



Inverted Nipple Repair Revisited: A 7-Year Experience

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Abstract

Background: Nipple inversion in females can be congenital or acquired. Women who desire treatment for this condition often report difficulty with breastfeeding and interference with their sexuality. However, data are limited on the demographics of patients who undergo surgery to repair inverted nipples and the associated recurrence rates and complications.

Objectives: The authors assessed outcomes of a 7-year experience with an integrated approach to the correction of nipple inversion that minimizes ductal disruption.

Methods: A retrospective chart review was performed for 103 consecutive patients who underwent correction of nipple inversion. (The correction technique was initially reported in 2004 and entailed an integrated approach.) Complication rates, breastfeeding status, and patient demographics were documented.

Results: Among the 103 patients, 191 nipple corrections were performed. Nine patients had undergone previous nipple-correction surgery. Recurrence was experienced by 12.6% of patients, 3 of whom had bilateral recurrence. Other complications were partial nipple necrosis (1.05%), breast cellulitis (1.57%), and delayed healing (0.5%). The overall complication rate was 15.74%. Fifty-seven percent of the patients had a B-cup breast size, and 59% were 21 to 30 years of age.

Conclusions: Results of the authors' 7-year experience demonstrate the safety and effectiveness of their technique to correct inverted nipples.

Level of Evidence: 4



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Nipple inversion is relatively common, occurring in up to 10% of females.¹ Patients who present with inverted nipples typically are self-conscious and insecure about the appearance of their naked breasts. If the inverted nipple inhibits breastfeeding, it may impact parent-child bonding and impair the health of the child.² Nipple inversion is a heavily discussed topic in online forums for laypersons. A recent search yielded >1,170,000 hits for the term “inverted nipples affect breastfeeding.” In our experience, many women with inverted nipples have complained to at least 1 doctor before seeking treatment and have been informed that nipple inversion is normal and does not require intervention. Of the 103 patients in the present series, only 23 were referred by a physician; the remainder were self-referred after personal Internet research.

Nipple inversion is caused either by failure of the lactiferous ducts to develop and grow during maturation of the breast tissue or by fibrosis around the lactiferous ducts due to

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inflammation (eg, mastitis, cancer, previous breast surgery).³ At approximately week 6 of fetal development, breast buds form along the milk line. The mammary glands develop as epithelial downgrowth into the mesenchymal tissue. Later, during the eighth or ninth month of fetal development, a pit forms at the entry to the ducts. The proliferation of mesenchymal tissue and fat below the pit causes it to elevate above the nascent skin to form the projection of the nipple. Failure of the growth of the mesenchyme or of lengthening of the lactiferous ducts can cause congenital inverted nipples.⁴

Inverted nipples can be classified into 3 categories based on the known classification systems and common findings (Table 1). Nipple inversion can be stratified according to the amount of eversion possible and the projection that can be maintained with traction. The surgical treatment of inverted nipples relies on several basic principles, including maintenance of as many of the functional lactiferous ducts as possible, meticulous dissection of the fibrous attachments surrounding the duct system, placement of mattress sutures at the nipple base to oppose the underlying tissue and close the dead space maintaining eversion, placement of running sutures at the base of the nipple in selected cases, and stent utilization to maintain the nipple in a projected state as it heals.³

Various techniques have been described for correction of inverted nipples.⁵⁻⁸ In the present study, we conducted a retrospective review of 191 consecutive nipple corrections (103 patients). In this article, we review the surgical technique (previously reported in 2004)⁶ and discuss recurrence, complications, and patient demographics.

METHODS

A retrospective chart review was conducted of 103 consecutive patients who underwent a total of 191 outpatient

inverted nipple-repair procedures in a 7-year period (May 2006–June 2013). All patients received local anesthesia and were treated at our outpatient facility, Marina Plastic Surgery, Marina Del Rey, CA. Demographic information was collected, including patient age, weight, height, bra size (band and cup), breast ptosis grade, medical comorbidity, and smoking status. Documented complications included recurrence, soft-tissue infection, partial nipple necrosis, and delayed healing. Data were collected and analyzed in a spreadsheet (Microsoft Excel 2006; Microsoft Corp, Redmond, WA), including *t* test values and stratification of patient variables. To determine the significance of differences between patient variables, chi-square testing was performed and mean values obtained. Patient variables included age, body mass index (BMI), smoking status, medical comorbidity, concomitant procedures, and incidence of recurrence. Preoperatively, all patients provided consent to use their information and images for this study.

