Anatomic Cohesive Gel Implants: Reshaping the Breast in Different Body Types

José Luis Martín del Yerro, MD

Augmentation mammaplasty is one of the most frequently requested aesthetic surgery procedures today. The introduction of anatomic cohesive gel implants represents a significant advance in cosmetic breast surgery that has altered the nature of this well-accepted operation and enhanced its potential for excellent aesthetic results. With these implants it is now clear that breast augmentation does more than alter breast size—it also has the ability to change breast shape and dimensions. By increasing the size of the breasts, we are also remodeling and reshaping them, and in most patients additional adjustments to the configuration of the inframammary fold or the relative position of the nipple-areola complex may be required.

The shape of the augmented breast depends largely on the shape of the implant used for enhancement. That is why anatomic implants, which have a well-defined, stable shape, make it possible to remodel the breast with greater precision and predictability. By using shaped implants we can recontour the breast, altering it to fit the individual needs of each patient. We can modify its width, change its lateral projection, and alter the projection of the upper or lower poles and the nipple-areola complex.

Despite their obvious benefits, anatomic implants present some challenges. They are more difficult to use than round implants and require more precise and meticulous surgical planning. There is little margin for error. The proper implant choice for each patient, along with careful preoperative marking and meticulous surgical technique, are essential to obtain good results. The learning curve for using these implants is steep; classic ways of thinking about breast size and implant choice do not apply. The focus has shifted from just enhancing breast size to producing a proportional breast shape that is balanced and in harmony with the torso. Thus augmentation mammaplasty requires an assessment of the breasts as well as the adjacent structures.

STANDARDS OF BREAST BEAUTY

As plastic surgeons we understand that the goal of plastic surgery is not to pursue perfection but to seek improvement. Aesthetics in breast surgery is a desirable but elusive goal. The patient's physical condition, the surgeon's skill, the operative approach selected, and the patient's expectations are all factors that influence the ultimate result. The challenge is to enhance the patient's appearance while approximating the ideals of beauty or harmony that are most suitable for that individual. Although the ideal is seldom present in nature, it is helpful to have a good understanding of breast aesthetics so that we have a standard of beauty to guide us in planning surgery.

Breasts are symmetrical structures found on the anterolateral walls of the thorax. Understanding the relations of the breasts to each other and to the torso is essential for evaluating the balance, proportion, and harmony of these structures. It is obvious that a morphologic analysis of breast beauty cannot be restricted to the breast itself, and that the torso and the rest of the body must also be analyzed. The breasts stand out and show their contour, beauty, and attractiveness against the backdrop of these other structures. The shape of an attractive or beautiful breast also depends on the proportions and shape of the torso. For educational purposes it is useful to compare the breast with the nose. The nose must maintain harmonious proportions within the face that frames it. In the same way that a large, thin, and pointed nose may spoil the harmony of a face with broad, flattened features, a breast with a narrow implantation base is unaesthetic on a broad, short torso.

Body Types and Breasts

The *breast implantation base* is the area of the thorax from which the breast mass projects. This area ranges from a few centimeters below the clavicle to the inframammary fold vertically and from a few centimeters from the sternal medial line to the anterior axillary line (or more laterally in some cases) horizontally.

Variations in body type produce variations in the breast implantation base, and the shape of this base may vary. In many cases it is circular; however, it may also be oval with a longer vertical axis or oval with a longer horizontal axis.

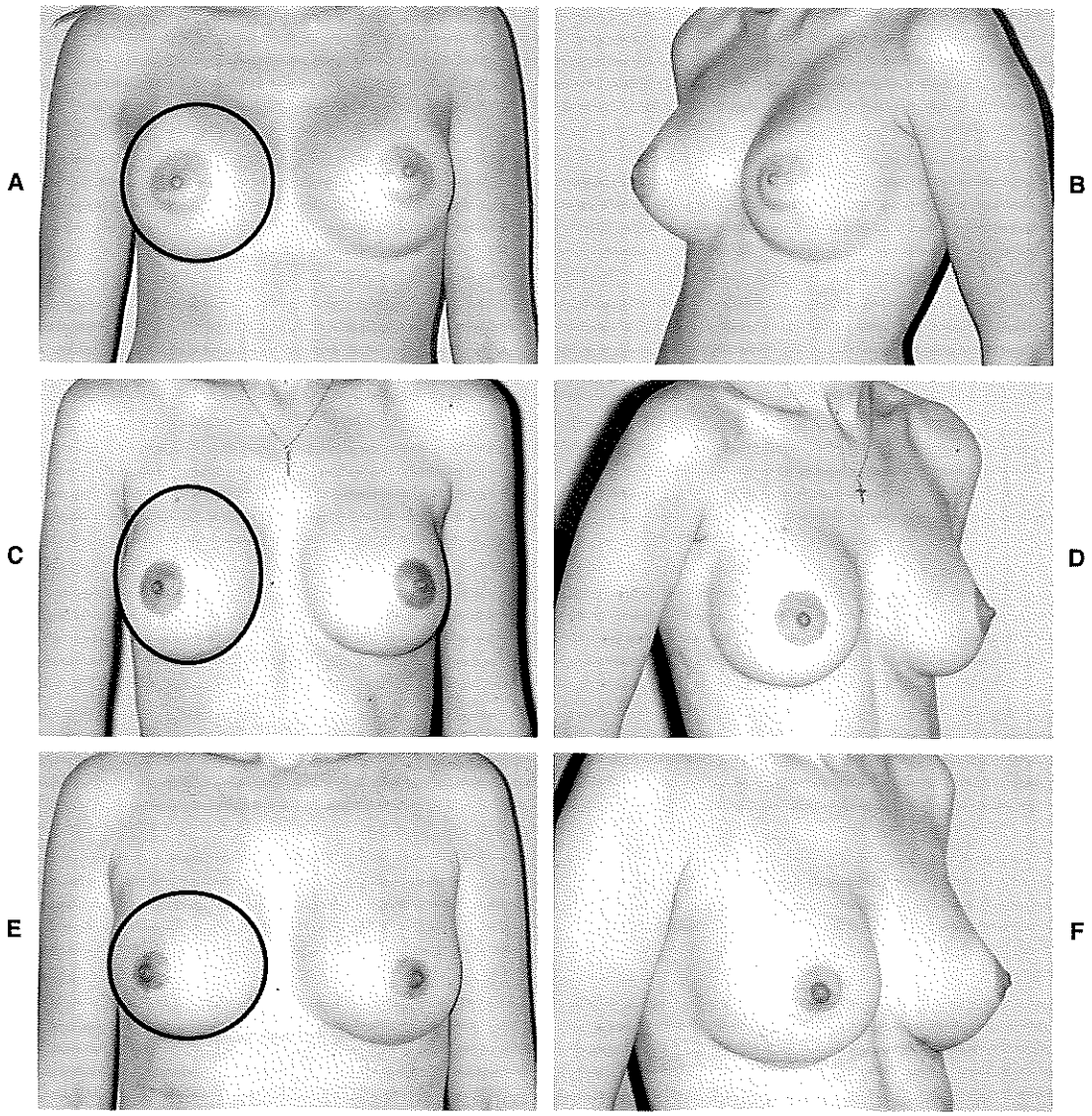

FIG. 1 Different possible shapes of the breast implantation base. **A** and **B,** Circular base. **C** and **D,** Oval base with larger vertical axis. **E** and **F,** Oval base with longer horizontal axis.

