Intraoperative Assessment of Breast Prosthesis Volume Using a Set of Graduated Expanders

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24.1 Introduction

One of the most puzzling decisions in augmentation mammoplasty for aesthetic purposes or following mammary gland removal is related to adequacy of the volume of the prosthesis to be inserted [1–10]. Several theoretic methods exist to calculate the final prosthesis volume on the basis of anthropometric measurements of the chest and/or contralateral breast. Nevertheless, in clinical practice such assessments often prove to be inadequate and do not correlate with the patient’s actual needs or expectations. Most surgeons use a graduated gauge to measure the surface between the inframammary groove, the supramammary margin, the costoclavicular line, and the anterior axillary line.

A very practical method to assess the patient’s expectations has been suggested by Brody [11]. The patient is invited to buy a brassiere of desired size and volume and fill it with cotton wool or other filling material to compensate for mammary gland lack. After the patient has worn the bra for several days or weeks and has found it aesthetically pleasant, the nurse in the plastic surgeon’s office measures the lacking volume, replacing the bulk material with small plastic bags filled with a defined amount water. In measuring the likely prosthesis volume by such a gross method, the author observed an average underrating by 50–100 ml on the basis of breast inspection alone.

Another preoperative measure created by Schultz and refined by Tezel [12] includes applying the principle of Archimedes. The breast is inserted into a graduated cylinder filled with water, the spillover of which will correspond to the gland volume in terms of cubic centimeters. This method, initially carried out with direct contact of the water with the breast skin, was then improved using polyethylene bags that were prefilled within the measuring cylinder. The patient was then invited to wear a bra having a size adequate to the new postprosthesis status to anticipate the final result.

Pechter [13] suggests a preoperative assessment based on breast girth, which is measured from the lateral to the median breast fold. An A cup would correspond to 17.78 cm (7 in), a B cup to 20.32 cm (8 in), a C cup to 22.86 cm (9 in), and so on, with a cup increase or decrease by 2.54 cm (1 in). According to the author, such a method may be very accurate on a preoperative basis. Obviously, the physician–patient relationship, while being highly introspective and able to perfectly identify the current needs, cannot result in a thorough interpretation because of the low quality of the measurements that have been carried out. During surgery it is possible to measure the subglandular or retropectoral pocket with traditional cutaneous prostheses, which, however, are neither graduated nor shaped according to the exact size of the permanent cutaneous expanders, giving rather approximate clues since they never represent the final actual breast projection once the operation is completed.

The authors deemed it necessary to plan the production of a set of expanders, or “phantoms,” that are completely identical to permanent prostheses in shape and volume. They are connected to a valved tube that can be filled with sterile physiologic solution, permitting expansion of the breast to reproduce the exact desired shape and size. The expanders are provided within a kit containing low-, high-, and medium-profile round and anatomic shapes. When the volume and type of prosthesis is chosen, the inflatable expander is rapidly deflated and extracted from the mammary cavity to be replaced with the definitive prosthesis.

24.2 Technique

The patients are told that during the operation the surgeon will carry out a technical trial of volume expansion, finally choosing on his or her own responsibility the prosthesis that most suits the patient’s desire and the anatomic conformation of the mammary region.

The operation is performed under general anesthesia, with midazolam premedication and propofol induction.
Intraoperative steps.

a Inframammary incision.
b Phantom introduction.
c Phantom inflated through a valved tube.
d Water filling of phantom in place to foresee the final cosmetic outcome.
e Introduction of the definite breast prosthesis.
f Final results at the end of the operation.
The periareolar or inframammary cutaneous incision with a perfectly symmetrical 3-cm-wide base is followed by a retroglandular blunt dissection under the control of a light-carrying retractor (Fig. 24.1). Thorough hemostasis is done in each quadrant.

After determining the ideal space for the creation of a suitable pocket in which the prosthesis will be placed, the inflatable prosthesis models are bilaterally inserted. These have various volumes (from 100 ml to 800 ml, with high and low profiles and anatomic and round shapes). The expander is equipped with a tube having an antireflux valve, which can be connected to a 50 ml syringe provided with a 3-way stopcock, thereby permitting the surgeon to rapidly inflate and deflate the simulators without any liquid loss (Fig. 24.1c). After the phantom is inflated with saline to the desired volume, the expected results are reviewed, observing the breast remodeling in the various profiles (Fig. 24.1d).

