Transareolar-Perinipple (Areolar Omega) Zigzag Incision for Augmentation Mammaplasty

Hyun Ho Han, M.D.
Kenneth K. Kim, M.D.
Kee Hoon Lee
DaEun Park, B.S.
Jong Won Rhie, M.D., Ph.D.
Sang Tae Ahn, M.D., Ph.D.
Paik Kwon Lee, M.D., Ph.D.

Seoul, Republic of Korea; and Los Angeles, Calif.

Background: Optimal augmentation mammaplasty results not only from proper implant size and breast shape, but also from the minimization of postoperative scarring, especially in patients prone to hypertrophic scars. In this context, the authors present a transareolar-perinipple (areolar omega) zigzag approach.
Methods: Between March of 2003 and June of 2012, a total of 613 patients underwent augmentation mammaplasty using a transareolar-perinipple incision. Among them, 45 patients received a classic (straight line) transareolar-perinipple incision, whereas 568 patients received a modified zigzag transareolar-perinipple incision.
Results: Patients' ages ranged from 21 to 60 years. Areola size varied from 2.3 to 4.5 cm in diameter. Follow-up duration ranged from 1 to 10 years, with an average of 2 years 7 months. Postoperative complications included capsular contracture, which occurred in 16 patients (2.6 percent). Nine patients (1.5 percent) had Baker class II and seven patients (1.1 percent) had Baker class III capsular contracture. Mild inferior displacement of the implant occurred in four patients (0.6 percent). The prevalence of areolar distortion was 3.4 percent. Nipple hypesthesia was found in approximately 70 percent of the patients, which returned to normal after 2 to 3 months. Based on third-party observers, 74.7 percent of patients who received zigzag transareolar-perinipple incision had excellent to good scarring results.
Conclusions: The transareolar-perinipple (areolar omega) zigzag incision resulted in satisfactory postoperative scarring and surgical results in Asian patients. This method increases the opening of the areolar incision and can be performed in patients with small (<3.5 cm) areolas. This approach can be an alternative in patients who are prone to hypertrophic scarring. (*Plast. Reconstr. Surg.* 135: 517e, 2015.)
CLINICAL QUESTION/ LEVEL OF EVIDENCE: Therapeutic, III.

THERAPEUTIC

For patients who are prone to scarring, the type of incision for breast augmentation is just as important as the implant size and shape. In selecting the location of the incision, adequate exposure of the surgical field, allowance of precise execution of the procedure, the rate of postoperative complications, and scar formation should be considered. Transaxillary, periareolar, and inframammary approaches are commonly used methods for making an incision.

Transaxillary incision is concealed within the axillary fold but is still visible when the patient raises her arm or wears sleeveless clothes. A surgical field distant from the incision site can lead to suboptimal hemostasis and cause difficulty in accurate pocket formation.[1,2] Endoscopy can be helpful in overcoming this difficulty but still has its limitations in pocket manipulation. It also requires a longer operative time and a prolonged learning curve.[3,4]

Inframammary incision provides the most direct approach to the breast pocket and can lead to consistent results. However, drawbacks include prominent and unpredictable scarring in certain ethnicities prone to hypertrophic scars. Besides scarring, the risk for implant exposure is higher

with an inframammary incision because of downward gravitational force constantly acting on the implant.[5]

A periareolar incision is beneficial in terms of concealed scarring around the areola. However, the risk for capsular contracture is reported to be higher, which may be caused by inadvertent injury to the breast parenchyma or leakage of nipple discharge.[6–17] This approach also has limited indications in patients with areola diameters greater than 3.5 cm, because it is difficult to insert a large implant or perform an accurate dissection through a small periareolar incision. Risk for injury to glandular duct structures and changes in nipple sensation are also significant concerns.[18] The best result of a healed incisional scar is a hypopigmented line. However, this white, hypopigmented line is noticeable in patients, especially those with dark areolas. In addition, nearly geometrically semicircular nipple-areola complexes postoperatively can appear unnatural.[19] However, the periareolar approach facilitates accurate dissection because the surgeon can most easily expose the central portion of the breast tissue with easy access circumferentially around the breast. If a revision operation has to be carried out, the periareolar approach is superior to other approaches because of its excellent surgical exposure.

