Alternative Technique for Breast Augmentation in Patients With a Small Nipple-Areolar Complex Diameter

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Background: The use of the periareolar incision in breast augmentation procedures results in inconspicuous scarring. However, this approach is problematic when treating a patient with a small nipple-areolar complex (NAC) diameter.

Objective: We describe a simple procedure for breast augmentation in patients with a small NAC diameter that uses an alternative periareolar approach to produce a scar similar to that resulting from the conventional periareolar incision.

Methods: The conventional periareolar approach requires an areolar diameter of at least 3 cm for breast augmentation. We utilized geometric calculations to obtain values of perimeters and areas of hemi-ellipses for circles with diameters between 2 and 2.9 cm that are similar to the values calculated for a circle 3 cm in diameter. We applied the findings to our surgical technique. A crescent moon-shaped incision was made using a zigzag pattern on the hemiareolar inferior border, and the epidermis was removed from this area. The dissection was made through the mammary parenchyma and by way of the external arch. The inframammary crease was lowered enough so that the implant would be centered under the nipple when the incision was closed. A silicone gel-filled implant was inserted, and the lower edge of the incision was overlapped onto the deepithelialized upper flap, allowing the edges of the wound to join and seal in layers without requiring a purse-string support.

Results: Between June 2002 and June 2004, we used this technique in 10 patients with areolar diameters ranging from 2.2 to 2.8 cm who requested primary breast augmentation with either cohesive gel or liquid silicone gel-filled implants. The resulting scar was satisfactory in color and quality for 8 patients; 2 patients had lateral widening of the scar. There was a slight change in the areolar diameter compared to the original diameter in all patients, but there were no deformities.

Conclusions: This simple procedure is an effective alternative technique for breast augmentation surgery in patients with a small NAC diameter. (Aesthetic Surg J 2005;25:117-125.)
However, the periareolar approach is problematic if the patient has an areolar diameter less than 3 cm. When treating a patient with a small nipple-areolar complex (NAC) for breast augmentation with medium or large-size silicone gel-filled implants, surgeons normally prefer the inframammary approach because it is very difficult to use the conventional periareolar incision for access to the surgical plane of dissection, for hemostasis, and for implant insertion. However, the inframammary approach can result in a wide and unsightly scar, particularly in patients with a tendency toward hypertrophic scar formation. In selected cases, surgeons may elect to use a periareolar incision with lateral extension, also called an Omega incision. Unfortunately, the horizontal extension leaves a visible and undesirable scar.

We describe a technique that allows the surgeon to offer an alternative periareolar approach to patients with a small NAC diameter. This technique allows the surgeon to both maintain optimal control of the operation and satisfy the patient’s preference for incision location.

Methods

The conventional periareolar approach requires an areolar diameter of at least 3 cm for breast augmentation. Skin elasticity and breast parenchyma thickness are key factors that determine management and stretching of the area and the length of the incision.

If we consider the areola as a circle (Figure 1), and take into account that the equation of the perimeter of the semicircle is \( \pi r \) and the equation for the area of the semicircle is \( \frac{1}{2} \pi r^2 \), then the length of the hemiareolar incision between 3 and 9 o’clock for an areola 3 cm in diameter (when a conventional periareolar approach is used) is 4.7124 cm, and the area of the semicircle is 3.5343 cm².

We performed geometric calculations using 2 variables. The first variable was the increase of the low vertical radius by 0.5 cm and 0.75 cm in circles with diameters between 2 and 3 cm, using intervals of 1 mm in the diameter, and the areolar diameter is the second variable. Therefore, the lower semicircle was transformed into a hemi-ellipse, resulting in an area with a crescent-moon shape between a semicircle and a hemi-ellipse. We made these calculations in order to obtain values of perimeters (Table 1) and areas (Table 2) of the hemi-ellipses similar to those calculated for a circle 3 cm in diameter. The perimeter of the hemi-ellipse would correspond to the new length of the incision through the dermis and mammary parenchyma and the areas would correspond to the access of the surgical field.

The approximate equation used to calculate the perimeter of the hemi-ellipse was

\[
\pi \sqrt{\frac{1}{2} (r(h)^2 + r(v)^2)}
\]

where \( r(h) \) is the horizontal radius, \( r(v) \) is the vertical radius, and \( r(v) \) will always be equal to \( r(h) + 0.5 \text{ cm or } 0.75 \text{ cm.} \)

The equation to calculate the hemi-ellipse area is the following:

\[
\frac{1}{2} \pi \cdot r(h) \cdot r(v)
\]

The calculations for the skin resection appear in Table 3. With the values obtained to cross the variables in the tables, we found that a 0.5-cm increase of the vertical radius for circles between 2.4 and 2.9 cm in diameter produces values of the areas and perimeters similar to those calculated for circles 3 cm or more in diameter. The removed epidermis area from the crescent moon-shaped area was approximately 1 cm². Similar results were obtained by increasing the vertical radius by 0.75 cm in circles between 2.1 and 2.3 cm in diameter. We decided to apply this concept to our technique.