Following the indication obtained by the phantom’s use, all patients studied had the prosthesis volume changed in eight cases and the shape changed in four cases. The volumes that were introduced varied between 180 ml and 350 ml.

The operation is completed by improving the shape and margins of the retroglandular pocket to obtain a perfect positioning without wrinkling or folding of the prosthetic membrane. In particular, after the extraction of the phantoms, thorough examination and hemosta-

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**Fig. 24.2** Clinical presentation of a woman implanted using the phantom implant technique. a 1,2 Preoperative. b 1,2 Postoperative
sis of the dissociated tissues are carried out. Following wide irrigation with saline and diluted Betadine, the definitive prostheses are inserted (Fig. 24.1e), and a two-layer absorbable suture along the cutaneous incision is placed, with a closed-circuit sump drain maintained for 24h (Fig. 24.1f). The patients are bandaged with elastic-compressive wrap and discharged 24h later.

At follow-up visits our patients registered their satisfaction on a form which obtained a consensus on outcome in 100% of the 50 cases, which was also confirmed in short-term and long-term follow-up checks at 3 months and 6 months (Fig. 24.2).

24.3 Discussion

The cases included in this study definitively outline the opportunity to do realistic intraoperative measurements of prosthetic size and shape. In fact, defining the desired volume and profile according to chest morphology in the preliminary assessment of a patient’s breast evaluation is a difficult task. The adjustment of the body image of the woman who undergoes augmentation mammoplasty must be aesthetically improved by confirmation, on an intraoperative basis, of the patient’s expectations. The surgeon therefore has the opportunity to temporarily choose the most suitable prosthesis in a very easy and accurate manner during general anesthesia. Without tissue tumescence, intraoperative observation is truly objective. Phantoms are not only useful as confirmation of the potential self-image expectations of the patient, but also of taking care of surgical details such as the final pocket definition, symmetry, and hemostasis control after contact with the phantom silicone environment.

In the authors’ experience, the operation planning time when using the phantoms is increased between 10 and 15 min. In fact, the phantoms can be easily deflated and rapidly inflated, allowing the surgeon to do repeated observations of different volumes in rapid sequence.

24.4 Conclusions

Planning with phantom implants is a practical aid to appropriately and consistently select the final breast conformation in augmentation mammoplasty. This is an especially important step to be included in the informed consent, in which the description of the use of the intraoperative phantom, aimed to obtain permission for use, represents a further warranty of accuracy. Moreover, the satisfaction of all patients with the final outcome of augmentation mammoplasty in this study greatly gratifies the surgeons. Sometimes there is a gap between the expected aesthetic result and the definitive outcome [14–15].

The authors recommend widespread use of the phantom implant, particularly for young plastic and general surgeons in the first stages of the learning curve. A patient’s frustration after cosmetic prosthesis surgery can be not only related to a surgeon’s lack of experience but also a potential source of medicolegal liability.

References

Crescent Mastopexy with Augmentation

André Auersvald, Luiz Augusto Auersvald

33.1 Introduction

Mastopexy associated with augmentation for small volume and mild ptotic breasts has historically challenged plastic surgeons' creativity. The perfect balance between breast volume, scar, shape, and long-lasting results has been the main focus of the work of many authors.

Circumareolar, periareolar, and donut mastopexy are different names for a common approach to patients with a ptotic breast. The technique, introduced in the mid-1970s, is based on resecting skin from the entire periphery of the areola as a way to lift the breast [1–7]. The crescent mastopexy was later conceived as a modification of this approach in which the skin resection (in a crescent shape) is restricted to the segment adjacent to the upper half of the areola [8–11]. Although limited in its indications, this technique is an important surgical strategy for patients with borderline ptotic breasts.

33.2 Indications

Understanding the parameters for circumareolar mastopexy with augmentation is crucial for selecting the ideal patient for crescent mastopexy with augmentation, since the latter technique derives from the first.

33.2.1 Ptosis Grading

In 1976, Regnault [3] established three different levels for breast ptosis (Table 33.1, Fig. 33.1). Patients with grade 1 (nipple at the inframammary fold level) are best suited for either the crescent or the circumareolar mastopexy with augmentation [5]. Grade 2 patients are borderline regarding indication for crescent mastopexy and are generally accepted as good candidates for the circumareolar approach. On the other hand, the crescent technique is viewed as contraindicated for grade 3 patients because a lift of more than 3–4 cm is very difficult to achieve by simply excising skin adjacent to the upper half of the areola [9, 12].