In this article, the authors present a novel incision, the transareolar-perinipple (areolar omega, Ω) zigzag approach, in which the incision is drawn in a diagonal, zigzag fashion over the evenly hyperpigmented irregular areola area. Our method provides easy and wide access to breast tissue and overcomes the contraindication for the conventional periareolar approach of areolar size limit. The quality of postoperative scarring is good to excellent in Asian patients, who are more prone to hypertrophic scarring compared with Caucasian patients.

PATIENTS AND METHODS

Our institutional review board (Catholic Medical Center Office of Human Research Protection Program) approved the study. Between March of 2003 and June of 2012, a total of 613 augmentation mammaplasties using the transareolar-perinipple (areolar omega) incision were performed. Classic transareolar-perinipple (areolar omega) without zigzag incision was used in 45 patients during the initial 5 years from March of 2003 through March of 2008 (Fig. 1, *above*). From April of 2008 to June of 2012, 568 patients received the transareolar-perinipple (areolar omega) with zigzag incision

(Fig. 1, *below*). All operations were performed by the principal investigator (P.K.L.). The smallest areolar diameter in our study was 2.3 cm.

Operative Technique

On the lower aspect of the nipple base, a semicircular incision was made. A zigzag-shaped incision having 5- to 10-mm arms and meeting in 60-degree angles on every corner was extended from the hemicircle. The direction of the incision was inferolaterally for each breast, from the 1-o'clock to the 7-o'clock position for the right breast, and from the 11-o'clock to the 5-o'clock position for the left breast. This inferomedially directed incision design facilitated medial pocket dissection.

The dissection was first carried out inferomedially in an effort to avoid injury to the lactiferous duct. Subcutaneous dissection should be carried out with caution to include a sufficient amount of subcutaneous fat. A subpectoral-subfascial pocket was formed for thin-skinned patients, and a total subfascial pocket was made for patients with greater than 2.5 cm of upper pole skin thickness.[20] To avoid areolar distortion, fat under the areola needed to be redistributed evenly.

Areolar Distortion Assessment

To evaluate the prevalence of areolar distortion in our study, we performed a retrospective evaluation of clinical images. Areolas that retained their presurgical round or oval shapes after surgery were considered nondistorted, whereas areolas that developed different shapes at 6 months postoperatively were deemed distorted.

Scar Assessment

A scar assessment survey was given to patients' guardians or family members at 6 months postoperatively. Scar appearance was determined on a scale of 1 to 5, where 5 = excellent (scar is inconspicuous), 4 = good (scar is visible but not concerning), 3 = acceptable (scar formation is moderate), 2 = bad (scar is clearly visible), and 1 = poor (scar is unsightly). The survey results were compared with results of classic transareolar-perinipple incision. Scores from the scar appearance surveys between the two groups were analyzed statistically by independent *t* test. SPSS version 13.0 software (SPSS, Inc., Chicago, Ill.) was used.

Nipple Sensation Assessment

Nipple sensation was assessed using the Semmes-Weinstein monofilament test.[21–23]

Fig. 1. Preoperative design. (*Above*) Classic transareolar-perinipple incision. (*Below*) Transareolar-perinipple zigzag incision.

Twenty monofilaments of varying thickness were applied on the nipple with consistent pressure until it bent slightly. Patients were blinded and asked whether they felt the filament or not. Starting with the thickest fiber, the thinnest monofilament that a patient could feel was recorded. The filament thickness values were converted into a unit of measured stress (grams per square millimeter) using a preestablished conversion table.[24] Patients who were insensible to the thickest fiber (marked 6.65) were considered as insensible.[23] This test was carried out preoperatively, and at 1 month, 3 months, and 6 months postoperatively. The results between preoperative and postoperative data were analyzed statistically by independent t test. SPSS version 13.0 software was used.

RESULTS

Patients' ages ranged from 21 to 60 years, and areolar diameters ranged from 2.3 to 4.5 cm. Volumes of implanted devices ranged from 194 to 340 cc. Among the 1226 total implants, 20 were saline and 1206 were silicone. Smooth surface, round silicone gel implants were used in this study. Follow-up duration ranged from 1 to 10 years, and average follow-up duration was 2 years 7 months.