Surgical Technique

Nipple eversion was first achieved by gentle traction with a single skin hook (Figure 1A). Next, the nipple base was freed through an inferior incision at the nipple base (Figure 1B). The fibrous bands that constrict the base of the nipple were freed through blunt dissection and a vertical spreading technique parallel to the ducts, initially helping to restore nipple projection (Figure 1A,B). The ductal structures were easily visualized and preserved during dissection. The ducts were visually identified as tubular nonvascular structures, larger and of different consistency than nerves. They did not resemble scar tissue. When necessary, selective ductal division was performed to achieve complete eversion with normal projection. This technique released tension by

Table 1. Proposed Grading System for Inverted Nipples

Nipple Grade	Nipple Protractility	Projection	Milk Ducts	Ability to Breastfeed	Fibrosis	Histology	Lactiferous Ducts
1	Easily protracted	Maintains projection; occasionally pops up without manipulation	Not compromised	Possible	Minimal or none	Soft-tissue deficiency	Normal; no retraction
2	Can be protracted	Inverted	Compromised	Very difficult, if possible	Moderate	Rich collagenous stroma; smooth muscle bundles	Mildly retracted; do not need to be cut for fibrosis release
3	Severely retracted/inverted; requires surgery to be protracted	Inverted	Constricted	Impossible	Remarkable fibrosis, sometimes with rashes; infection; poor nipple hygiene	Insufficient soft-tissue; atrophic terminal duct; lobular units; severe fibrosis	Short and severely retracted

Several classification systems and findings have been incorporated into this proposed nipple grading system. Note the key physical examination findings as well as the correlated histologic findings.