Another important issue when considering crescent mastopexy with augmentation is the distance between the nipple–areola complex and the inframammary fold. In patients presenting with glandular ptosis and pseudoptosis (nipple at the inframammary fold level but with loose skin brassiere), this distance tends to be greater than what one would find in grade 1 ptosis (Fig. 33.2). This scenario is considered a poor indication for a circumareolar approach and a strong contraindication for the crescent mastopexy with augmentation because the excess skin and gland in these situations are not addressed adequately by crescent skin removal. A vertical, L-shaped, or inverted T should be considered here instead [13, 14].

Table 33.1 Regnault’s classification of breast ptosis

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st-degree (minor)</td>
<td>Nipple is at the inframammary fold</td>
</tr>
<tr>
<td>2nd-degree (moderate)</td>
<td>Nipple below the inframammary fold but still located on the anterior projection of the breast mound</td>
</tr>
<tr>
<td>3rd-degree (major)</td>
<td>Nipple below the inframammary fold and on the dependent position of inferior convexity of the breast mound</td>
</tr>
<tr>
<td>Glandular ptosis</td>
<td>Nipple above the fold, but the breast hangs below the fold</td>
</tr>
<tr>
<td>Pseudoptosis</td>
<td>Nipple above the fold, but the breast is hypoplastic and hangs below the fold</td>
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</table>
33.2.2 Nipple–Areolar Complex Diameter

Both crescent and circumareolar mastopexy with augmentation are best indicated in patients with a nipple–areolar complex diameter greater than 35–40 mm. Spear et al. [12, 15] suggested a mathematical method to guide the planning of circumareolar mastopexy. This method is based on rules that determine the amount of skin removed in an attempt to prevent tension on closure and to avoid hypertrophic scarring and areolar spreading. According to their guidelines, the outer incision should be less than three times the diameter of the inner circle and is generally less than 10 cm total.

Crescent mastopexy with augmentation is also well indicated in patients with a nipple–areolar complex diameter greater than 35–40 mm who need a lift of no more than 25–30 mm [14]. However, because the skin is not excised in the entire periphery of the areola, this technique should be indicated with care in patients with larger areolas (diameter greater than 8 cm, in the authors' experience).

33.2.3 Skin Characteristics

Thicker and pigmented skins tend to have worse healing when crescent and circumareolar mastopexy with augmentation are performed. Unsightly scarring and areolar enlargement may also occur in a patient with a small and well-delineated nipple–areolar complex [12].

Markings should be done before the anesthetic procedure with the patient in a sitting position. At this time, if not done previously, eventual asymmetries should be considered and discussed with the patient, preferably in front of a mirror. It is important to highlight that thoracic asymmetries may not only be of soft tissue origin (skin, gland, and muscle) but also of bone structure, and that the latter are not addressed in the surgery and will persist after the procedure.

The higher point of the nipple–areolar complex is marked and the new point established on an imaginary vertical line 1–3 cm above the original point. The crescent can then be drawn with two almost parallel curves starting at 9 o'clock, passing through the higher points (the original and the new) and going down to the 3 o'clock point (Fig. 33.3) [7].

Local or epidural blockage associated with sedation or general anesthesia are chosen according to the surgeon's and the anesthesiologist's preferences. Infiltrating the skin and the plane to be dissected with adrenaline (1:500,000) may help reduce bleeding.

Incision with a #15 blade scalpel and subsequent deepithelialization is performed. Dissection through the gland should be perpendicular to the thoracic plane and may be performed with electrocautery or with a #22 blade scalpel. If using the scalpel, one should be careful in splitting the gland in only one plane. Thorough hemostasis and placement of a tubular suction drain (if such a device is used) should be done before introducing the implant.

Fig. 33.1 Regnault's classification of breast ptosis

Fig. 33.2 Pseudoptosis according to Regnault

33.3 Technique
Closure should follow three planes: glandular, subdermal, and intradermal levels. In all of them, the authors’ preference is for poliglecaprone (Monocryl, Ethicon): 3-0 interrupted sutures for the glandular and subdermal planes and 4-0 for the intradermal suture.