Capsular contracture occurred in 16 patients (2.6 percent). Among these, nine patients (1.5 percent) had Baker class II and seven patients (1.1 percent) had Baker class III capsular contracture. Delayed hematoma formation occurred in five patients (0.8 percent) 2 weeks postoperatively because of trauma or aggressive breast massage. The hematomas were evacuated promptly and healed uneventfully.

Results of the surveys regarding postoperative scarring were very satisfactory (Figs. 2 through 4). Excluding 84 patients who did not respond to the survey, a total of 529 patients were assessed for scar formation; 74.7 percent of patients had scores ranging from 4 to 5 (Table 1). For patients with scores ranging from 1 to 3 and who wanted scar revision, intralesional triamcinolone injection
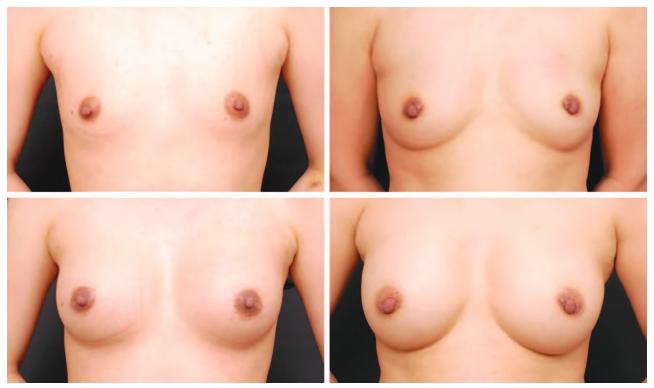
Fig. 2. (*Above*) Preoperative view. (*Below*) Postoperative view at 1-year follow-up. The scar is well hidden. (*Left*) Smooth surface cohesive silicone gel implant (right breast, 280 cc; left breast, 280 cc) in the subpectoral-subfascial pocket. (*Right*) Smooth surface cohesive silicone gel implant (right breast, 300 cc; left breast, 300 cc) in total subfascial pocket.
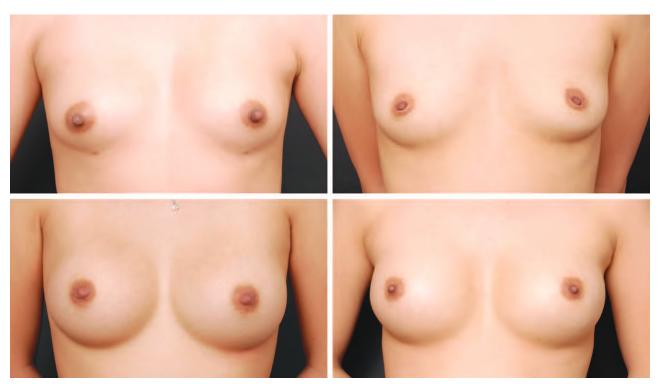

Fig. 3. (*Above*) Preoperative view. (*Below*) Postoperative view at 1-year follow-up. The scar is well hidden. (*Left*) Smooth surface cohesive silicone gel implant (right breast, 280 cc; left breast, 260 cc) in the subpectoral-subfascial pocket. (*Right*) Smooth surface cohesive silicone gel implant (right breast, 286 cc; left breast, 286 cc) in total subfascial pocket.
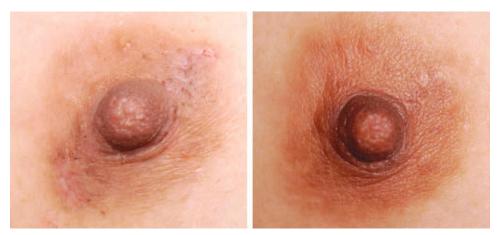
Fig. 4. Follow-up photographs of postoperative scarring at 3 weeks (*left*) and 6 months (*right*).