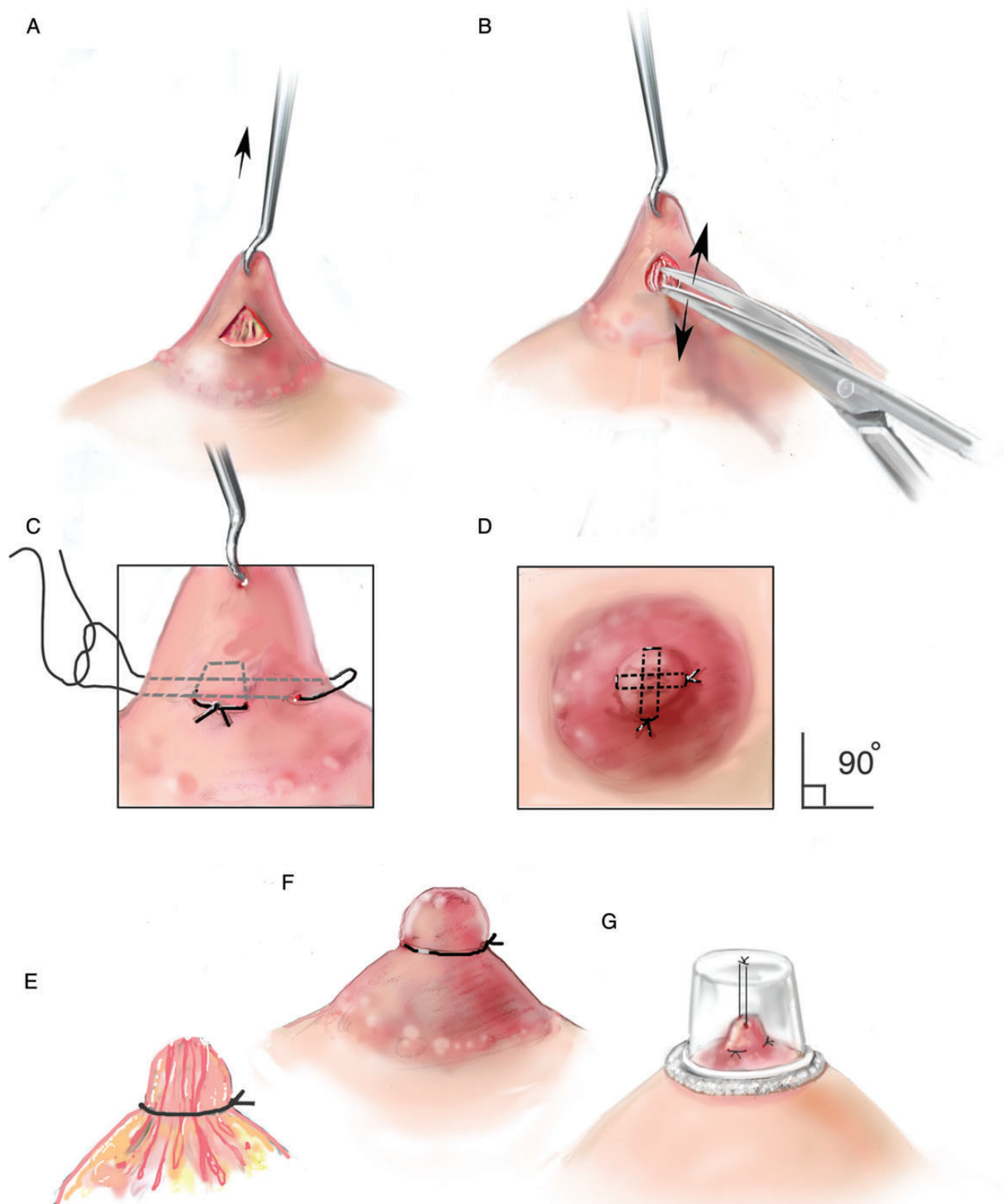


Figure 1. Inverted nipple repair technique. (A) Gentle traction with a skin hook. (B) Blunt dissection and vertical spreading parallel to the ducts to restore nipple projection. (C, D) Two external horizontal mattress sutures were placed: one from the 12 o'clock to 6 o'clock position, the other from the 3 o'clock to 9 o'clock position. (E, F) An external 4-0 chromic purse-string suture was placed at the junction of the nipple and areola to provide stability and reduce dead space. (G) A 4-0 nylon traction suture was placed through the point of highest projection of the nipple and affixed to a stent comprising a medicine cup and gauze padding. Traction was maintained for 2 to 5 days.

incrementally dividing the peripheral lactiferous ducts under direct vision.

Two external 4-0 Vicryl (Ethicon, Somerville, NJ) horizontal mattress sutures were then placed, one from the 12-o'clock to the 6-o'clock position and the other from the 3-o'clock to the 9-o'clock position (Figure 1C, D). To avoid vascular embarrassment, the entry and exit points of the suture were placed as close together as possible. These sutures serve to draw together opposing nipple-areola dermal flaps, thereby providing stability and reducing dead space while not compromising vascular flow or constricting the lactiferous ducts. Theoretically, the orientation of the sutures should minimize restriction of the ducts, because the sutures are oriented longitudinally, parallel to ductal structures. However, in practice, the surgeon must ensure the correct tension and placement of the sutures to avoid circumscribing and tamponading the ducts through pressure from the nipple-areola complex. An external 4-0 chromic purse-string suture was then placed at the junction of the nipple-areola border (Figure 1E, F). To limit vascular disruption, the perpendicular sutures were in close proximity to each other. The cerclage suture was placed in the dermis to ensure that parenchymal/ductal blood supply to the nipple was preserved. Finally, a 4-0 nylon traction suture was placed through the point of highest projection of the nipple and affixed to a stent consisting of a medicine cup and gauze padding (Figure 1G). This traction helped exert an anteriorly directed force that maintained the nipple in an overcorrected position. Traction was maintained for 2 to 5 days, depending on the ease of retraction. If the nipple retracted easily, traction duration was 2 days (grades 1 and 2); if it was densely fibrotic, the stent was maintained for 5 days (grade 3). If there was any sign of vascular compromise, the stent was removed. The nipple was examined 30 minutes after the procedure and on post-operative day 1 to assess vascular embarrassment. A video demonstrating the surgical technique may be viewed at www.aestheticsurgeryjournal.com.

Follow-up Evaluation and Secondary Surgery

In follow-up evaluations, we assessed maintenance of nipple eversion and subjective patient satisfaction. (If nipple inversion is corrected but the patient desires more projection, fillers may be considered to augment the projection. However, data regarding the effect of fillers on the lactiferous ducts are lacking, and this would represent an off-label use of fillers.) Due to the significant recurrence rate with nipple-correction procedures, our standard protocol was to schedule frequent follow-up appointments, provide appropriate patient counseling, and offer secondary surgery for recurrence of nipple inversion. For secondary surgery, the same

procedure was performed, in the hope that repeated release of the nipple would free the underlying stromal attachments.