In 2006, Gruber et al. [14] proposed a variant approach to the technique described above, the so-called extended crescent mastopexy with augmentation. The objective, according to these authors, is to minimize skin tension by gland removal under the crescent, thereby reducing the potential for nipple–areolar complex spreading and scar hypertrophy.

### 33.4 Case Results

Case 1: This 31-year-old patient came seeking treatment for her hypomastia and grade 1 ptotic breasts (Fig. 33.4). She underwent bilateral crescent mastopexy with augmentation. A 250-ml silicone implant (anatomic profile) was used.

Case 2: This 29-year-old sought treatment for her small-volume breasts and the asymmetry of her nipple–areolar complex position (Fig. 33.5). On the right side she presented a grade 1 ptosis, and on the left side, no ptosis. A crescent mastopexy with augmentation of her right breast was planned; on the left side, the implant was placed through the upper half of the areola, but no skin was removed. Both implants were of silicone gel and anatomic profile (275 ml). She underwent simultaneous liposuction.

### 33.5 Complications

Complications of crescent mastopexy with augmentation are not well documented in the literature. However, as mentioned in the beginning of this chapter, crescent
and circumareolar mastopexy are intrinsically analog, and therefore one can extract from the latter potential complications for the former.

Although no specific incidence is reported in the literature, infection, partial and transient loss of nipple–areolar complex sensitivity, and hematoma are listed as possible early complications. Higher bleeding rates are generally expected when approaching the submuscular plane through the upper quadrant [3]. Skin pleats tend to accommodate in the first few months; revision is rarely required for this reason. Globular-shaped and flat breasts can eventually be found after surgery and may persist as late complications [4].

Areolar spreading and distortion are also among the complications (Fig. 33.6) [16]. When analyzing long-term results in a series of 26 patients who received crescent mastopexy with augmentation, Puckett et al. [9] reported 12 cases of areolar spreading greater than 5 mm and five individuals with oval areolas.

Another important complication of this technique that is poorly indicated in the literature is early and late recurrence of ptosis. Because no gland work is performed, this complication depends greatly on the quality of the patient’s skin. Thicker skin tends to keep the result for a longer period than thinner skin.

33.6 Discussion

Balancing shape, volume, and scar with a low recurrence rate is the main goal when considering lifting and augmenting the breast. Although the use of crescent mastopexy and augmentation is restricted to few patients [17], it can be of great help for women with grade 1 or borderline grade 2 ptosis with a normal or near-normal distance between the nipple–areolar complex and the inframammary fold [14].

Other important factors also have to be considered when choosing a good candidate for this technique.
Those with lighter and thinner skins and with areolar diameters greater than 35–40 mm and less than 80 mm tend to heal better.

Upper-pole fullness is among the priorities of women from many cultures when breast augmentation and lift are considered. Therefore, one of the mandatory issues to be discussed with the patient prior to surgery is the recurrence of breast ptosis, a possible late complication of this procedure. In the crescent technique, the blood supply is interrupted on the upper half of the nipple–areolar complex; therefore, a secondary mastopexy using a vertical, inverted T, or L-shaped incision may be precluded—at least for the first few years—for concerns with the areolar skin viability [13].

One of the approaches used by the authors to overcome this problem is to combine the crescent mastopexy with augmentation via the inframammary fold or the axilla. Because the implant is not introduced through the areola, the deepithelialization of the skin (crescent) spares the periareolar dermal and subdermal plexuses. If a vertical, inverted T, or L-shaped mastopexy is needed in the near future, these intact plexuses will provide the blood supply to the areola.

This alternative method (crescent skin excision only and introduction of the implant through the inframammary fold or through the axilla) may be very helpful in patients with asymmetric breasts in which the desired lift is slightly different for each side. For instance, patients with no ptosis on one side but with grade 1 or 2 ptosis on the other side may benefit from this approach (case 2).

### 33.7 Conclusions

Crescent mastopexy with augmentation is a technique used for patients with a small grade of ptosis in which the desired lift of the nipple–areolar complex does not exceed 3 cm. Thick- and light-skinned patients tend to have better results compared with those with thin or dark skin. Areolar distortion and spreading and early or late recurrence are possible complications (Fig. 33.6). When appropriately indicated, this approach may lead to a good balance between shape, scar, and long-lasting results.

### References