Table 1. Scar Survey Score Analysis of Two Groups at 6 Months Postoperatively*

	Transareolar-Perinipple Zigzag Incision (%)	Classic Transareolar-Perinipple Incision (%)
No.	499	30
Scar scale score		
5 (excellent)	120 (24.0)	5 (16.7)
4 (good)	253 (50.7)	10 (33.3)
3 (not bad)	90 (18.0)	11 (36.7)
2 (bad)	30 (6.0)	3 (10.0)
1 (poor)	6 (1.2)	1 (3.3)
Average†	3.90	3.50

*Tattooing was recommended to patients whose survey scores ranged from 1 to 3.
†Statistically significant between the two groups ($p = 0.015$).

and areolar tattooing were performed after 6 months, with satisfactory results (Fig. 5). On statistical analysis, the zigzag incision showed superior results compared with the classic method. Scar scale values of the two study groups showed statistical significance ($p < 0.05$).

The prevalence of areolar distortion in our study was 3.4 percent (Fig. 6). Of 529 patients with 1058 total breasts, there were 36 breasts with areolar distortion.

Nipple sensation was evaluated in 529 patients. Preoperative average threshold was 22.1 g/mm², which dropped to 94.7 g/mm² 1 month after surgery. However, it gradually improved to 34.4 g/mm² by 3 months after surgery and 27.63 g/mm² by 6 months after surgery. Therefore, approximately 70 percent of patients showed a temporary decrease in nipple sensation, but most patients recovered to the preoperative condition. The average threshold between the preoperative values and postoperative values of 6 months after surgery showed no statistical significance

($p > 0.05$). However, some cases showed nearly no loss of sensation even on postoperative day 1. In our study, 0.8 percent of cases (five patients; four unilateral cases and one bilateral case) needed 1 or 2 years to recover fully, with no permanent sensory loss. During follow-up, none of the patients reported difficulty with lactation.

DISCUSSION

There are multiple factors to consider when a plastic surgeon decides which type of incision to use in augmentation mammaplasty. Wide surgical exposure that allows for precise dissection and that minimizes postoperative complications and scar formation is an important factor. Although much has been published on techniques and complications, optimal location of the incision with regard to minimizing postoperative scarring and exposure of the surgical field has not been discussed in detail. The quality of the scar becomes important in ethnicities such as Asians, who tend to scar more than Caucasians.

To minimize postoperative scarring, surgeons have used intraareolar or perinipple incisions.[25–28] However, these relatively small incisions hinder precise dissection and make insertion of larger implants difficult without creating significant torsion and trauma to the implant. These techniques are only applicable to patients with relatively large areola diameters. In addition, insertion of texture-type implants is even more difficult with this type of approach.[25–27]

We modified Pitanguy's transnipple and transareolar incision[28] to minimize postoperative complications such as visible areolar scarring, decreased nipple sensation, mastitis, difficulty with lactation, and capsular contracture. Our technique involves making an omega-shaped incision, which goes
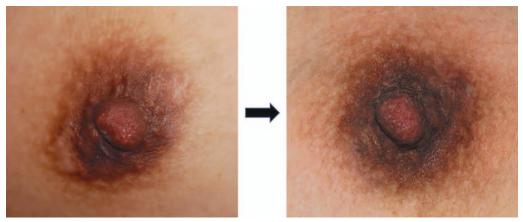
Fig. 5. (*Left*) Postoperative scarring. (*Right*) Results after areolar tattooing performed 6 months postoperatively.
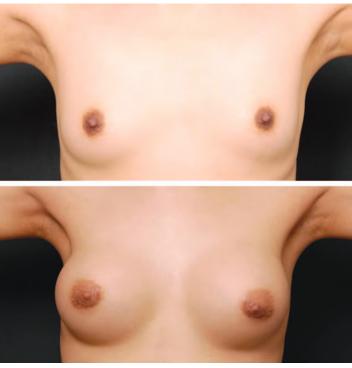

Fig. 6. (*Above*) Preoperative view. (*Below*) Postoperative view at 1-year after breast augmentation with smooth surface cohesive silicone gel implant (right breast, 240 cc; left breast, 260 cc) in the subfascial pocket. Areolar distortion is seen on both sides.

halfway around the areolar stalk. Pocket dissection was performed through the plane between the breast parenchyma and subcutaneous tissue instead of dissecting directly deep toward the pectoral muscle by cutting glandular tissues. The method of making an omega-shaped incision is ideal for patients with an areolar diameter greater than 3.5 cm, but it is also applicable to patients with smaller areolas. We changed a straight transareolar incision into a zigzag to allow lengthening of the skin incision and

widening of the operative field. Therefore, because meticulous hemostasis and pocket dissection under direct vision were possible, it might be helpful for controlling the bleeding and precise dissection.