Review of the Literature

In an effort to compare and contrast reported rates of complications and outcomes, a review of the literature was conducted to revisit data for previously reported techniques of inverted nipple repair.

RESULTS

Of the 103 patients, all except 1 were women. The mean age was 29 years (standard deviation [SD], 7.8 years; range, 18-57 years). The mean BMI was 21 ± 4 kg/m², mean bra size (band) was 34 ± 1.4 inches, and median cup size was B (Table 2). Ninety patients presented with bilateral inverted nipples. At the time of the repair, 14 women were actively breastfeeding with their noninverted nipple, 22 had a medical comorbidity, and 5 were smokers. Nine patients had undergone previous surgery to correct their inverted nipples. Concomitant procedures were performed in 15 cases, which included breast augmentation (n = 5), mastopexy (n = 5), and liposuction or facial procedures (n = 5).

The mean follow-up time was 8 months (range, 3 weeks–9 years). When present, recurrence often was apparent at the 1-month follow-up visit. There were no incidents of vascular embarrassment.

Typical results of the inverted nipple repair are shown in Figures 2-4 and included improved nipple projection without manual extraction. The repaired nipples reacted to stimulation and temperature. Several patients experienced

Table 2. Patient Demographics

Characteristic	Gender (n)	
	Female (102)	Male (1)
Mean age, y (± SD)	29 (± 7.8)	35
Mean BMI, kg/m ² (± SD)	21 (± 4)	29
Mean bra size (band), in (± SD)	34 (± 1.4)	NA
Median cup size	B	NA
Bilateral inverted nipples	90	1
Actively breastfeeding	14	NA
Medical comorbidity	22	1
Smoker	5	0
Previous nipple surgery	9	0

Data denote numbers of patients unless otherwise indicated. BMI, body mass index; NA, not applicable; SD, standard deviation.

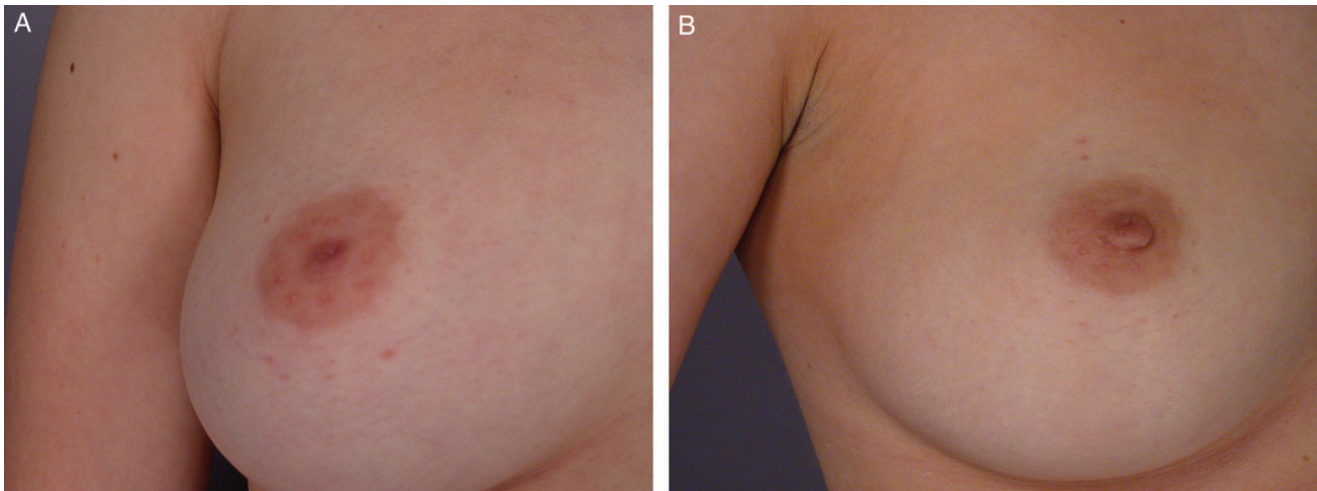


Figure 2. (A) Preoperative view of the right breast of a 23-year-old woman (bra size, 34B) who presented for bilateral nipple repair. (B) Fourteen months after the surgery.

improvement in body image and breastfeeding, although these data were not documented for every case.

With respect to age, most patients were in their 20s (Figure 5). Several younger women (18-20 years of age) presented for this procedure, and care was taken to ensure that complete breast development had been attained before the surgery was offered. Many patients were self-referred after conducting research on the Internet, and several were referred by their primary care physician.

