction with implants.
Methods Three hundred and sixty-six patients who underwent combined breast reduction or mastopexy with implants from January 2014 to November 2017 at IM Clinic were retrospectively reviewed. We present the indications, surgical technique, and outcomes of these patients to determine the safety and efficacy of our technique.
Results No major complications were noted in an average of 2 years of follow-up (range 2 months to 4 years). Minor complications occurred in 61 patients, of whom 46 required revision surgery (12.6%). The most common tissue-related complications were dog ears (7.6%) and poor scarring (4.9%). The most common implant-related complication was capsular contracture (0.8%).
Conclusions Breast reduction with implants is a reliable option to provide additional volume to the upper pole of the breast to improve long-term breast shape and avoid ptosis recurrence. Our study indicates that the procedure is safe and has complication and revision rates comparable to traditional breast reduction or augmentation mastopexy techniques.
Level of Evidence IV This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266.

Keywords Breast reduction · Breast augmentation · Augmentation mastopexy

Introduction

Breast reduction is one of the most common breast procedures performed by plastic surgeons. Although many reduction techniques have been described [1–22], they all have limitations. The two most common problems, shared by all techniques, are a consistent lack of upper pole fullness and bottoming out, which refers to the caudal migration of lower pole parenchymal tissue resulting in a flat, non-projecting breast with pseudoptosis [23–28]. Patient satisfaction is generally high in breast reduction surgery, but the desire for increased excellence in the esthetic appearance of the breast prompted us to seek a better way to provide long-term upper pole fullness.

Considering the limitations of traditional breast reduction, we hypothesized that a combination of complete submuscular breast augmentation with round silicone-filled implants and breast reduction would prevent ptosis recurrence and bottoming out and provide natural, lasting upper pole fullness.

The senior author who introduced the procedure in 2000 called the technique combined breast reduction augmentation (CBRA). In our experience, CBRA has proven to be

✉ Ana Rodriguez-Vega
dra.rodriguezvega@gmail.com

[1] Department of Plastic and Reconstructive Surgery Dr. Ivan Mañero, Institute of Plastic Surgery, Barcelona, Spain

[2] Institute of Plastic Surgery Dr. Ivan Mañero, Barcelona, Spain

a versatile, effective technique that can also be used to correct ptosis.

The aim of this article is to outline the technical aspects of CBRA and discuss potential complications based on data from patients who have undergone this procedure at our clinic over a period of 4 years.

Patients and Methods

We reviewed the medical records of all patients who underwent either breast reduction (removal of > 200 g of breast parenchyma) or mastopexy (removal of ≤ 200 g of breast parenchyma) with implants between January 2014 and November 2017 at IM Clinic in Barcelona, Spain.

Information recorded included patient age, smoking history, amount of tissue removed, size of implant, follow-up time, and postoperative surgical and esthetic outcomes. All patients had preoperative and postoperative photographs taken and received general anesthetic and antimicrobial prophylaxis and postoperative oral antibiotics for 5–7 days.

A detailed medical history is obtained during the first visit. Thorough preoperative assessment is essential. This includes physical examination of breast size, shape, elasticity, looseness, striae, rashes, bra strap grooving, asymmetry, masses, and consistency. The position of the nipple–areola complex (NAC) relative to the inframammary fold is also assessed. Degree of vertical correction is assessed by measuring the distance from the sternal notch to the nipple and from the nipple to the inframammary fold.

Preoperative Markings

All patients are marked preoperatively in the standing position. Skin incision design begins by marking the inframammary crease and the vertical breast meridian (Fig. 1a). The superior border of the areola is then marked at the level of the medial end of the inframammary crease at the cleavage (Fig. 1b). The vertical incisions are drawn next. A 60° angle is used to determine the location of the two vertical limbs, whose length varies between 10 and 11 cm (Fig. 1c). The design is more conservative in cases of ptosis without breast hypertrophy. In these cases, the angle is reduced to avoid excessive skin removal. The horizontal limbs are then continued down to the inframammary crease boundaries (Fig. 1d).

Surgical Technique

The areola is marked with a 42-mm-diameter nipple marker, and skin incisions are made following the preoperative marks. We use a superomedial pedicle in most patients. A free nipple graft is only used when the NAC transposition distance exceeds 8–10 cm. We also consider comorbidities and other factors, especially smoking status.

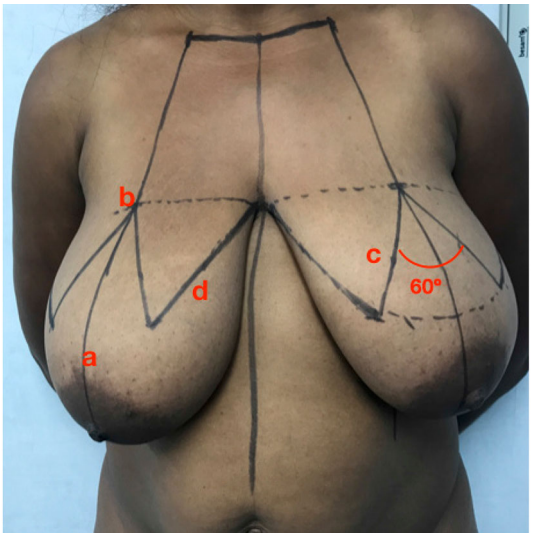

Fig. 1 Preoperative markings. **a** Breast meridian, **b** new nipple position; note that the superior border of the areola is positioned at the level of the medial end of the inframammary crease at the cleavage, **c** location of the two vertical limbs determined using a 60° angle, **d** horizontal limbs

After de-epithelialization of the pedicle or elevation of the NAC as a graft, the intervening superior and lateral periareolar tissue is excised down to the pectoralis major muscle fascia along with the inferior pole breast tissue (Fig. 2a and c).