Surgical Technique

Preoperative markings were made with the patient in a sitting or standing position. The planned incision was drawn in a crescent-moon shape at the existing areolar border. A semicircular zigzag pattern was outlined as described by Gryskiewicz and Hatfield in a direction from 3 to 9 o’clock along the lower areolar margin. A 0.5-cm or 0.75-cm infrareolar mark was made on the breast meridian according to the diameter of the areola, and a vertical eccentric curve, also using a zigzag pattern, was drawn joining this point with the 3 and 9 o’clock points on the periareolar border. The result was a cres-
cent moon-shaped figure in which the internal arch was a semicircle and the external arch was a hemi-ellipse (Figure 2). The calculation of the postoperative position of the submammary fold was variable and depended on factors such as breast width, the size of the implant selected, and the distance between the areola and the inframammary fold. Placement of the implants usually requires lowering the inframammary crease. In our expe-

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experience, those patients with small NAC diameters usually have hypoplastic breasts with minimal or no breast ptosis, which is why the procedure is well tolerated. We marked the existing inframammary fold and drew the new fold 1 to 2 cm below it. The crease should always be lowered enough so that the implant is centered under the nipple when the incision is closed. Obviously, the amount that the crease is lowered also depends on the size of the implant. General anesthesia was used with all of the patients in a supine position. The chest wall was prepared and draped as usual. We generally used an intravenous antibiotic (Ampicillin-Sulbactam).

We began the procedure by removing the skin from the crescent moon-shaped area (Figure 3). The dissection was made through the mammary parenchyma through the external arch of the crescent moon, perpendicular to and up to the pectoralis fascia. Dissection of the pocket continued easily, by way of either the subglandular or subpectoral plane according to the surgeon’s choice (Figure 4). After hemostasis, silicone gel implants were inserted (Figure 5). The lower edge of the incision was overlapped onto the deepithelialized upper flap, allowing the edges of the wound to join. The wound was closed in layers with polypropylene 4-0 with interrupted buried sutures, including the dermal layer, after making a subcuticular suture with poliglecaprone 25 4-0 and Steri-strips. This technique does not require a purse-string suture for dermal support (Figure 6).

RESULTS

We used this technique to treat 10 patients with small NAC diameters who requested primary breast augmentation between June 2002 and June 2004. Table 4 summarizes relevant patient data, including age, areolar diameter, implant volume, type of implant, and resulting scar.

Figure 2. A, B, At the existing areolar border, the planned incision is drawn in a crescent-moon shape in which the internal arch is a semicircle and the external arch is an ellipse.

Figure 3. The crescent moon-shaped skin area is deepithelialized.

Figure 4. The dissection is made through the mammary parenchyma through the external arch of the crescent moon.
Both cohesive gel and liquid silicone gel-filled implants were used for augmentation. The decision concerning selection of the appropriate size and type of implant for insertion was made in consultation with the patient. Implant volumes ranged from 300 to 400 cc. The range of the areolar diameter among the patients was between 2.2 and 2.8 cm, with a maximum increase in vertical radius of 0.75 cm. We had easy access to the surgical field and comfortable insertion of implants in all cases. The skin removed in our technique was always less than 0.75 cm around the hemi-areola. Soft wrinkles around the junction of the areola and the skin were observed. The incision usually healed without difficulty and the wrinkles resolved in 2 to 4 weeks. There was a slight increase in the areolar diameter compared to the original size, possibly because of the expansive effect of the implant, but there were no deformities in areolar shape.

Scar color and quality were satisfactory and the scar was inconspicuous in 8 of 10 patients. The other 2 patients had widening on the lateral ends of the scars caused by lateral dehiscence of the wound; however, the patients did not find the scars to be objectionable. The approach resulted in scars similar to those associated with a conventional periareolar incision (Figures 7 to 9).

Discussion

In our experience, patients with a small NAC are seen infrequently. There are no studies that indicate the per-
percentage of women with small NAC diameter (less than 3 cm) in the general population.

Over the years, little has been published concerning normal anthropometric measurements of the female breast, and there are few studies that assess areolar diameter. Among the few studies that have documented breast morphometry in healthy women, the mean areolar diameter reported by Brown21 was found to be 49 mm in Caucasian women. The study by Quiao et al22 found an average areolar diameter of 33.2 mm in Asian women.

Figure 7. A, C, Preoperative views of a 24-year-old woman with an areolar diameter of 2.5 cm who requested breast augmentation with 375-cc liquid silicone gel-filled implants using a periareolar approach. B, D, Postoperative views 5 months after breast augmentation showing slight lateral widening of the scar on the left breast. E, F, Close-up views of areolar scar.
Conclusion

For patients with a small NAC diameter, the technique described here for breast augmentation provides an adequate surgical field that allows the surgeon to reach all areas of the implant pocket where dissection may be carried out under direct vision. Thus, it facilitates the management of hemostasis, lowering or adjustment of the inframammary fold, and placement of either cohesive silicone or liquid silicone gel-filled implants without damaging the device or the skin margins. In addition to these

Figure 8. A, C, Preoperative views of a 41-year-old woman with an areolar diameter of 2.8 cm who requested breast augmentation with 300-cc liquid silicone gel-filled implants through a periareolar approach. B, D, Postoperative views 18 months after breast augmentation. E, F, Close-up views of areolar scar.
advantages, the scar is camouflaged by the skin-areolar junction, and the use of the zigzag pattern incision reproduces the radiate aspect between the areola and periareolar skin; therefore, the scar is inconspicuous, and virtually unnoticeable in most patients.

References
18. La Trenta GS. Breast augmentation. In: Rees TD, La Trenta GS, eds.


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