The low mean BMI of our study population (Figure 6) reflects the fact that many patients were thin, and suggests that a correlation may exist between BMI and the prevalence of inverted nipples. However, no such correlation could be identified from our literature search of the subject.

Most patients reported a cup size of B (Figure 7), which correlates with the low mean BMI. Most of these breasts did not have high-grade ptosis: 86 patients (83%) had grade 2 ptosis or less.

Approximately 19% of patients (10% of breasts) experienced at least 1 complication; these included recurrence, partial nipple epidermolysis, eschar, and breast cellulitis (Figure 8). Recurrence was the most common complication. To augment nipple projection in such cases, 4 women received injections of calcium hydroxylapatite microspheres in a water-based gel carrier. The use of external 4-0 chromic purse-string sutures was not recorded consistently in the charts, and therefore it was not possible to correct for this confounding variable.

Review of the Literature

Our review of the literature yielded many studies of techniques to repair inverted nipples, some more invasive than others.⁹⁻²² Several retrospective studies relevant to ours

were identified,^{9-13,21} but only 3 had a higher number of patients.^{12,13,21} One of these studies had no data on recurrence or complications.¹³ Although 1 study included many procedures (452 nipples), no complications and only 1 recurrence were described, and data on long-term postoperative outcomes were lacking.²¹ Other studies involved sample sizes of 11 to 17 patients, but recurrence was not mentioned in the reports.⁹⁻¹¹ The authors of another study described only 1 recurrence among 16 patients.¹⁰ In the most comprehensive of these studies, Long and Zhao¹² reported on 53 patients; the follow-up period was 1 year, there were no incidents of recurrence, and the complication rate was 5%. However, per the study protocol, patients were required to wear nipple retractors for 6 months. This warrants extraordinary patient compliance and diligence on the behalf of the surgeon, and may be practical only in a controlled setting. In comparison, our complication and recurrence rates were approximately 3% and 7% of patients, respectively.

DISCUSSION

The higher rate of recurrence in our study, relative to others, may be attributable to differences in duration of nipple retractor use and/or differences in patient demographics such as BMI. Such intrinsic differences could affect the rates of contracture and fibrosis.

Limitations of the present study include its retrospective nature. Thus, it was not possible to prospectively track changes in self-image and patient satisfaction. Moreover, reporting forms for patient outcomes were not standardized, and follow-up dates were not determined in advance. Importantly, some women in our study sought correction for aesthetic reasons, and we do not know if they later



Figure 3. This 23-year-old woman (bra size, 34C) presented for bilateral nipple repair. (A, C) Preoperative and (B, D) 15-month postoperative views.