A medial and lateral wedge is resected to reduce the width of the breast, thereby improving breast contour and preventing a boxy shape (Fig. 2d).

The remaining superior, lateral, and medial flaps are then elevated off the muscular fascia. It is important to undermine the flaps extensively to prevent flattening of the inferior pole of the breast. Further resection is performed to leave 2-cm-thick flaps. This additional tissue removal provides thin, pliable flaps that adapt better to the implant; it also prevents parenchymal ptosis and a snoopy breast. A crease is created in the subcutaneous tissue of the upper pole to achieve better redraping of the breast and an attractive conical shape that does not give the appearance of unnatural upper pole fullness.

Submuscular pocket dissection is made through the pectoralis major muscle (with separation of the fibers) and extended to the posterior fascia. The pocket extends under the serratus fascia and the rectus fascia as needed (Fig. 3). In all cases of previous breast augmentation or augmentation mastopexy with a subglandular implant, the implant site is changed to a submuscular position.

The implants and pockets are rinsed in povidone iodine solution. We use round, microtextured, moderate-profile

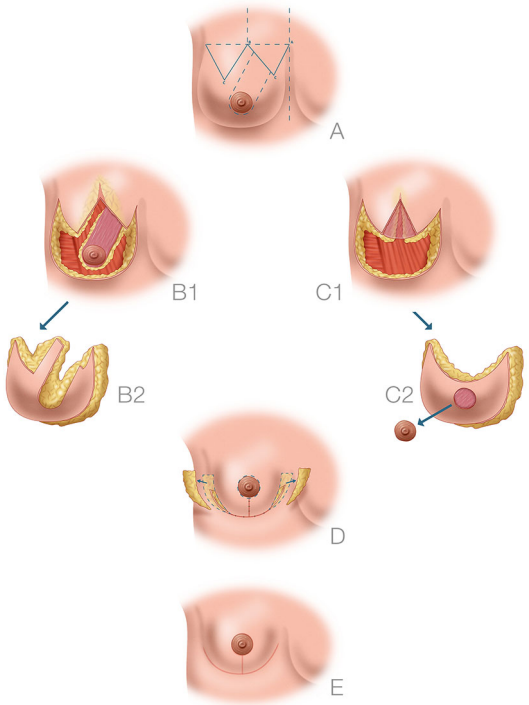

Fig. 2 **a** Preoperative markings, **b1** appearance of breast after parenchymal resection using a superomedial pedicle; note the crease on the subcutaneous plane of the upper pole designed to achieve better redraping of the breast and a conical shape, **b2** excised tissue, **c1** appearance of other breast with nipple–areola complex graft transposition, **c2** tissue resection specimen in the case of the nipple–areola complex graft, **d** removal of a medial and lateral wedge reduces the width of the breast and achieves a better contour, **e** result

implants as their larger diameter helps achieve better padding of the cleavage. Suction drains are routinely left in the implant pocket.

The pillars of breast tissue from the remaining medial and lateral flaps are closed with interrupted 2-0 Vicryl sutures to reduce tension on the vertical closure.

A 38-mm-diameter nipple marker is used to mark the final placement of the areola, and the periareolar tissue is de-epithelialized. Finally, the areola is inset with interrupted 4-0 Monocryl sutures.

All skin defects are closed in two layers. A deep plane is closed with interrupted 2-0 Vicryl sutures, while the skin is closed with subcuticular interrupted 4-0 Monocryl sutures.

Liposuction may be necessary, particularly in the axillary tail of Spence, to help shape the peripheral fatty tissue.

Postoperative Care

As part of the postoperative care program, patients are given guidelines for appropriate activity limitations. They are instructed to wear a postoperative bra without underwire and an adjustable stretch chest band with Velcro to

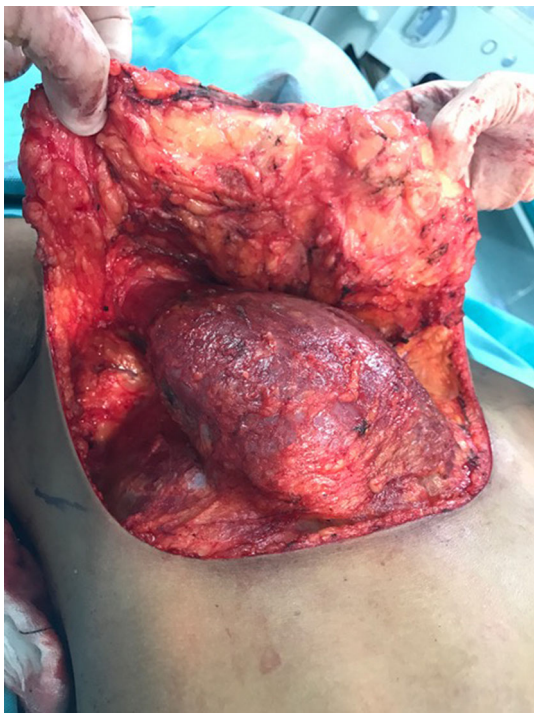

Fig. 3 Complete submuscular pocket

stabilize and position the implants for 4 weeks. Patients can usually resume intense physical activity 6 weeks after the operation. Oral prophylactic antibiotics may be continued for 5 days. Drains are removed on postoperative day 2–4, when the drain output is less than 30 cc per day. All patients are seen 2–3 days after the operation and again at 1 week, 1 month, 3 months, 6 months, and then annually or as needed.