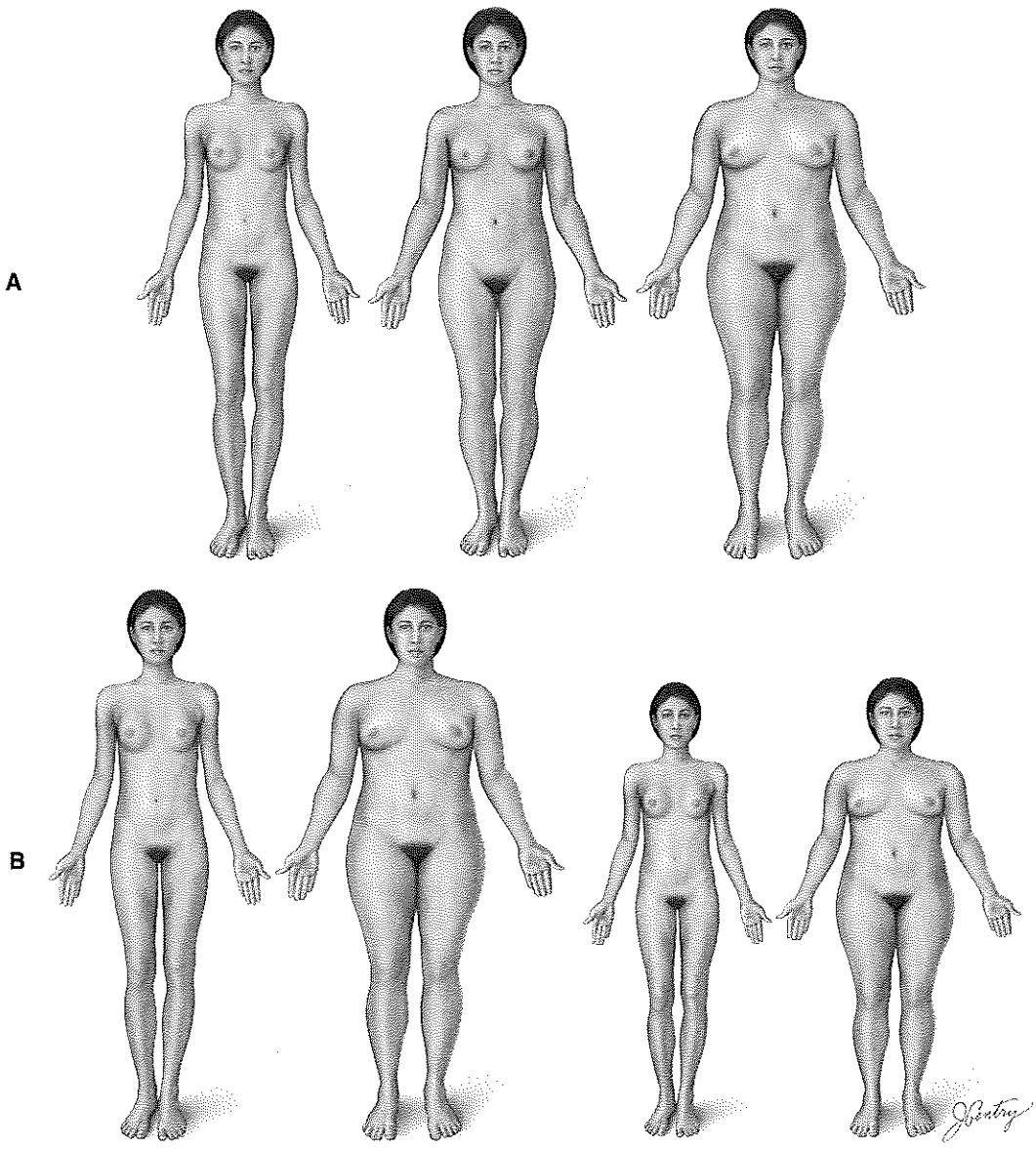

FIG. 2 **A,** The *asthenic* or *ectomorphic* body type corresponds to a thin body, lightly muscled and small shouldered *(left)*. The *pyknic* or *endomorpohic* body type corresponds to a thick body, heavily muscled and broad shouldered *(right)*. Between these is the *intermediate* body type *(center)*. **B,** The body type of any woman does not directly correlate to her height. Every body type can be found in both short and tall women.

The ratio between the width and height of the breast implantation base is not fixed in all women; it varies depending on the body type. A woman with an *asthenic* or *ectomorphic* body type—that is, someone who is thin, lightly muscled, and small shouldered—typically has breasts with vertical dimensions larger than the horizontal dimensions. A woman with a *pyknic* or *endomorphic* body type is thicker of body, heavily muscled, and broad shouldered; she should have breasts that occupy the entire width of the torso without being excessive in the vertical dimension. It is the body type, and especially the proportions, that determine the ratio between the height and width of the breast implant base, and not the absolute dimensions of the patient.

An asthenic body type can be tall or short, as can a pyknic body type. For an aesthetically pleasing result, the height/width ratio of the torso must be maintained in the implantation base of the new breast. The most common body type (in Caucasian women) is an intermediate one in which the height and width of the breast are similar, having an implantation base that is practically circular.

The Shape of the Breast

Because the height/width proportion of the breast implantation base varies, the shape of the breast also varies. It is helpful to first consider the ideal breast shape for a woman of an intermediate or "normal" body type and then consider the variations observed in other body types. Breast proportions and beauty standards are most effectively seen with the woman standing.

The Intermediate or "Normal" Body Type

Nipple-Areola Complex Position

The nipple-areola complex must be located over the point of maximum anterior projection of the mass of the breast.

The Upper Pole

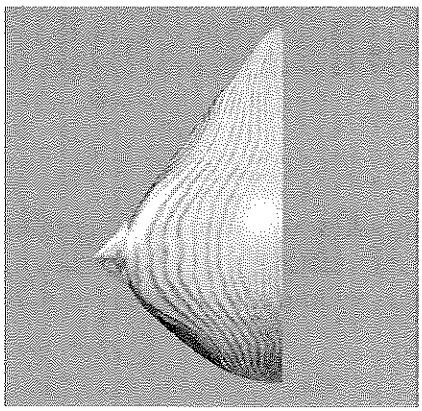

FIG. 3

The breast mass above the nipple-areola complex is called the *upper pole.* It starts a few centimeters below the clavicle and descends, following a gentle curve (slightly convex or straight) until it reaches the upper edge of the nipple-areola complex. It has a geometric form similar to half of a truncated cone.

The Lower Pole and the Inframammary Fold

The *lower pole* of the breast is located below the nipple-areola complex. It is similar in shape to a quarter sphere, but because the breast is situated on the curved plane of the thorax, the lateral portion extends along the side of the chest and is longer and larger than the medial portion.

The *inframammary fold* is the skin fold that defines the intersection between the lower edge of the breast and the skin of the abdomen. It is of particular importance for remodeling the breast and is the foundation that supports and defines the shape of the breast and its relation to the torso. It is truly from the inframammary fold upward that the rest of the breast is constructed.