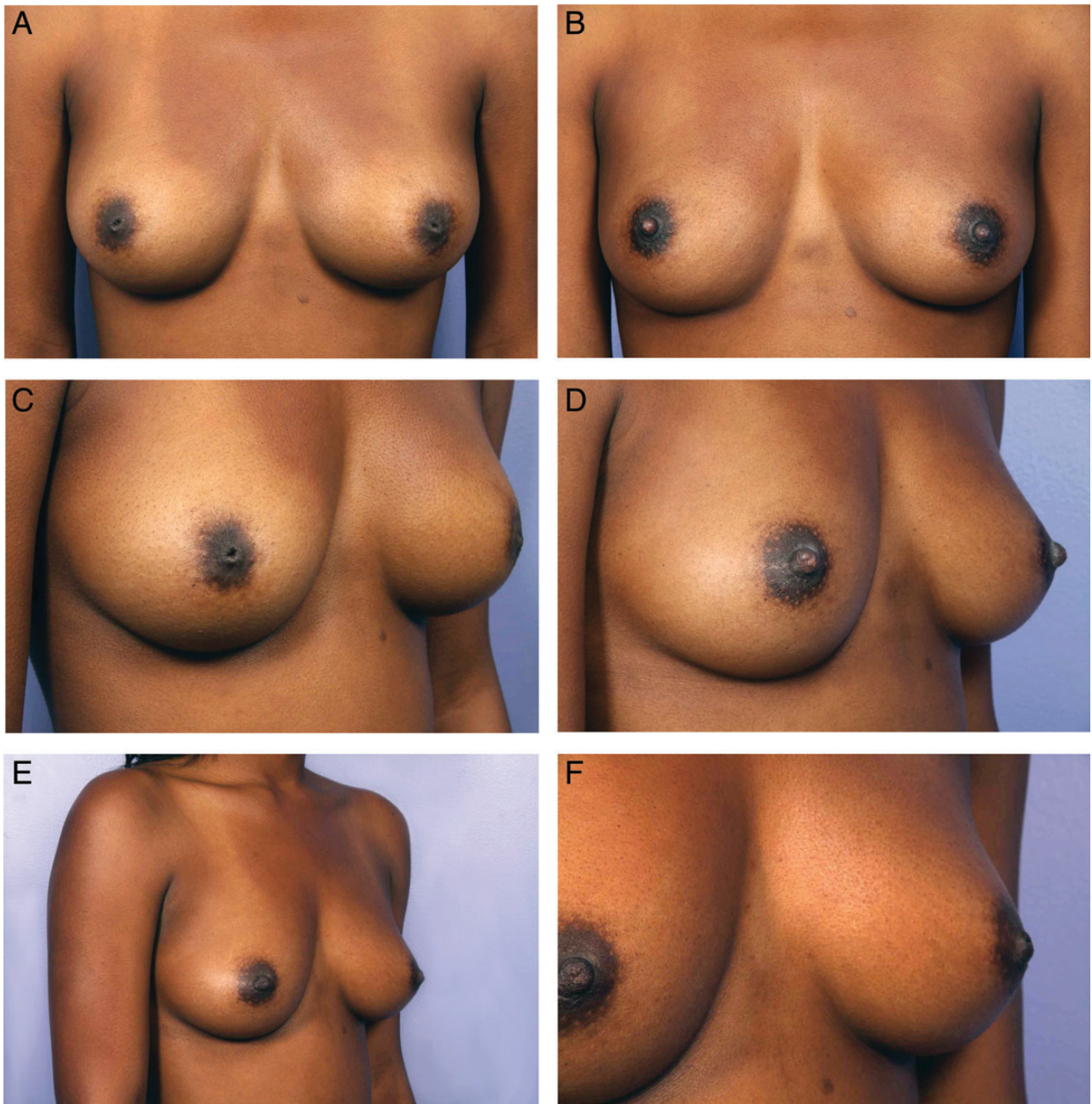


Figure 4. (A, C) Preoperative photographs of a 23-year-old woman (bra size, 34C) who presented for bilateral nipple repair due to deformity of the nipples, which she claimed affected her relationship with her boyfriend. Postoperative photographs obtained at (B, D) 6 weeks and (E, F) 14 months show improved nipple projection without significant scarring.

became pregnant and were able to breastfeed. This information would be valuable for understanding how this procedure affects the lactiferous ducts and breastfeeding. Another limitation is our inability to assess lactiferous duct patency and disruption. However, the ducts are directly visualized during this procedure, which should reduce disruption. During follow-up visits, many patients reported breastfeeding postoperatively, but these data were not

recorded formally. A study of long-term patient satisfaction with inverted nipple repair is being designed to address disruption of the lactiferous ducts.

To our knowledge, this study represents the largest retrospective cohort of patients in a single-practice setting to have undergone inverted nipple repair. Our sample size and mean follow-up duration were sufficient to permit retrospective analysis of recurrence and complication rates.

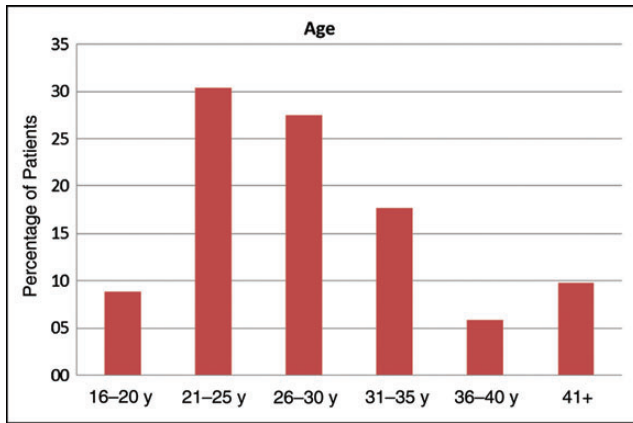


Figure 5. Age at time of surgery. The majority of patients were 21 to 30 years of age.