Results

Between January 2014 and November 2017, 366 patients underwent CBRA at IM Clinic: 182 underwent breast reduction with implants, while 184 underwent mastopexy with implants.

The average age of the patients was 39 years (range 17–78 years). Just under a third of patients (n = 121, 33.06%) had a history of smoking, which was defined as smoking up to 2 weeks before surgery.

The average weight of resected breast tissue was 520.1 g/breast (range 202–2308 g) in the reduction mammoplasty group and 140.67 g/breast (range 22–198 g) in the mastopexy group. The average implant volume in the two groups was 321.39 cc and 367.09 cc, respectively. Implant volumes were comparable in both groups. A majority of implants (53.52%) were in the range of 301–400 cc. The volume was less than 200 cc in 4.59% of

cases, 201–300 cc in 31.19%, and greater than 400 cc in 10.7% (Table 1).

The superomedial pedicle technique was used in 340 patients (92.9%) and a free nipple graft in 26 (7.1%).

Complications were divided into tissue- and implant-related categories (Table 2). The most common tissue-related complications were dog ears (n = 28, 7.6%) and poor scarring (n = 18, 4.9%). The most common implant-related complication was capsular contracture (n = 3, 0.8%); two patients had capsular contracture Grade III on Baker scale and one patient had a Grade IV cc. Fifty-three patients (14.4%) required revision surgery: 46 had a complication that needed correction and seven wanted a change in implant size, all changes were made for larger implants (Tables 2, 3). The most common type of revision surgery was minor scar revision performed under local anesthesia for dog ears or poor scarring (n = 28, 7.6%), followed by correction of breast, areola, or nipple asymmetry (n = 10, 2.7%). There were no cases of recurrent ptosis or of implant exposure or infection (Table 3).

Table 1 Types of implants placed in CBRA

Type of implant	Percent of patients (%)
Sebbin microtextured gel	
< 200	4.59
201–300	31.19
301–400	53.52
401–500	9.48
> 500	1.22

Table 2 Complication rates in CBRA

Percent of patients (number of patients)	
Tissue-related complications	
Hematoma	0.5% (2)
Nipple necrosis	1.9 (7)
Skin necrosis	0.3% (1)[a]
Wound dehiscence	1.4% (5)
Implant exposure	0% (0)
Recurrent ptosis	0% (0)
Dog ear	7.6% (28)[a]
Poor scarring	4.9% (18)[a]
Asymmetry	3.5% (13)
Implant-related complications	
Infection	0% (0)
Capsular contracture	0.8% (3)

[a]Eighteen patients experienced more than one complication

Discussion

Breast tissue stretches and descends following weight fluctuations, aging, and pregnancy. Despite the great symptomatic relief that breast reduction provides, prior to the introduction of the CBRA technique at our clinic, we saw many cases of loss of upper pole fullness after just a few years.

Bottoming out can be caused by recurrent glandular ptosis if the surgeon attempts to push tissue higher up into the upper pole, regardless of the reduction technique used. This tissue will inevitably drop back down, particularly in the case of insufficient inferior glandular resection [23–28].

The literature contains many descriptions of procedures aimed at improving upper pole fullness in breast reduction surgery [29–37]. The most popular technique is the use of an inferiorly based parenchymal flap [29, 30]. This method offers great flexibility in terms of resection volume and breast shaping and ensures a reliable blood supply to the NAC complex. However, as time after the operation increases, the breast can become less plump in upper part of the breast and breast ptosis occurs [31]. Another approach designed to create a more lasting breast shape is dermal suspension [32–34]. The dermal suspension sling technique was first reported by Lalardrie in 1982 [32] and involved combining an inferior pedicle with a dermal suspension sling in women undergoing reduction mammaplasty. This technology used a vascularized autogenous dermis package and fix mammary glands to replace the ligament of Cooper function to overcome sagging breasts and loss of upper breast fullness. Suspension meshes are also intended to provide a stronger, more durable support system for the breast parenchyma [35, 36]. Meshes, however, are not suitable for all patients, and tissue quality is fundamental, as potential scarring caused by both the mesh and skin retraction will determine the cosmetic outcome. In addition, suspension meshes are not advisable in breasts with a high proportion of adipose tissue as the greater amount of subcutaneous fat favors tissue detachment from the thoracic wall, resulting in a loss of anterior projection. Chest wall-based flaps are also used to achieve better upper pole fullness [37–39]. This approach involves using a pectoral loop to support the breast in its new position. Passing a permanently fixed flap into the upper pole and closing the breast tissue behind it achieves a desirable breast shape. Although the above techniques all have advantages, in our experience, none of them offer lasting results.