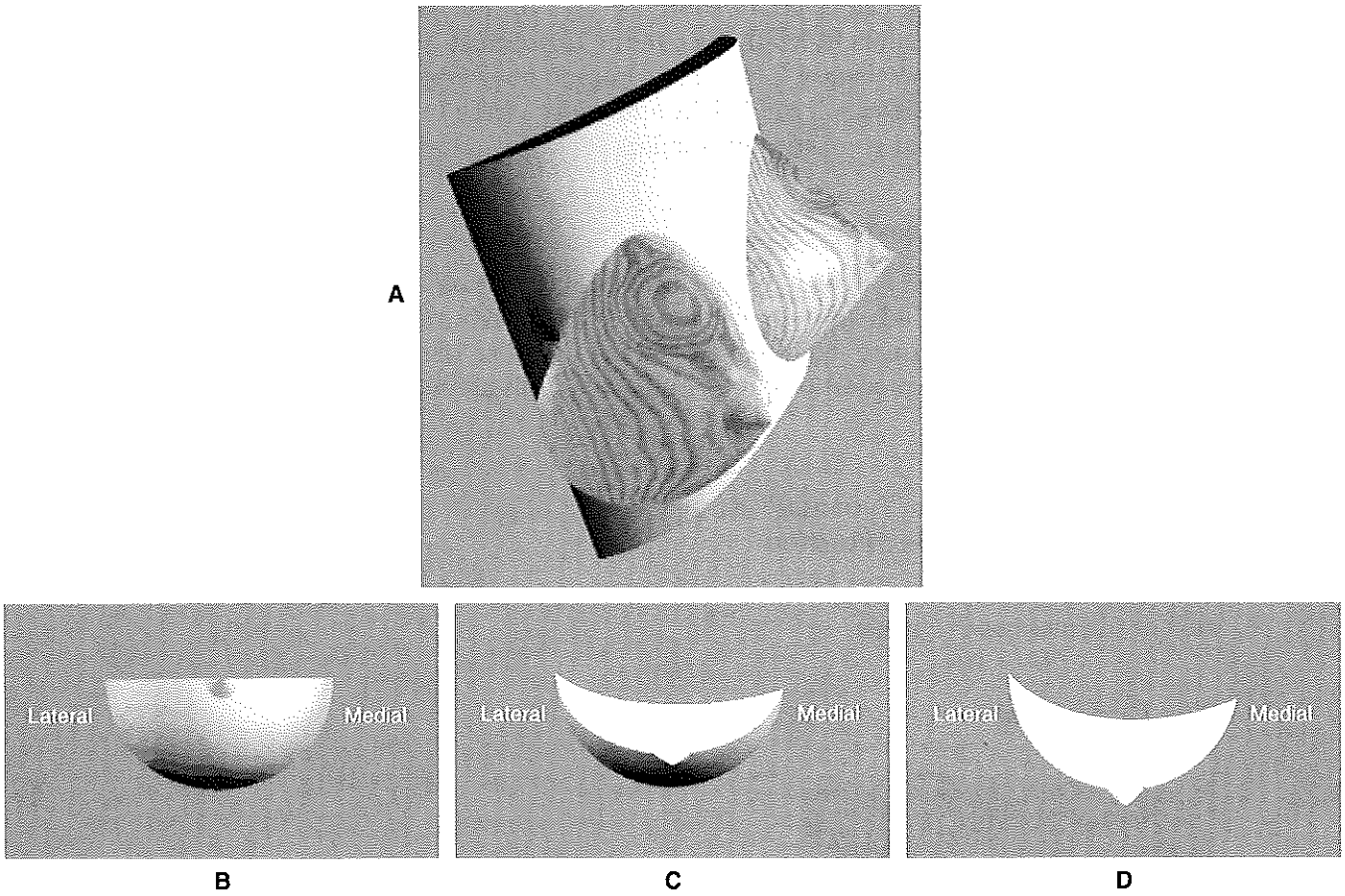

FIG. 4

Because the breast is located over the curved plane of the chest wall, the lateral portion of the breast serves to hold the nipple-areola complex in a relatively anterior position, causing the lateral portion of the lower pole to be larger in volume and area (see Fig. 4, *B* through *D*).

The 25-year-old woman shown in Fig. 5 presented with a tight skin envelope of low compliance. She had never been pregnant, nor had she lactated. Anatomic cohesive gel implants (11.5 cm wide, 10.8 cm high, 4 cm projection) were implanted in a pocket under the pectoralis major muscle using an incision in the inframammary fold. In the 1 year postoperative view, note that the new inframammary fold is not concentric with the nipple-areola complex; it extends further from it as it goes from medial to lateral. The incision is set precisely on the new inframammary fold.

When designing a new inframammary fold during augmentation mammaplasty, it must be remembered that the inframammary fold is not concentric with the nipple-areola complex, but rather moves away from it as it passes from the medial to the lateral areas.

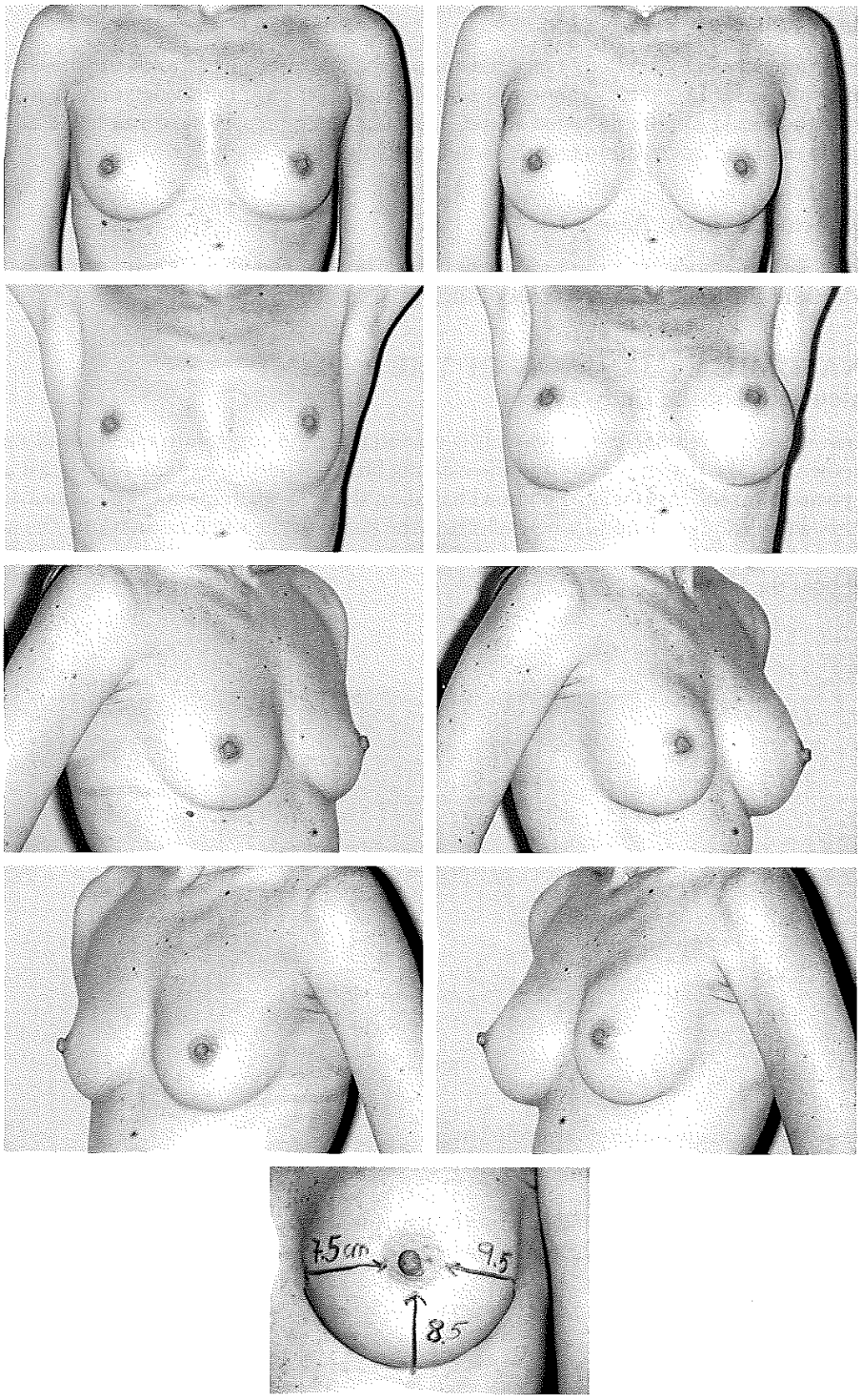

FIG. 5

The Pyknic Body Type

The differences between body types may affect the width/height ratio of the breast implantation base. In pyknic body types the implantation base is broader than it is tall, giving the breast a more flattened shape. Typically, these breasts have ample lateral extension, and the inframammary fold is not very low.

The Asthenic Body Type

In the asthenic body type the breast extends vertically. The chest is narrow compared with its height, and the same is true of the breast implantation base.

ANATOMIC EVALUATION OF THE PATIENT

Calculation of the Body Type

When surgically remodeling a breast, it is essential for the surgeon to take careful measurements of the patient's body and the existing breast. The shape of the new breast and its position on the torso will be planned based on these measurements. These measurements will also prove helpful when selecting the shape of the implant, marking the new inframammary fold before surgery, and determining the dimensions of the pocket that will hold the implant.

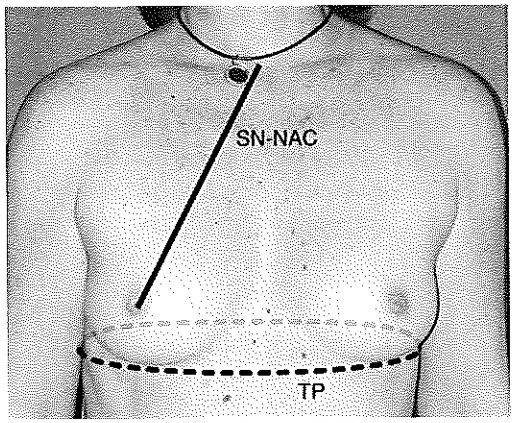

FIG. 6

These measurements include the following:

- Distance from the suprasternal notch (SN) to the nipple-areola complex (NAC): SN-NAC
- Thoracic perimeter at the level of the existing inframammary fold: TP
- Width of the breast to be remodeled

Once these measurements have been obtained, TP is divided by SN-NAC:

$$\frac{\text{TP}}{\text{SN-NAC}} = \text{Y}$$

The value Y is an indication of the ratio of the height and width of the torso in the area of the breast and therefore gives us, in an objective and quantifiable manner, the body type of the patient in relationship to the breast implantation base.

When this calculation is performed on a sufficient number of patients and the results are graphed, a Gaussian curve is obtained on which most are in a central position, with a Y value close to 4 (between 3.8 and 4.2), and two minima at the upper and lower ends.