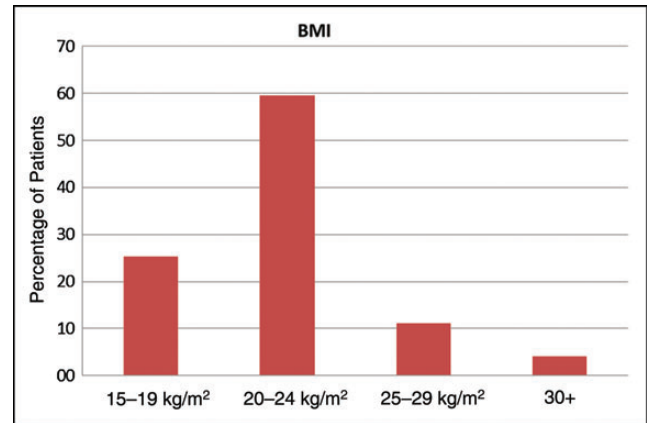


Figure 6. Body mass index (BMI) at time of surgery. The mean BMI (\pm SD) of the study population was low (21 ± 4 kg/m²); most values were in the range of 20 to 24 kg/m².

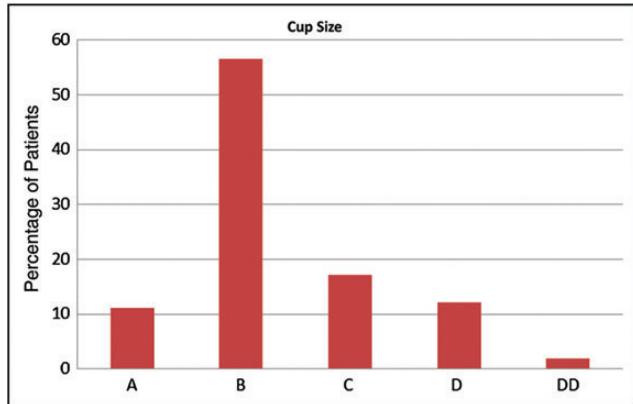


Figure 7. Patient-reported bra-cup size at time of surgery.

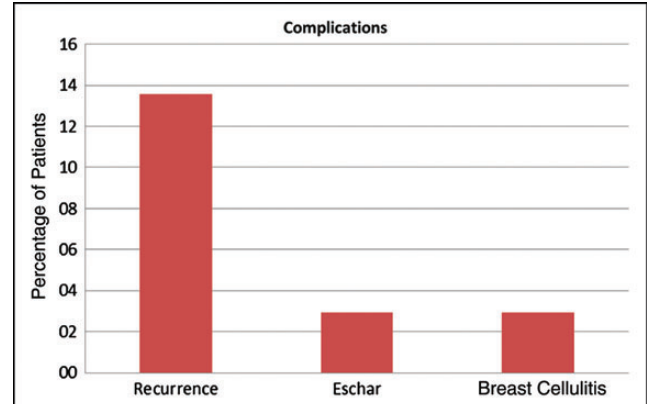


Figure 8. Postoperative complications based on the number of patients (not the number of procedures). Recurrence was the most common complication, and several patients experienced infection or eschar. When normalized by number of procedures, the recurrence rate was 7%, and the rates of eschar/redness and possible infection were 3% each.

Our recurrence rate among all nipple-repair procedures was 13%. Most published studies on the correction of nipple inversion have involved very small samples that are insufficient for ascertaining rates of recurrence or other complications. Although the results of 2 studies that approached our sample size demonstrated lower recurrence rates, the correction techniques required long-term external wires (6 months)¹² or complete disruption of the ducts.¹³

CONCLUSIONS

Nipple inversion is a fairly common condition that can be treated safely and effectively with the method described in this article. In our study, very few referrals for this corrective surgery came from primary care physicians or obstetric-gynecologic physicians, despite the fact nearly all patients reportedly mentioned their concerns to these practitioners. Future research is warranted to assess the psychosocial and

breastfeeding benefits of this procedure in an objective manner, which should help bridge the referral gap.

Disclosures

Dr Stevens is an investigator for Sientra (formerly Silimed; Santa Barbara, CA), Cohera Medical (Pittsburgh, PA), and Mentor CPG (Santa Barbara, CA); medical luminary for BTL (Framingham, MA), Cutera (Brisbane, CA), Merz (Greensboro, NC), and Syneron-Candela (Greensboro, NC); speaker for Allergan Academy (Irvine, CA) and Cynosure (Westford, MA); consultant for TauTona (Menlo Park, CA); medical luminary and speaker for Cutera (Brisbane, CA) and Solta (Hayward, CA); and medical luminary, investigator, and speaker for Zeltiq (Pleasanton, CA). Drs Gould, Nadeau, and Macias have no potential conflicts of interest with respect to the research, authorship, and publication of this article.