With the CBRA technique, while it may seem unreasonable to use implants in a procedure whose goal is to reduce breast volume, we find that they allow us to remove as much tissue as needed while preventing bottoming out

Table 3 Revision rates in CBRA

Indications for revision	Percent of patients (number of patients)
Tissue related	
Hematoma	0.5% (2)
Nipple necrosis	0.5% (2)
Dog ear	5.7% (21)
Poor scarring	4.9% (18)
Asymmetry	2.7% (10)
Implant related	
Capsular contracture	0.8% (3)
Desire to change implant size	1.9% (7)

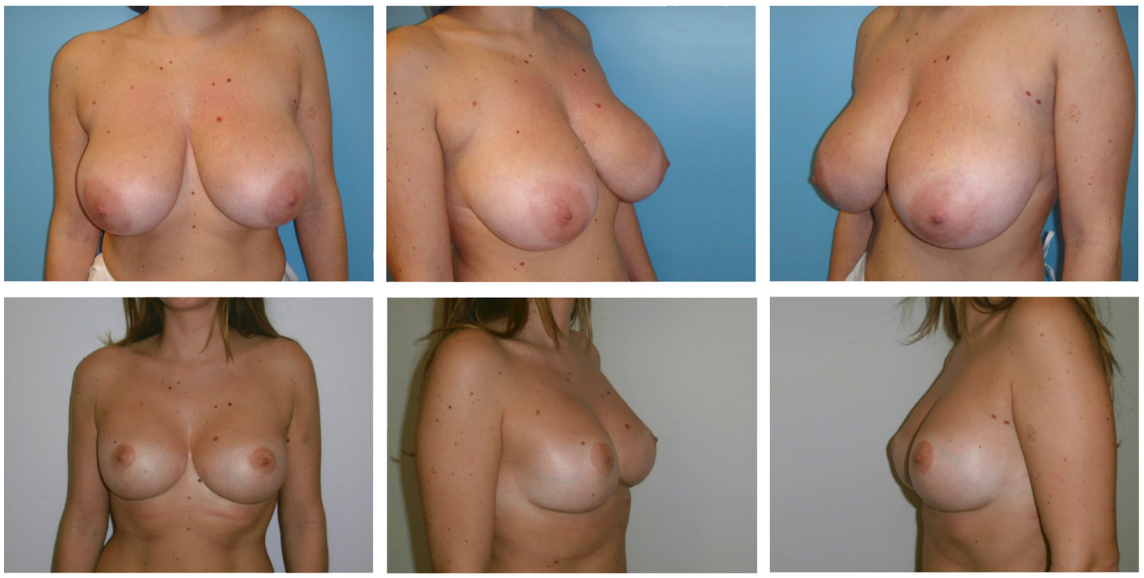

Fig. 4 Preoperative and 2-year postoperative result. Placement of 300-cc Sebbin LS70 implant with excision of 630 g from the right breast and 605 g from the left breast

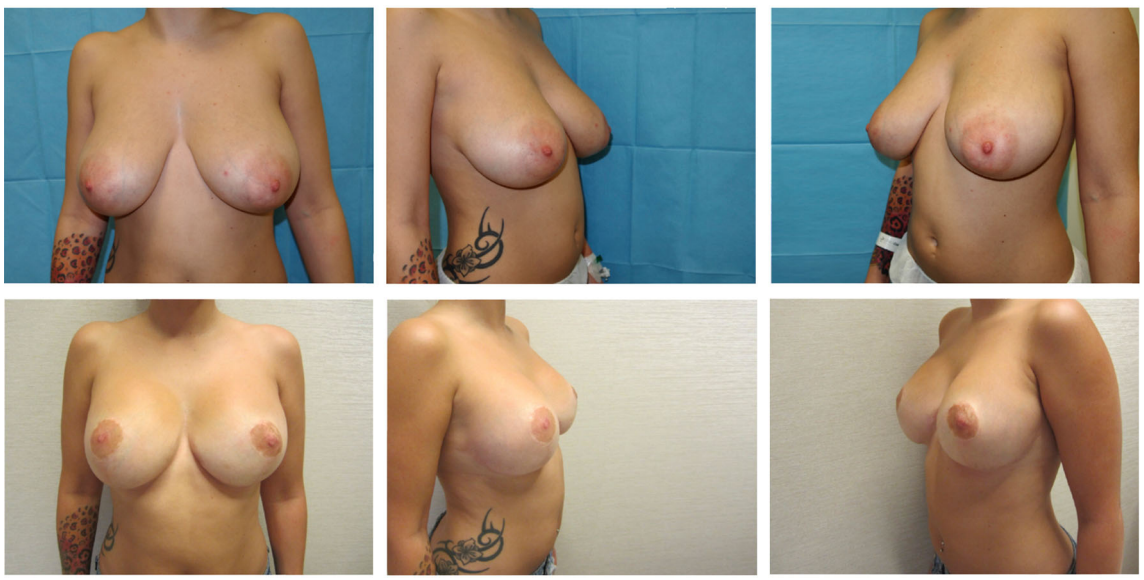

Fig. 5 Preoperative and 2-year postoperative result. Placement of 390-cc Sebbin LS70 implant with excision of 380 g from the right breast and 402 g from the left breast