When Y is greater than 4.3, the body type is pyknic and corresponds to women with proportions that are broader than they are tall. When the Y value is less than 3.7, the body type is asthenic, with long vertical lines. Patients between those two values have an intermediate body type.

There are no clearly defined boundaries between these body types. The transition from an asthenic to an intermediate body type, and from an intermediate to a pyknic body type, is a gradual one.

It is important to note that these calculations are reliable only in cases of mammary hypoplasia in which no ptosis or defects in mammary development have occurred. The calculation can still be applied when these conditions are present, but mastopexy or an appropriate correction must be planned simultaneously. In these cases we take the measurements in relation to the final position of the nipple-areola complex once the correction is made and not the measurements of the patient before the mastopexy.

PLANNING

Breast Shape and Dimension

In augmentation mammaplasty the lower pole of the breast receives the greatest remodeling. The upper pole of the breast and the nipple-areola complex project more over the chest wall, but this change requires little or no cutaneous expansion, which is why the nipple-areola complex is displaced upward during breast augmentation. However, the lower pole must undergo great change because this is where most of the volume is added, and therefore the area of the skin covering must be greatly increased. Note that remodeling a breast with an implant expanding and shaping its lower pole generally requires the creation of a new inframammary fold in a lower position.

Following the beauty standards we have described, the lower pole of the breast and the outline of the inframammary fold must be designed according to the patient's body type in an attempt to obtain results with the greatest possible harmony of proportions.

Selection of the Implant
Anatomic Implant

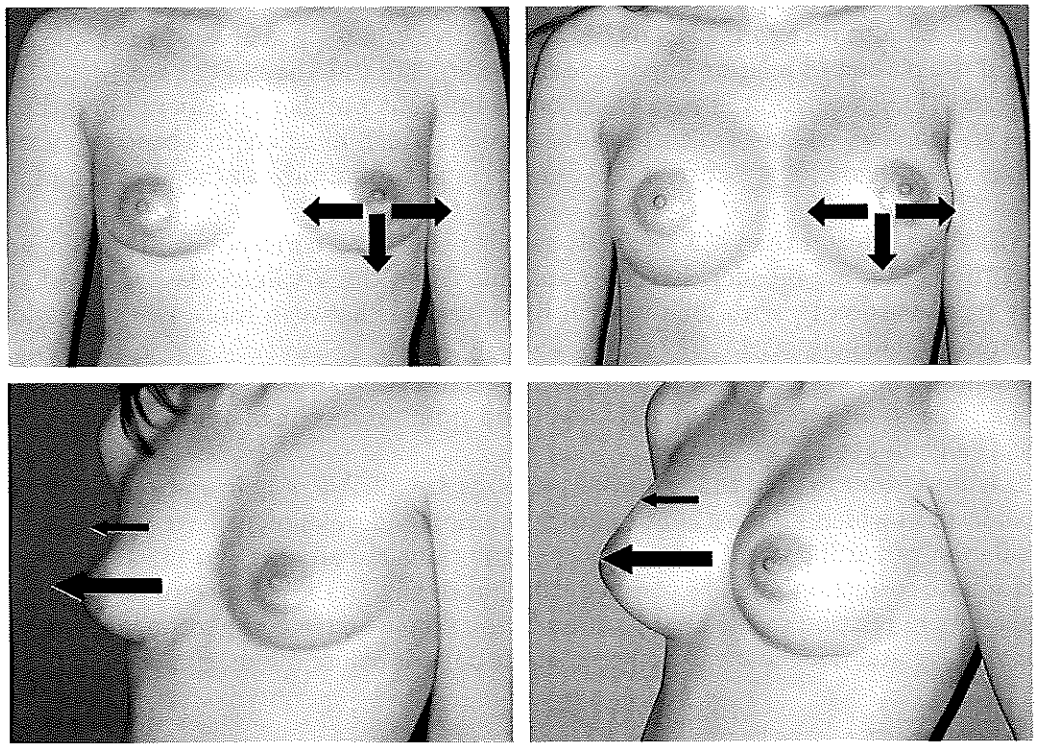

FIG. 7

In my opinion, anatomic implants permit improved reshaping of the breast in line with the aesthetic principles discussed here. They provide a stable, predictable means of breast enhancement. These implants reshape the lower pole without overfilling the upper pole, thus avoiding unnatural-looking results.

High-Cohesive Gel Implants

The high-cohesive gel implant has shape memory, allowing it to recover after deformation and remain stable over time. The shape does not depend on the covering of the implant; instead it is dependent on the gel itself. The gel allows the implant to be deformable and soft, with edges that are scarcely perceptible. These characteristics allow the surgeon to plan the shape of the new breast, estimating its dimensions very precisely.

Therefore, from a theoretical as well as a practical point of view, extracapsular rupture of the implant is not possible (no cases have been described in the literature); this is an enormous advantage over liquid gel or less cohesive implants in terms of safety, stability, and durability.

Implant Size

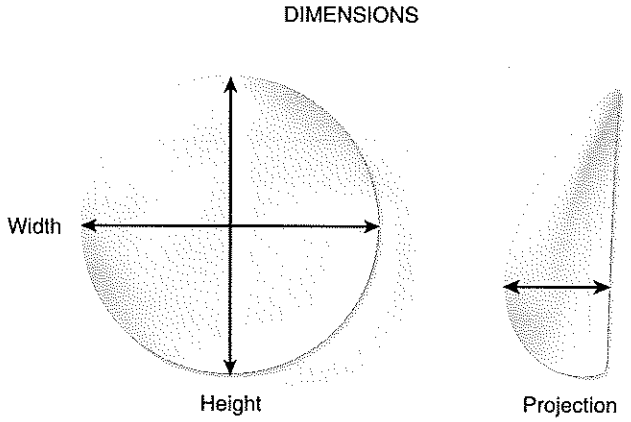

FIG. 8

The size of an implant must be considered in terms of its height, width, and projection and not its volume. The volume of the implant results from these other dimensions.

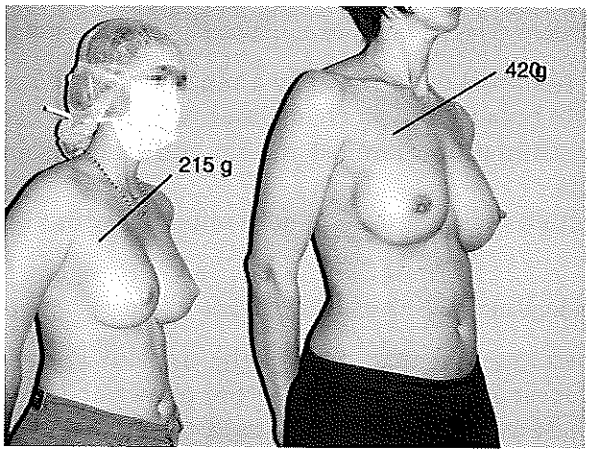

FIG. 9

The size of an implant is also related to size of the patient. Women with large frames require larger implants than women with small fames to achieve a balanced and harmonious appearance. We do not recommend maximum or minimum sizes, because what is disproportionate for one woman might be appropriate for another.

Implant Width

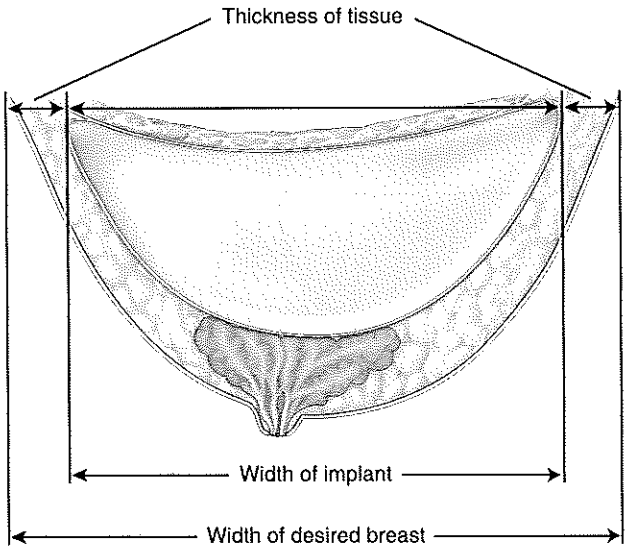

FIG. 10

The width of the breast is equal to the width of the implant plus the thickness of overlying tissues on each side.

$$\text{Width of desired breast} = \text{Width of implant} + \{\text{Thickness of tissues} \times 2\}$$

The thickness of the tissues is determined by a pinch test—the result of this test is already multiplied by two because the pinch encloses two layers. I determine the width of the desired breast by estimating the most medial and lateral points. This distance is measured with calipers.