Postoperative scarring is a very important issue to patients in Asian countries such as South Korea and Japan, where use of public bath spas is very common. Hypertrophic scarring tends to occur more frequently in Asians than in Caucasians and therefore warrants consideration in selecting an incision for

breast augmentation. To minimize bias, scar assessment was performed by a third person (e.g., family member) rather than the patient herself. Of patients who received transareolar-perinipple (areolar omega) zigzag incision, 74.7 percent had survey scores ranging from 4 to 5. In patients with unsatisfactory scarring, areolar tattooing after 6 months significantly improved the appearance of the scars.

Our technique results in more satisfactory scarring results because the principle of minimizing tension at the incision site is followed. First, we increased the incision length by making a zigzag incision rather than a straight incision at the arm of the omega shape. By lengthening the incision, the focal wound tension was distributed throughout the entire length of the increased incision. Second, the location of the incision is at the epicenter of the breast. Tension distribution in breast augmentation is unique in that the breast tissue acts as a shock absorber. Therefore, the tension that is transmitted to the breast skin is not uniform throughout the surface area of the breast, as the breast parenchymal mass is not uniform throughout the breast—most parenchymal mass is at the epicenter and progressively less radially. Mechanically, an implant exerts pressure on the breast parenchyma. The breast parenchyma absorbs this pressure through compression and then transmits force to the overlying skin and back to the implant (Figs. 7 and 8).[19,29] The amount of breast parenchyma is greatest at the epicenter of the breast; thus, it can be modeled with the spring-damper system, with the greatest spring

constant and damper constant. Therefore, the absorption of tension by the breast parenchyma is greatest at the epicenter, with the least amount of tension absorption at the base. In addition, as more compressive force is transferred back to the implant centrally from the breast parenchyma, the implant is subjected to more pressure radially. This radially displaced pressure is exerted back to the breast skin radially. Thus, tension or the pulling force on the skin is minimal at the epicenter of the breast, and the tension becomes progressively greater toward the base of the breast. We see this clinically, as scar widening always occurs at the most outer region of the zigzag incision, away from the epicenter of the breast (Fig. 4). For patients prone to scarring such as Asians, inframammary fold incision with the most amount of tension creates more significant scarring.

In addition to tension, changes and differences in color at the incision site are also important considerations. Asians and darker skinned ethnicities tend to have darker areola compared with Caucasians. Therefore, the formation of a scar appearing as a white line can be highly noticeable. Thus, we believe that a typical periareolar incision is applicable to patients without a significant color difference between the areola and the breast skin.

Handel et al.[30] reported in their large-scale study of 1655 breast implants a 14 percent occurrence rate of Baker class III or IV capsular contracture, whereas our incidence rate was 1.1 percent. We emphasized nontraumatic sharp dissection with electrocautery and meticulous hemostasis
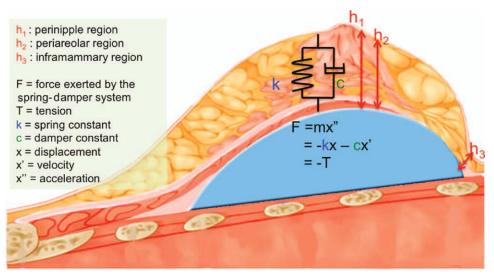