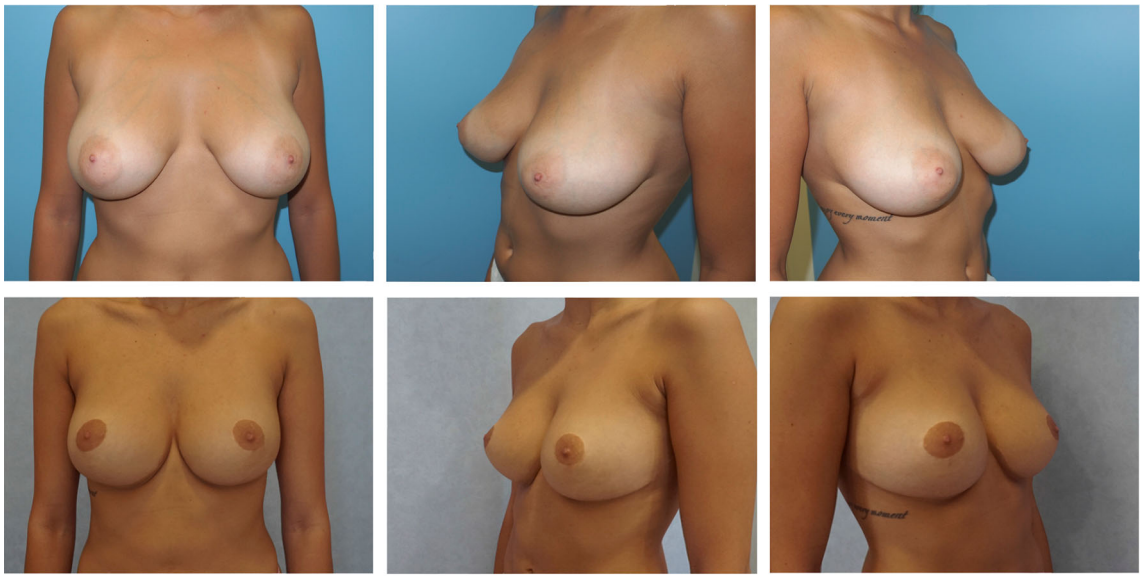

Fig. 6 Preoperative and 4-year postoperative result. Placement of 360-cc Sebbin LS70 implant with excision of 256 g from the right breast and 225 g from the left breast

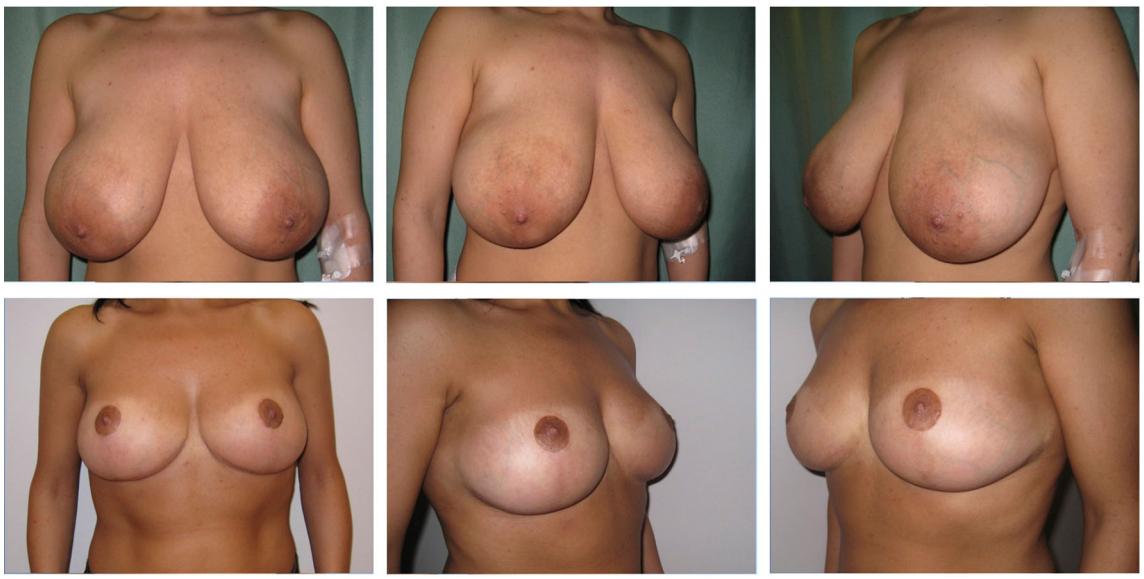

Fig. 7 Preoperative and 3-year postoperative result. Placement of 390-cc Sebbin LS70 implant with excision of 657 g from the right breast and 582 g from the left breast using the superomedial pedicle technique

and creating a round shape and full upper pole that many patients desire (Figs. 4, 5, 6).

It should also be recalled that breast size has been postulated as a risk factor for breast cancer [40–42] and that reduction mammoplasty may reduce this risk [43–49]. Breast cancer accounts for over 10% of all cancers among women worldwide, making it the most common non-skin cancer in this population [50]. If there is, in fact, a direct relationship between excision size and degree of cancer protection, apart from improving esthetic results, our technique might offer a reduction in breast cancer risk, although long-term studies are needed to validate this hypothesis.

Plastic surgeons have been performing simultaneous breast augmentation and mastopexy for decades, and several recent studies have demonstrated acceptable complication and reoperation rates, with the concomitant advantages of a single-stage procedure, lower costs, and potentially greater patient satisfaction [51–67]. The relatively low complication and revision rates observed in