The following formula makes it easy to determine the width of the implant and its value:

$$\text{Width of implant} = \text{Width of desired breast} - \{\text{Thickness of tissues} \times 2\}$$

This formula demonstrates that the width of the implant is calculated based on the width of the desired breast and the thickness of the tissues and assumes a fixed and objective value. Only these two parameters are used to select the width of the implant, which is independent of other measurements taken.

Implant Height

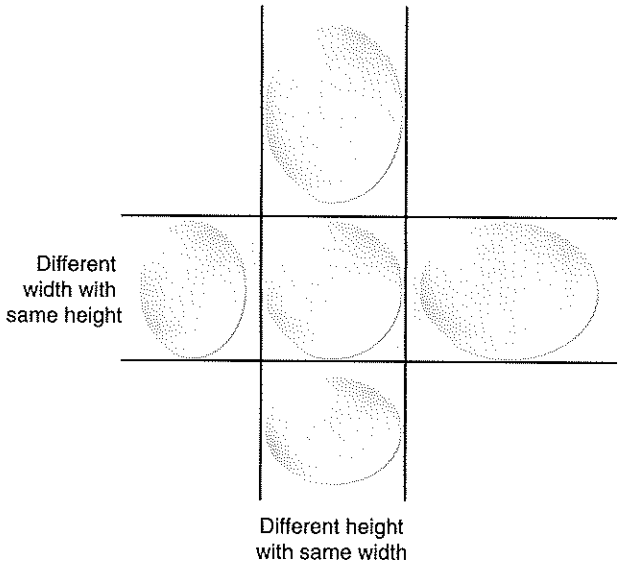

FIG. 11

Although the width of the implant is a fixed and objective value, the height is a relative value. The height of the implant is related to its width. Currently a wide variety of implants with different shapes are available. Therefore if the height is varied for a given width, there are a number of options to choose from: implants with a circular base (where the height and width are equal), implants with a vertical oval base (where the width is less than the height), or implants with a horizontal oval base (where the width is greater than the height).

To determine the height of the implant to be used (with a circular, vertical oval, or horizontal oval base) the physician must look at the patient's body type and select the type of implant that will help remodel the breast to attain the most aesthetic appearance.

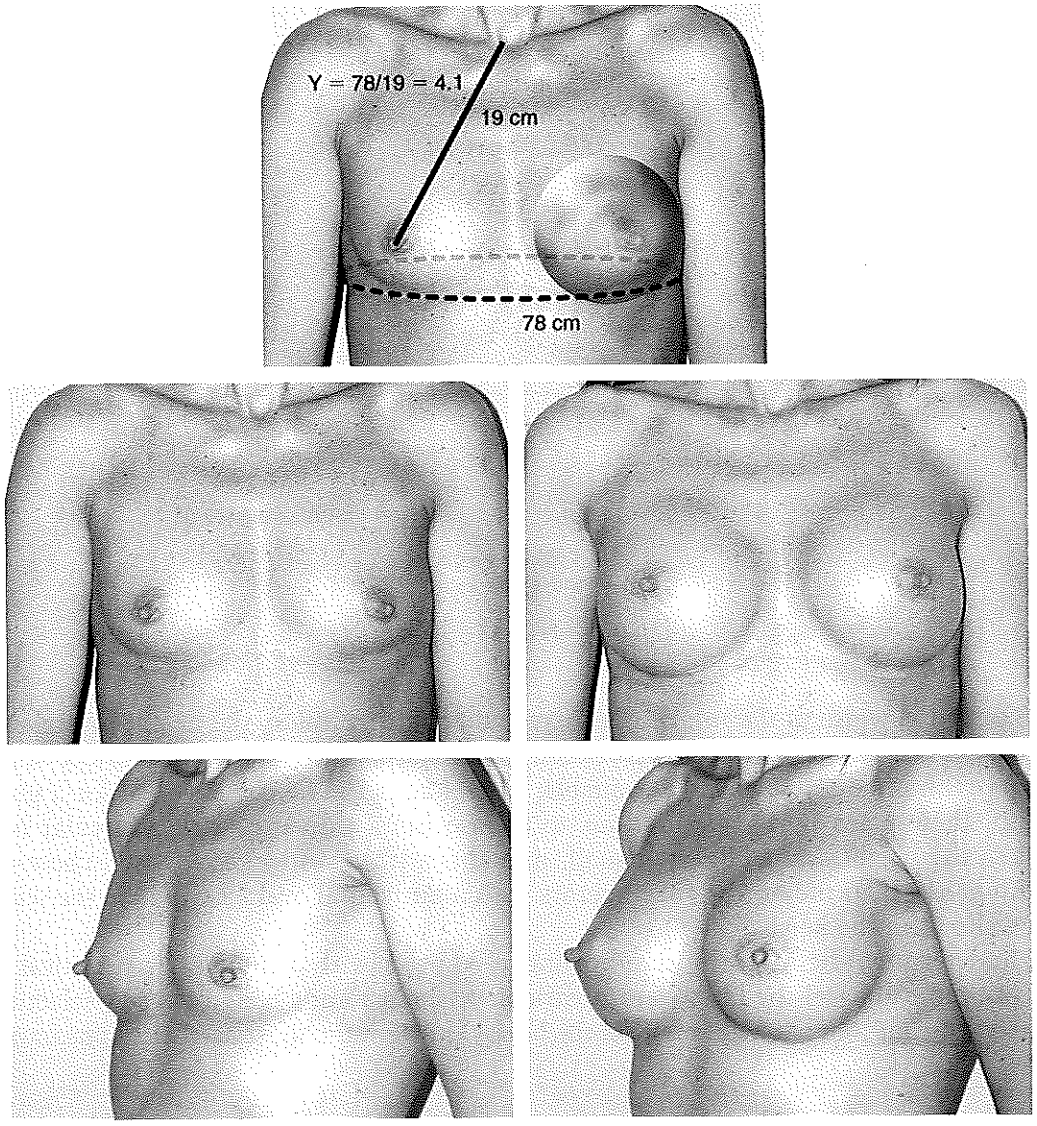

FIG. 12

Women with an intermediate habitus and a Y value close to 4 require an implant with a circular base.