Fig. 7. Simple spring-damper system used to model breast parenchyma in the event of breast augmentation. The system has resistance against the movement, and this resistance is measured by spring constant k and damper constant c. Breast parenchyma under distinctive positions h_1, h_2, and h_3 are modeled by the spring-damper system with a different set of constants, k and c, that is unique to that particular mammographic position.
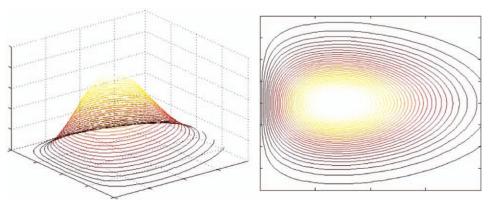
Fig. 8. Graphic representation of extended skin because of tension exerted by breast augmentation. (*Left*) Three-dimensional contour model. Originally uniformly spaced contour lines are newly spaced according to the tension exerted on the corresponding area of the skin. (*Right*) Top view of the contour model. Skin is increasingly stretched farther from the epicenter of the breast. The distances between incremental circumferential contours depicted in Figure 7, *below* are proportional to the exerted tension on the skin in each area.

under direct vision. We believe that bleeding control can minimize postoperative inflammation and subsequent capsular contracture. Bacterial infection caused by discharge from the nipple may be a factor contributing to capsular contracture. Studies[7,31] have shown that the rate of capsular contracture decreases when a nipple shield is applied during surgery. Multiple factors likely contributed to the low rate of capsular contracture.

The perinipple incision proposed by Lee et al.[25] and Becker[27] has the limitation of permitting only saline implants, because of the small size of the incision. Atiyeh et al.[26] inserted prefilled implants but did not specify the maximum size that can be inserted. We were able to insert round, cohesive silicone gel implants, up to 340 cc, in patients with areolar diameters less than 3.5 cm. However, for patients with areolar diameters greater than 3.5 cm, a larger implant insertion was possible. Although not included in our study, insertion of form-stable anatomical type implants is also possible through our incision design.

Diminished nipple sensation may be a potential morbidity in perinipple or areolar incision. Araco et al.[32] suggested that decreased sensitivity of the nipple-areola complex or areolar pain may occur with periareolar incision because of injury to the intercostal nerve branches coming in from the lateral sides of the areola. However, Mofid et al.[33] and Okwueze et al.[34] reported no sensory change after using a periareolar approach. Sensation of the nipple is provided by the third, fourth, and fifth intercostal nerves. They branch out as superficial and deep lateral cutaneous branches on the lateral side of the areola and nipple, and as an anterior cutaneous branch on the medial side of the areola and nipple. Our oblique incision from the 1-o'clock position to the 7-o' clock position for the right breast, and from the 5-o'clock position to the 11-o'clock position for the left breast minimizes injury to the medial and lateral anterior cutaneous intercostal nerves. The fourth intercostal nerve, which is the most important nerve for nipple sensation, was absolutely spared. Therefore, most of the patients in our study did not have long-term loss of nipple sensation. Dissection procedures between the classic and zigzag incisions are the same, and thus there was no difference in nipple sensation between the two groups.

A minor complication in patients who underwent our approach included areolar distortion (Fig. 6). The postoperative change in areolar shape is thought to be the result of wound contraction in the relatively thin inferomedial areolar skin, where thin subcutaneous dissection is carried out. Also, changes in areolar volume were noted in patients with especially high fat volume under the areolar skin. To prevent these occurrences, subcutaneous dissection should be carried out with caution to include a sufficient amount of subcutaneous fat. In a small minority of patients who desired correction, fat grafting under the areolar skin was performed after 6 months.

CONCLUSIONS

Transareolar-perinipple (areolar omega) zigzag incision allows wider surgical fields than perinipple or periareolar incisions. Wider access to the breast facilitates ease of pocket dissection, meticulous

hemostasis, and precise surgery under direct vision. Less tension is transferred to the incision, resulting in excellent to good quality of scars. We saw a few cases of long-term decrease in nipple sensation with no permanent sensory loss and a low rate of capsular contracture. Easy access to the area of dissection with direct vision resulted in less trauma to the breast and surrounding tissues and complete bleeding control, leading to rapid postoperative recovery with minimal postoperative pain. This incision is ideal for Asian patients and patients of other ethnicities who are prone to hypertrophic scarring.

Paik Kwon Lee, M.D., Ph.D.
Apgugeong Avenue Plastic Surgery Clinic
577-6 Shinsa-dong
Gangnam-gu, Seoul 135-891, Republic of Korea
prspklee@yahoo.com

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