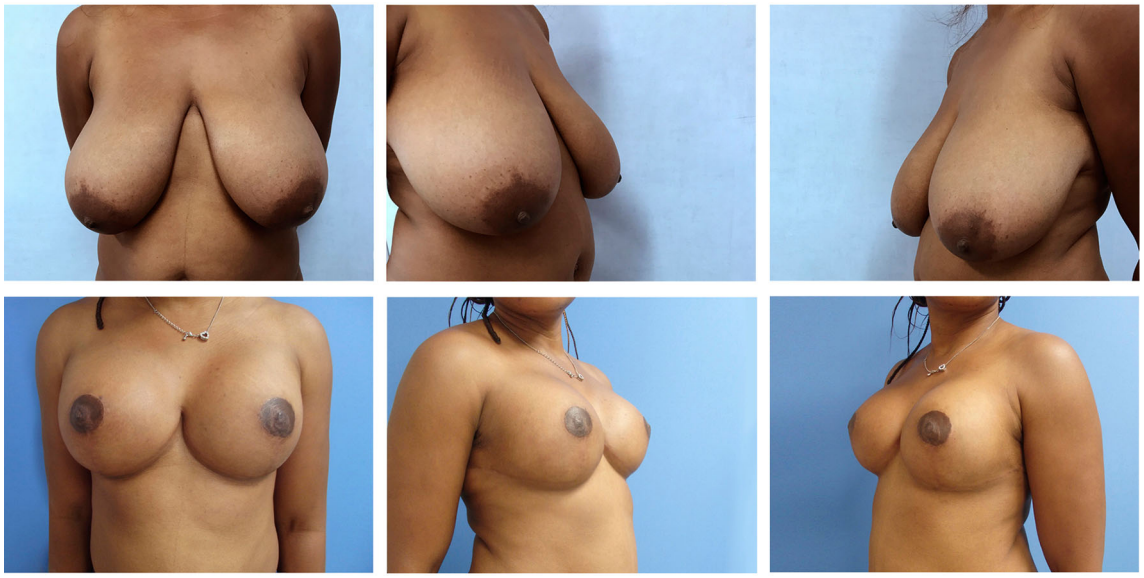

Fig. 8 Preoperative and 6-month postoperative result. Placement of 430-cc Sebbin LS70 implant with excision of 968 g from the right breast and 895 g from the left breast. In this case, a graft was used for the nipple–areola complex transposition

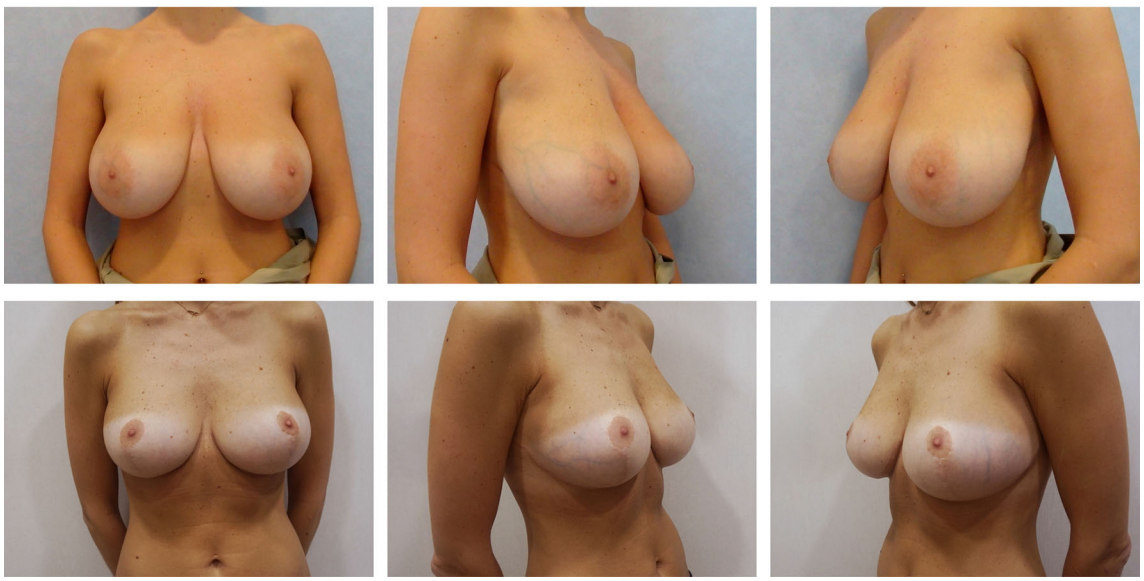

Fig. 9 Preoperative and 1-year postoperative result. Placement of 330-cc Sebbin LS70 implant with excision of 710 g from the right breast and 726 g from the left breast

simultaneous augmentation mastopexies support our belief that combined breast surgery does not necessarily predispose patients to a higher risk of complications, particularly considering that in some cases the difference between one procedure and the other is just a few grams of resected breast tissue. The complication and revision rates in our series are very similar to those described for breast reduction and single-stage augmentation mastopexy procedures. In an outcome analysis of 2142 breast reduction procedures published in 2015, the two most common complications reported were wounds (14.9%) and scars (14.5%); the reoperation rate for scars was 6.7% [68]. In our series, wound dehiscence occurred in 1.4% of patients and poor scarring in 4.9%. Breast or nipple asymmetry was observed in 13 patients (3.5%). In three cases, the slight pocket asymmetry resolved with time as the tissue stretched and the implant settled. The other 10 patients required revision surgery. This revision rate of 2.7% is comparable to rates reported in previous publications (4% [54], 3% [67], 2.94% [69]). Our overall revision rate of 12.6% is