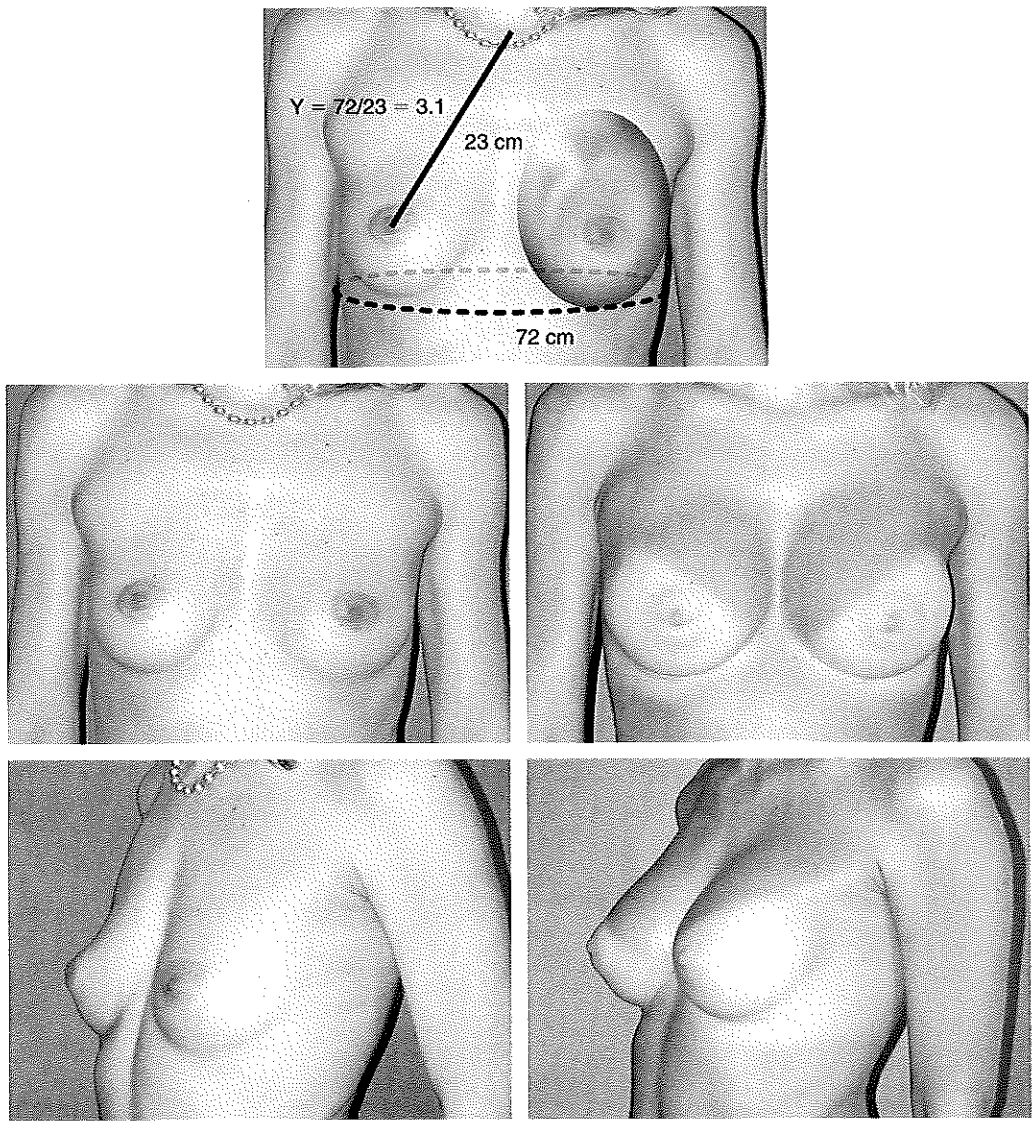

FIG. 13

Women with an asthenic body type and a Y value less than 3.7 require an implant with a base that is higher than it is wide (vertical oval). For example, this woman has an asthenic breast type; the TP is 72 cm and the SN-NAC distance is 23 cm. The Y value is 3.1; therefore the implant should have an oval base with a greater vertical axis to permit reshaping of the breast with good fill in the upper pole without causing a disproportion between the width of the breast and the torso.

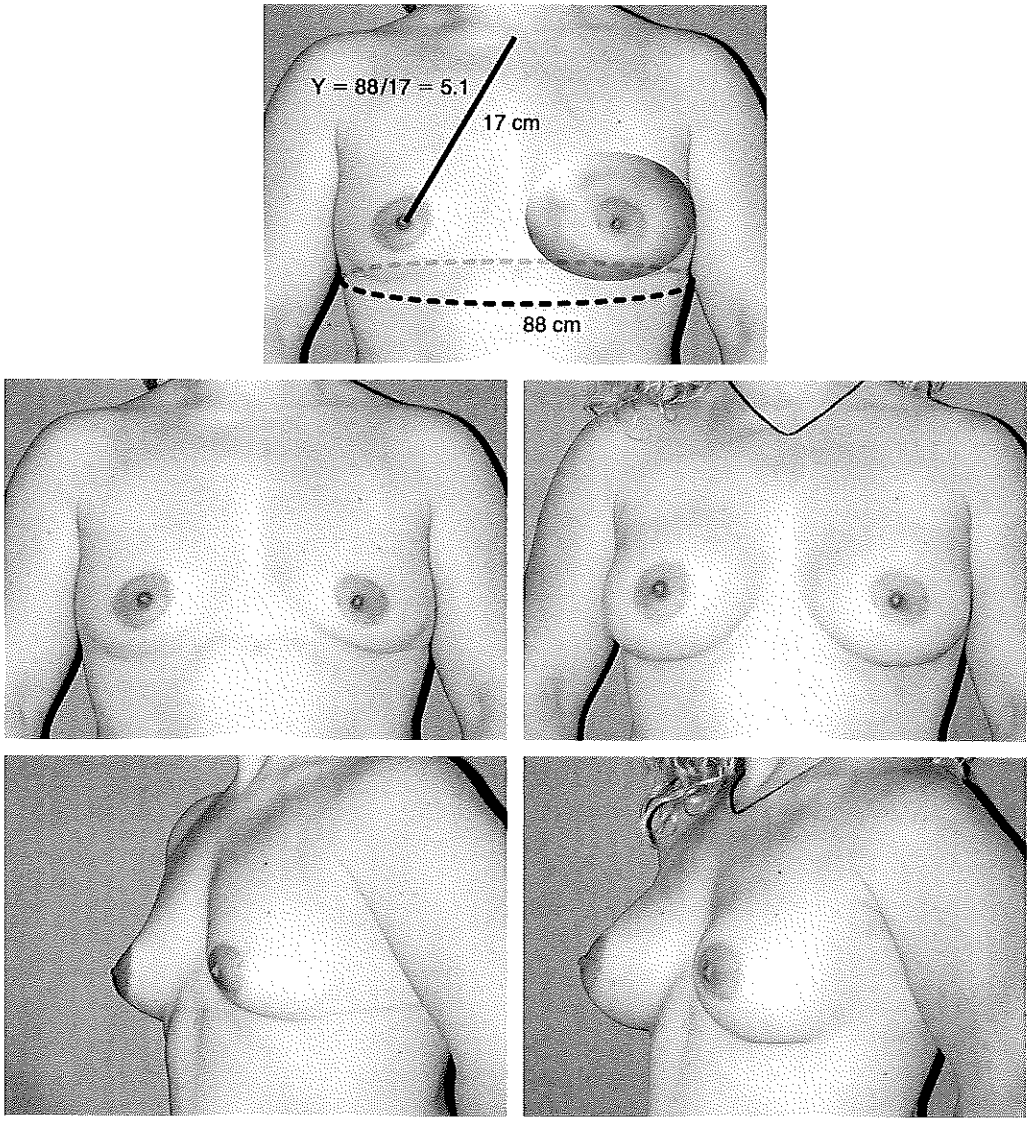

FIG. 14

On the other hand, for women with a pyknic body type and a Y value greater than 4.3, the implant must be wider than it is tall (horizontal oval). This woman has a TP of 88 cm and an SN-NAC distance of 17 cm. The Y value is 5.1, which is clearly a pyknic body type. An implant with an oval base having a longer horizontal axis was used for this patient.