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REFERENCES

1. Park HS, Yoon CH, Kim HJ. The prevalence of congenital inverted nipple. *Ann Plast Surg.* 1999;23(2):144-146.
2. Leung AK, Sauve RS. Breast is best for babies. *J Natl Med Assoc.* 2005;97(7):1010-1019.
3. Schwager RG, Smith JW, Gary GF, et al. Inversion of the human female nipple, with a simple method of treatment. *Plast Reconstr Surg.* 1974;54:564-569.
4. Koyama S, Wu HJ, Easwaran T, Thopady S, Foley J. The nipple: a simple intersection of mammary gland and integument, but focal point of organ function. *J Mammary Gland Biol Neoplasia.* 2013;18(2):121-131.
5. Persichetti P, Poccia I, Pallara T, Delle Femmine PF, Marangi GF. A new simple technique to correct nipple inversion using 2 V-Y advancement flaps. *Ann Plast Surg.* 2011;67(4):343-345.
6. Stevens WG, Fellows DR, Vath SD, Stoker DA. An integrated approach to the repair of inverted nipples. *Aesthet Surg J.* 2004;24(3):211-215.
7. Kolker AR, Torina PJ. Minimally invasive correction of inverted nipples: a safe and simple technique for reliable, sustainable projection. *Ann Plast Surg.* 2009;62(5):549-553.
8. Chen SH, Gedebou T, Chen PH. The endoscope as an adjunct to correction of nipple inversion deformity. *Plast Reconstr Surg.* 2007;119(4):1178-1182.
9. Lee MJ, Depoli PA, Casas LA. Aesthetic and predictable correction of the inverted nipple. *Aesthet Surg J.* 2003;23(5):353-356.
10. Durgun M, Ozakpinar HR, Selçuk CT, Sarici M, Ceran C, Seven E. Inverted nipple correction with dermal flaps and traction. *Aesthetic Plast Surg.* 2014;38(3):533-539.
11. Lee HB, Roh TS, Chung YK, Kim SW, Kim JB, Shin KS. Correction of inverted nipple using strut reinforcement with deepithelialized triangular flaps. *Plast Reconstr Surg.* 1998;102(4):1253-1258.
12. Long X, Zhao R. Nipple Retractor to Correct Inverted Nipples. *Breast Care.* 2011;6(6):463-465.
13. Min KH, Park SS, Heo CY, Min KW. Scar-free technique for inverted-nipple correction. *Aesthetic Plast Surg.* 2010;34(1):116-119.
14. Alexander JM, Campbell MJ. Prevalence of inverted and non-protractile nipples in antenatal women who intend to breast-feed. *The Breast.* 1997;6(2):72-78.
15. Kim JT, Lim YS, Oh JG. Correction of inverted nipples with twisting and locking principles. *Plast Reconstr Surg.* 2006;118(7):1526-1531.
16. Serra-Renom J, Fontdevila J, Monner J. Correction of the inverted nipple with an internal 5-point star suture. *Ann Plast Surg.* 2004;53(3):293-296.
17. Jiang HQ, Wei X, Yuan SM, Tang LM. Nipple aspirator: a self-designed instrument for inverted nipple. *Plast Reconstr Surg.* 2008;121(3):141e-143e.
18. Yamada N, Kakibuchi M, Kitayoshi H, Kurokawa M, Hosokawa K, Hashimoto K. A method for correcting an inverted nipple with an artificial dermis. *Aesthetic Plast Surg.* 2004;28(4):233-238.
19. Ritz M, Silfen R, Morgan D, Southwick G. Simple technique for inverted nipple correction. *Aesthetic Plast Surg.* 2005;29(1):24-27.
20. Huang WC. A new method for correction of inverted nipple with three periductal dermofibrous flaps. *Aesthetic Plast Surg.* 2003;27(4):301-304.
21. Crestinu JM. The correction of inverted nipples without scars: 17 years' experience, 452 operations. *Aesthetic Plast Surg.* 2000;24(1):52-57.
22. Pompei S, Tedesco M. A new surgical technique for the correction of the inverted nipple. *Aesthetic Plast Surg.* 1999;23(5):371-374.