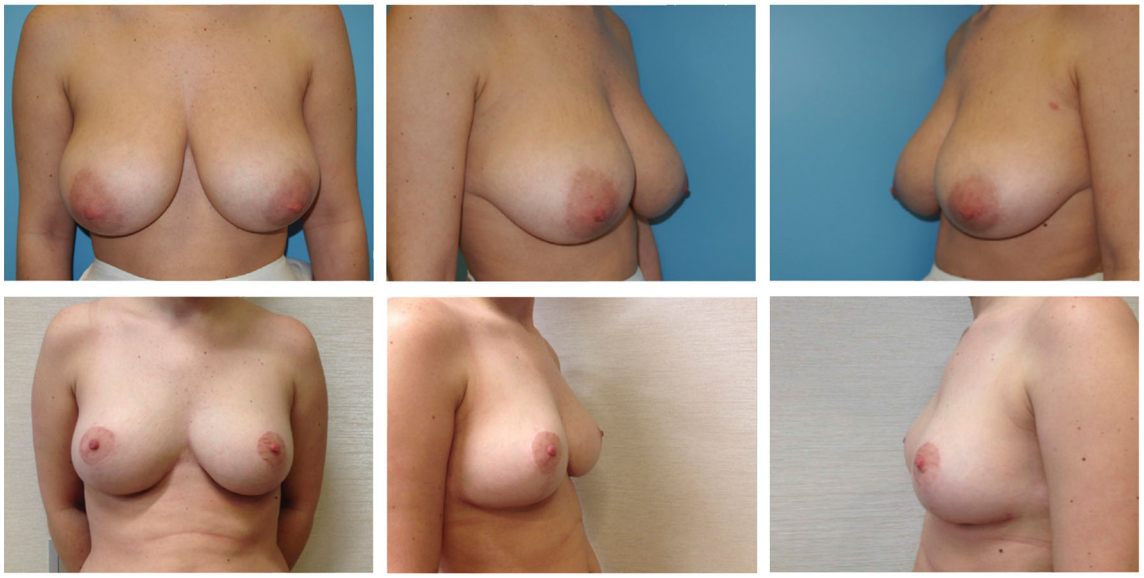

Fig. 10 Preoperative and 1-year postoperative result. Placement of 300-cc Sebbin LS70 implant with excision of 677 g from the right breast and 665 g from the left breast

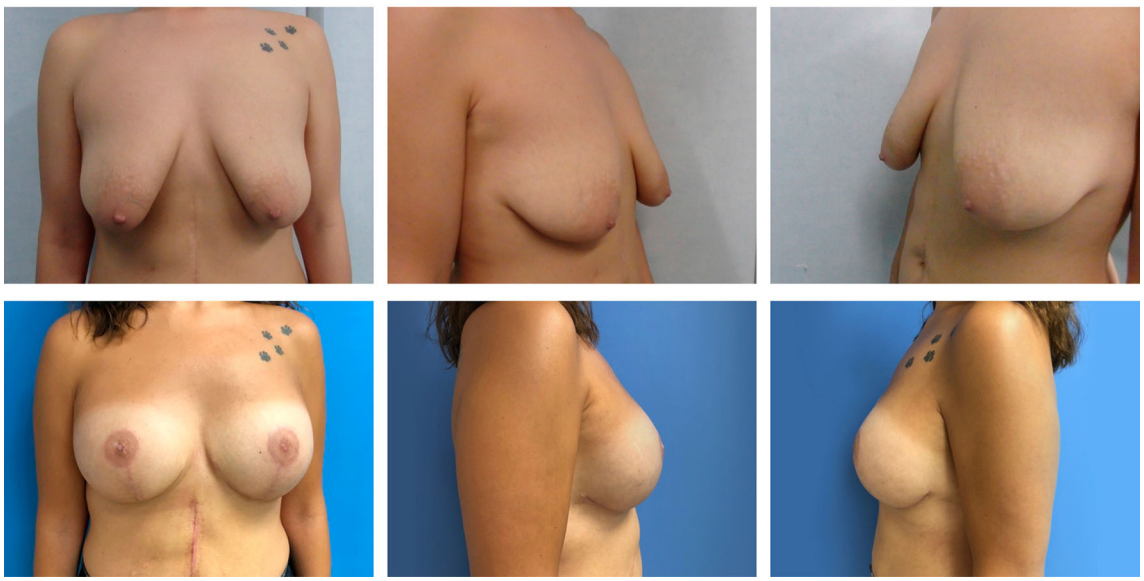

Fig. 11 Preoperative and 6-month postoperative result. Placement of 430-cc Sebbin LS70 implant with excision of 65 g from the right breast and 52 g from the left breast

also comparable to rates reported in other series of primary single-stage breast augmentation and mastopexy procedures (14% [53], 15% [54], 16.7% [70], and 10.7% [69]).

Implant-related complications were less common. The most common complication in this category was capsular contracture (0.8%), which is also the most common implant-related complication described in the literature (3%) [69]. A pooled incidence rate of less than 2% has been reported for hematoma and infections [69]. In our series, just 0.5% of patients experienced hematoma and there were no infections. Implant-related complications are due to the inherent nature of breast implants. Just three patients (0.8%) required revision surgery due to implant-related complications, and none of the 366 patients developed recurrent ptosis.

The use of reductive augmentation of the breast to improve upper pole fullness has been described in just one other publication to date [71]. The mean resection weights in that series, however, were 255 g in the primary surgery group and 227 g in the revision group. These weights are