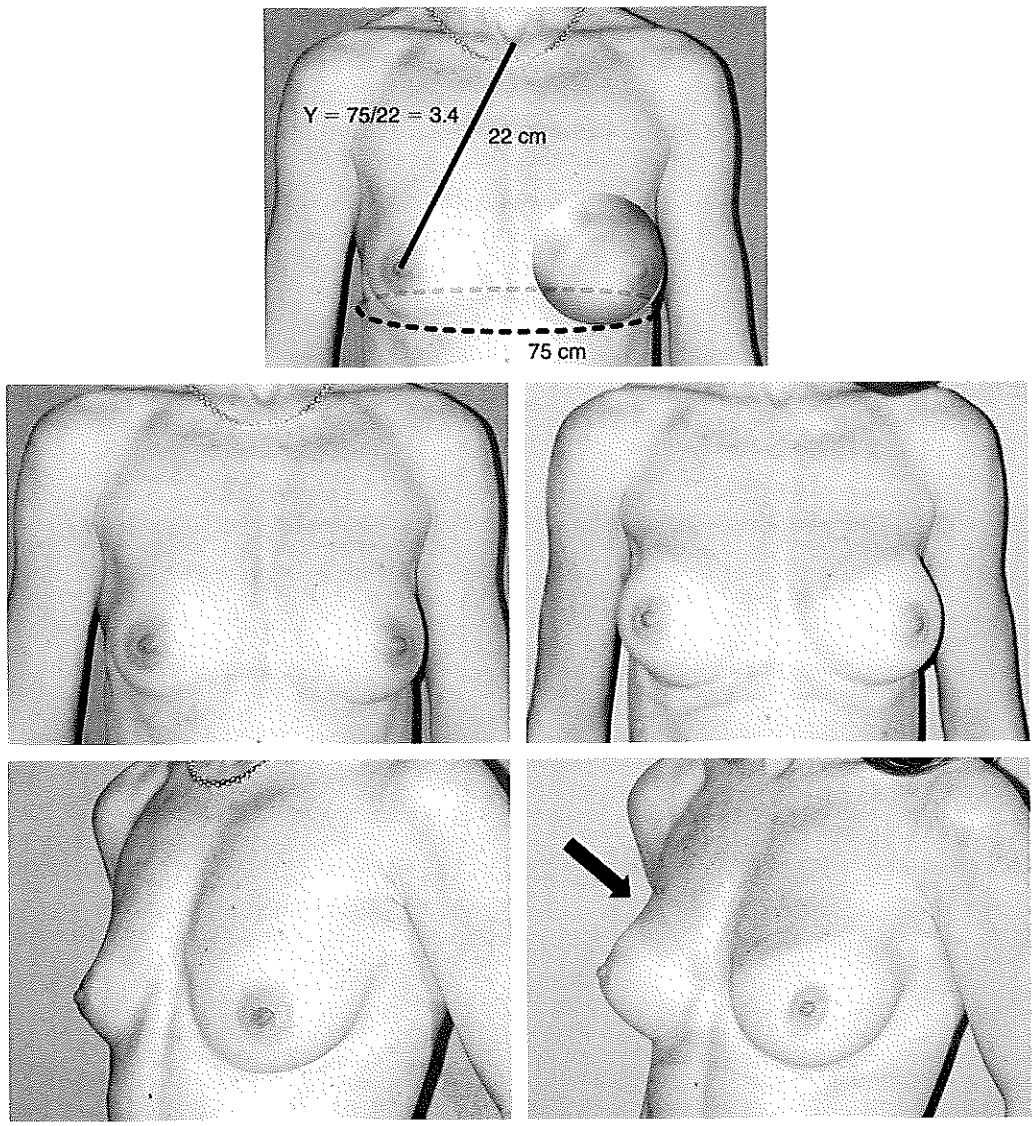

FIG. 15

For teaching purposes, let us consider a case in which the implant was poorly selected. This patient had a TP of 75 cm and the SN-NAC was 22 cm. The Y value was 3.4, so her body type was asthenic. An implant with an oval base having a larger vertical axis was indicated, but an implant with a circular base was actually used. The results are not optimal, with insufficient fill in the upper pole of the breast.

The boundaries between the various body types are not precise, and a gradual transition can be observed between the different body types. In these transitional cases, clinical judgment and discussions with the patient help the surgeon select an implant most suitable to each individual.

Implant Projection

The projection, or the anteroposterior dimension, of an implant must be determined using the patient's wishes and existing tissue. The patient's desire for a breast with greater or lesser projection will determine the implant profile chosen. If the patient prefers minimal or moderate augmentation, then an implant with low projection should be chosen. If greater enhancement is desired, implant projection must be increased accordingly.

It is important to note that existing tissues, their elasticity and thickness, quantitatively limit breast augmentation. The surgeon must estimate the projection of the implant that can be safely used and not exceed it, thereby producing natural, safe results that are stable over time.

Preoperative Marking

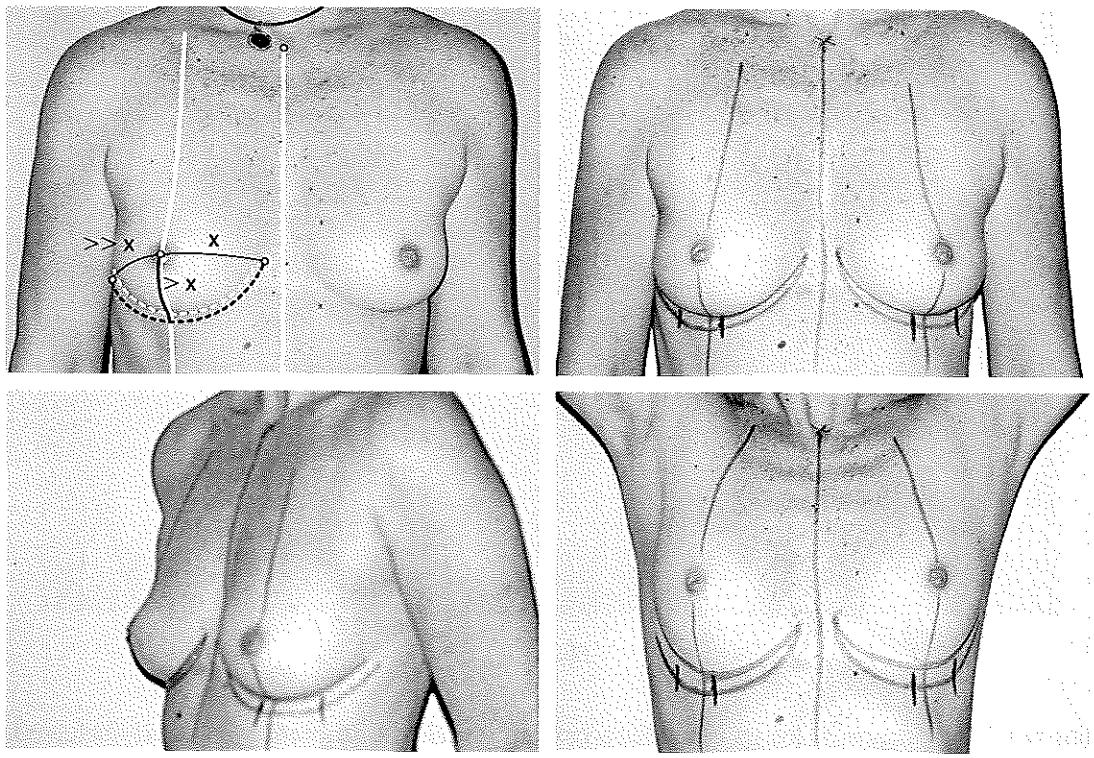

FIG. 16

Preoperative markings should be made on the patient's skin with colored markers, showing reference points and lines on the torso as well as the new inframammary fold and the position of the incision. The markings are made with the patient in an upright position immediately before the patient enters the operating room.

We start by drawing the anterior central line on the torso, followed by the preexisting inframammary fold and the medial line dividing the lateral and medial halves.

The most medial point of the breast to be reshaped (the desired breast) is then marked. The distance between these points on both breasts should not be less than 3.5 cm. The distance is measured from this point to the nipple, stretching the skin slightly. This measurement, which we call *x*, is the length of the medial pole once the implant has been inserted.

Next we mark the position of the new inframammary fold. In accordance with the canons of beauty described previously, the inframammary fold will not be concentric with the nipple. Laterally it will be further from the nipple-areola complex than it is in the medial portion.

In an intermediate body type, the most caudal point of the inframammary fold intersects the vertical axis of the breast, and its distance from the nipple is 2 to 5 mm longer than *x* (Fig. 16). When transferring this measurement to the lower pole the skin must be stretched, simulating the expansion effect of the implant when it is in place. The most lateral point of the new inframammary fold is determined by adding 5 to 10 mm to the *x* measurement.

When marking patients who have a pyknic or endomorphic body type, the most caudal point of the inframammary fold is more cranial than the canons of beauty indicate, and it should be marked at a distance nearly equal to *x*. In asthenic or ectomorphic body types this point should be marked more caudally by adding 5 to 10 mm to *x*.

Above all, it is important to understand that the inframammary fold is not concentric to the nipple-areola complex. In addition, the inferolateral quadrant should have a greater length and volume compared with the inferomedial quadrant, and these dimensions and relationships provide a more anterior orientation for the nipple-areola complex and a more natural, attractive lateral fullness for the breast.

Absolute measurements are not always recommended in surgery. Ultimately, all standards and measurements are subject to the clinical and artistic judgment of the surgeon. So understanding these concepts and applying these measurements with the subjective appreciation required by plastic surgery (a combination of science and art) is indispensable.

Finally, the incision is marked. It must be placed precisely over the new inframammary fold and be given a length of 5 cm: 4 cm lateral to the medial line of the breast and 1 cm medial to it. This is the part of the inframammary fold where the greatest amount of ptosis occurs and where the incision will be most easily concealed.