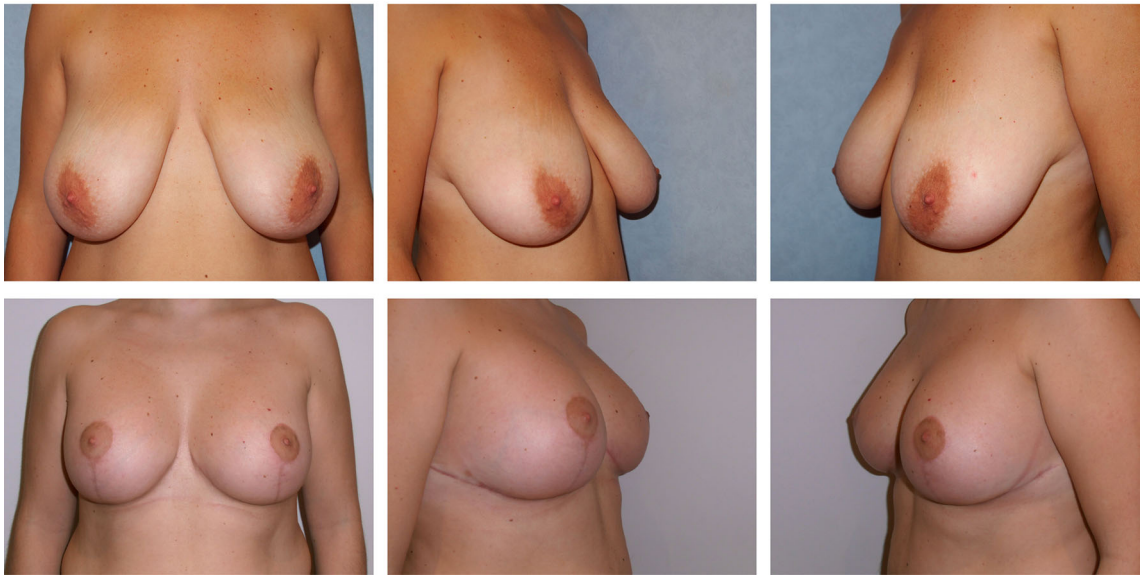

Fig. 12 Preoperative and 6-month postoperative result. Placement of 360-cc Sebbin LS70 implant with excision of 166 g from the right breast and 153 g from the left breast

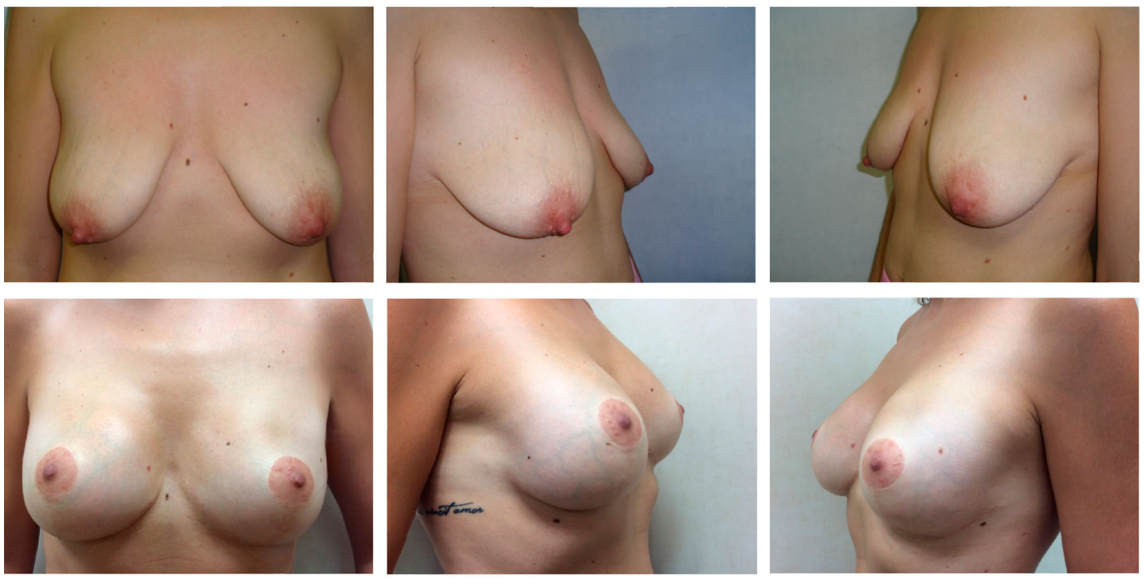

Fig. 13 Preoperative and 2-year postoperative result. Placement of 300-cc Sebbin LS70 implant with excision of 98 g from the right breast and 86 g from the left breast

comparable to those observed in our augmentation mastopexy group, and in our opinion the technique does not differ greatly from augmentation mastopexy techniques previously described. The main originality of our method lies in the combination of large parenchymal resection and implant placement (Figs. 7, 8, 9, 10). Another important difference between our technique and the reductive augmentation technique described by Chasan [71] is that we use a complete submuscular pocket rather than a dual-plane/partial submuscular pocket. Submuscular implant placement prevents bottoming out of the implant and offers an important safety advantage, as even if skin dehiscence or necrosis occurs, the implant will not be exposed. Additional advantages are maximization of implant soft-tissue coverage, a reduced risk of capsular contracture, and prevention of interference with future mammograms. Implant placement in the submuscular plane also reduces tension on the skin closure, thereby decreasing the incidence of skin necrosis and poor scarring.

Last but not least, our preoperative markings guide the skin resection during surgery without the need for intraoperative assessment. Tailor-tack mastopexy with the patient in an upright sitting position lengthens operating time, and secondary tailor-tack mastopexy makes for an even longer procedure, increasing both risks and costs.

In our experience, CBRA has proven to be an effective technique that can also be used to correct ptosis (Figs. 11, 12, 13). The safety and lasting esthetic outcomes of the CBRA technique described in this article are supported by the results from a large number of patients who have undergone this procedure.

Conclusions

Breast reduction with implants is a useful tool for obtaining lasting upper pole fullness. The procedure can be safely used in all cases, regardless of the degree of hypertrophy, ptosis, or asymmetry.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflicts of interest to disclose. None of the authors has a financial interest in any of the products, devices, or drugs mentioned in this manuscript.

Ethical Approval This article does not contain any studies with human participants or animals performed by any of the authors.

Informed Consent For this type of study, informed consent is not required.

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