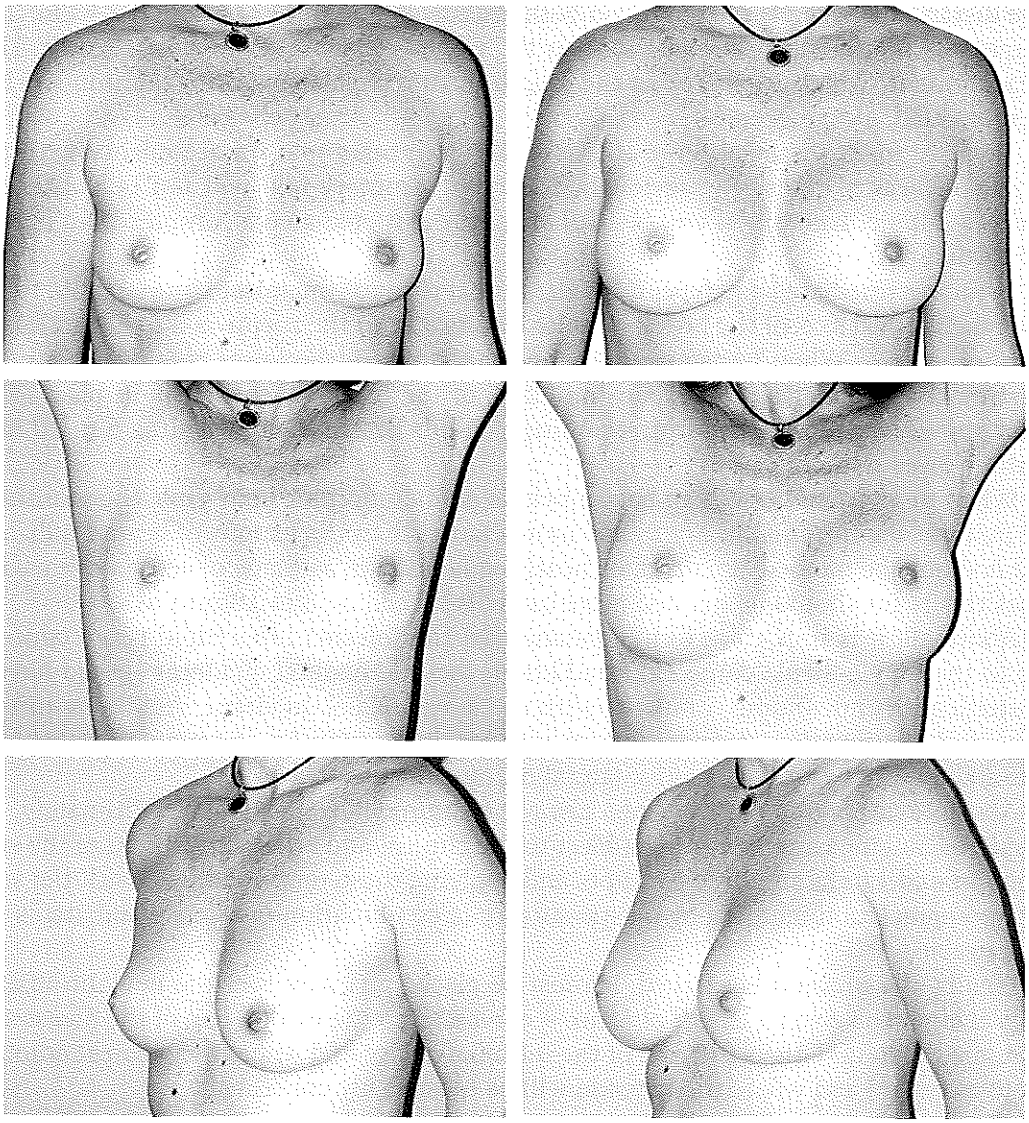

FIG. 17

This nulliparous 42-year-old woman presented with a skin envelope of mild compliance. Anatomic cohesive gel implants (12 cm wide, 11.3 cm high, 4.2 cm projection) were placed in subpectoral pockets. She is shown 1 year postoperative.

CONCLUSION

- Augmentation mammaplasty today should be viewed as a remodeling operation, performed to achieve an attractive breast shape and a harmonious relationship between the breast and the torso.
- Depending on the patient's body type, the shape of the breast and its implantation base on the thorax will vary. For women with an intermediate body type the implantation base is circular; for pyknic body types it is oval with a greater horizontal axis; for asthenic body types, the base is oval with a greater vertical axis.
- Anatomic implants permit surgeons to perform augmentation mammaplasty with greater predictability and harmony of proportions between the breast and the torso.
- The body type of a patient can be calculated simply, based on a few measurements. These measurements facilitate selection of the mammary prosthesis with the most appropriate implantation base for each patient.
- The transition between the intermediate body type and the other body types is not abrupt; there are many patients in the transitional zone for whom the surgeon's subjective appreciation and artistic gifts are key for selecting the right implant.
- Meticulous planning and preoperative marking are essential for achieving optimal results.

SUGGESTED READINGS

Angell M. Shattuch lecture evaluating the health risks of breast implants: The interplay of medical science, the law, and public opinion. N Engl J Med 334:1513-1518, 1996.

Heden P, Jernbeck J, Hober M. Breast augmentation with anatomical cohesive gel implants: The world's largest current experience. Clin Plast Surg 28:531, 2001.

Heitmann C, Schreckenberger C, Olbrisch RR. A silicone implant filled with cohesive gel: Advantages and disadvantages. Eur J Plast Surg 21:329-332, 1998.

Rohrich RJ, Beran SJ, Ingram AE Jr, et al. Development of alternative breast implant filler material: Criteria and horizons. Plast Reconstr Surg 98:552-560, 561-562, 1996.

Spear S. Breast augmentation with reduced height anatomic implants: The pros and cons. Clin Plast Surg 28:561-565, 2000.

Tebbetts JB, Tebbetts TB. The Best Breast: The Ultimate Discriminating Woman's Guide to Breast Augmentation. Dallas, CosmetXpertise, 1999.

Tebbetts JB. Dimensional Augmentation Mammaplasty Using the BioDimensional System. Santa Barbara, CA: McGhan Medical, 1994.

Tebbetts JB. Dual plane (DP) breast augmentation: Optimizing implant-soft-tissue relationships in a wide range of breast types. Plast Reconstr Surg 107:1255-1272, 2001.

Westreich M. Anthropomorphic breast measurement: Protocol and results in 50 women with aesthetically perfect breasts and clinical application. Plast Reconstr Surg 100:468-479, 1997.

Editorial Commentary

Dr. del Yerro emphasizes that when anatomic implants are used, it is very important to plan the shape and size of the implants. He cautions, quite rightly, that if an error in sizing is made, particularly if this is coupled with design, then an unfortunate result can occur. The prosthesis is stable when implanted, and if positioning is wrong, then the patient's natural breast will be unrelated to the underlying implant. As a result of that, a significant deformity can occur that is difficult to overcome. An additional, extremely significant feature is the patient's own anatomy. If this is disregarded, again the result will be suboptimal. Natural features such as the nipple/areolar complex position, the in-

framammary fold position, and the configuration of the fold are all important, and without paying attention to these the patient may be unhappy.

Another aspect that must be kept in mind is the width of the base of the breasts and how the implant must relate to this. Failure to take this into consideration will again end up with an unfortunate result.

A further aspect of cohesive gel implants is that various base shapes are offered that relate to the overall shape of the breast, which, in turn, is related to chest width and shape. Taking this into consideration is an important aspect of choosing the correct implant for the patient and, of course, ultimately achieving a satisfactory result.

It is the planning of the procedure that will give the best results. This is no longer the type of augmentation where one can place implants filled with saline or silicone gel and expect to have a satisfactory result. It is paramount that all aspects of the patient's breast and chest anatomy are carefully studied and assessed. With this information, an accurate implant size and shape can be estimated.

Ian T. Jackson, MD

Dr. del Yerro lucidly describes how breast shape necessarily follows anatomic constraints during development. Surgeons who wish to attain natural-looking results are advised to carefully study this article. Although he describes the location of the breast as beginning "a few cm below the clavicle," I advise surgeons to carefully study their collections of preoperative patient photographs. Patients generally do not have breast fullness above the line that crosses their chests transversely and connects the apexes of their anterior axillary folds. If surgeons carefully criticize their own postoperative results, any patient with fullness above this transverse line will look unnatural. I really like Dr. del Yerro's analysis of breast base shape, and his insights are excellent. I take several measurements similar to his, but I have not used the calculation of Y as described in the article, preferring to use my own methods developed over the years. Regardless of the technique used, the point is that individual surgeons are encouraged to use some form of objective method to determine these factors. The wonderful comparison drawings in this article bring to life the various shapes and shape relationships present in different body types. I predict that this article will be a classic of our generation, because even surgeons who do not use his measurements will gain insight into the basic shapes found in their patients. This can only help us to achieve better, natural-looking results. Keep these illustrations in mind when reading descriptions of shaped implants. Do the implants make sense from an anatomic standpoint? Will the breast tissue be supported properly in all orientations? Will there be excessive pressure on the tissues from these devices that will cause secondary changes and atrophy of the tissues? Surgeons must go beyond ad copy to understand the devices they are using and pressure manufacturers to provide what is required to achieve a "nondetectable" result that looks and feels like the real thing.

Claudio De Lorenzi, BA, MD