



# A New Technique in Correction of Nipple Inversion Using Dermal C Flaps

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Received: 24 April 2021 / Accepted: 2 August 2021 / Published online: 12 August 2021  
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## Abstract

**Background** Nipple inversion, which is defined as a nipple located on a plane deeper than the areola, presents both functional and cosmetic problems. Surgical repair of severe cases involves suture or flap techniques. In the present study, an alternative repair technique using two cross dermal areolar flaps to correct challenging inverted nipples is presented. Releasing the inverted nipple is performed by severing the underlying tight fibrous tissue bands and canaliculi.

**Methods** This is a retrospective case series. Fifteen patients who had been operated between January 2010 and January 2016 were included in the study. Seven of these had bilateral inverted nipples. Patient age at operation ranged from 26 to 47 years (mean age, 32.5 years). All nipples were congenital, with no previous operations. The follow-up period ranged between 8 and 16 months (mean of 13 months).

**Results** There were no complications associated with surgery, including infection, hematoma, permanent sensory disturbance, or nipple necrosis. Unilateral recurrence occurred in one patient on the 26th postoperative day. This patient was reoperated on successfully using the same method. Adequate projection was achieved in all patients. All patients were satisfied with their results.

**Conclusions** The authors conclude that their procedure is a reliable, simple, safe, and effective method for correction of inverted nipples. The alignment of the scar with the junction of the nipple and the areola leads to a more aesthetic appearance with no apparent scarring. This technique can be applied to any type of inverted nipple as a primary surgical procedure.

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**Keywords** Correction of nipple inversion · Dermal areolar flap · Inverted nipple

## Introduction

The nipple is a pink or light-brown conical projection below the center of the breast. The nipple and areola vary in size, shape, and color among individuals. The average nipple is 1 cm in length and 1 cm in diameter [1, 2], and the average areola is 3 cm in diameter [3]. Functionally, 15–20 lactiferous ducts traverse it, and its appearance and location on the breast mound are aesthetically important. The normal nipple is projected, but sometimes it is flat or even inverted [4].

The inverted nipple deformity has been recognized for more than 150 years. The condition was first described by Cooper in 1840, and the first corrective operation was reported by Kehrer in 1879 [5, 6]. In patients with inverted nipple, relatively short lactiferous ducts are attached to the nipple via dense and highly inelastic connective fibers. Although this deformity is usually congenital, it may also

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result from infection, recurrent inflammation, trauma, breast surgery, or cancer [5]. Presenting unilaterally or bilaterally, and with varying degrees of severity, it has been estimated that up to 10% of women are affected by this deformity [7]. Clinically, congenital inverted nipple is divided into 3 grades (grades 1, 2, and 3) as classified by Han and Hong [8]. The grade 1 nipple can be pulled out easily and maintains its projection quite well without traction. The grade 2 nipple can also be pulled out manually, however the nipple has difficulty in maintaining its position. The grade 3 nipple is very difficult to pull out manually. The fibrosis is remarkable and the lactiferous ducts are short and severely retracted [4].

An inverted nipple causes functional problems and can cause psychological and emotional discomfort in some women. Furthermore, it can be a source of poor hygiene and inflammation, and even in some cases, breastfeeding is impossible connected to lack of nipple erection [9, 10].

Various procedures have been described for correction of this anomaly; a condition which causes both esthetic and functional problems. Reconstructive surgical techniques today are oriented toward methods that allow adequate filling to maintain the nipple permanently everted [10]. Dermal and dermoglandular flaps, endoscopic release, internal suture, continuous traction, artificial dermis, and a variety of suction techniques have all been described to correct the inverted nipple [7]. This variety of available methods amply reflects the difficulty of achieving a satisfactory outcome.

The aim of the study presented here is to show an effective, simple, safe method for correction of inverted nipple. The procedure leaves minimal scars and involves no recurrence of inversion.

## Patients and Methods

### Patients

This is a retrospective case series. The records were checked for inverted nipple correction operations and patients who had been operated with C-flaps were included. In a period of six years, between 2010 and 2016, 22 nipples of 15 female patients with inverted nipples were operated on. Of these, seven patients had congenital bilateral inverted nipples; eight had congenital unilateral inverted nipples. Two out of seven cases of bilateral nipples were nulliparous. No acquired inverted nipples were noted. Patient age at operation ranged from 26 to 47 years (mean age, 32.5). Patients were followed up for 8–16 months (mean, 13 months).

### Surgical Technique

All patients were given detailed information about the operation and their preoperative and postoperative photographs were taken. The areola diameters were measured preoperatively. The periareolar region was anesthetized using an injectable local anesthetic (2 % lidocaine including 1:200,000 epinephrine). Incisions were located on the skin around the areola where two de-epithelialized counterpart dermal flaps were elevated on the subdermal plane between 1–5 and 11–7 o'clock positions (Figures 1, 2). Each one of these flaps is called "C-Flaps." Widths of C-flaps were changed between 3.8 and 4.3 mm, depending on the diameter of the preoperative areola. The remaining postoperative areolar widths were adjusted larger than 32 millimeters. However, at least 38 millimeters of areola-widths were formed when possible.

The inverted nipple was held with a traction suture that was placed at the nipple base. To minimize the damage to the lactiferous ducts while keeping the nipple projected, a tunnel was formed in the deep plane below the nipple with a careful blunt dissection. If the inversion of the nipple could not be released totally with these dissections, as in grade 3 inverted nipples, all the retracting ducts were transected to prevent restriction of the nipple. Future candidates for breastfeeding, who have grade 3 inversions, were given detailed preoperative information about possible decrease in the breastfeeding capacity. The tips of the deepithelialized C-flaps were passed through the tunnels reciprocally (Figures 1, 2), and sutured on the contralateral areolar side with absorbable sutures. A monofilament purse-string suture (4-0 polydioxanone) was used around the circumference of the nipple-base to support eversion of nipple and was tied under moderate tension (Figures 1, 2). The traction suture was suspended to adjacent skin for supporting the eversion and was left in place for 5 days. Patients were given a prefabricated cotton stent and larger brassieres were used as a postoperative care against recurrence of nipple inversion (Table 1).

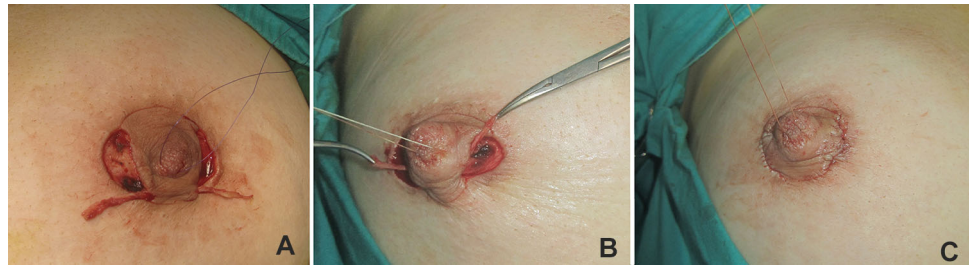
### Measurements

Preoperatively, the distances between the deepest points of the nipples and areola bases were measured by a caliper. The distances between the most projectile points of the nipples and areolar base were measured by a caliper 8 months postoperatively. Preoperative and Postoperative nipple heights are outlined in Table 2.

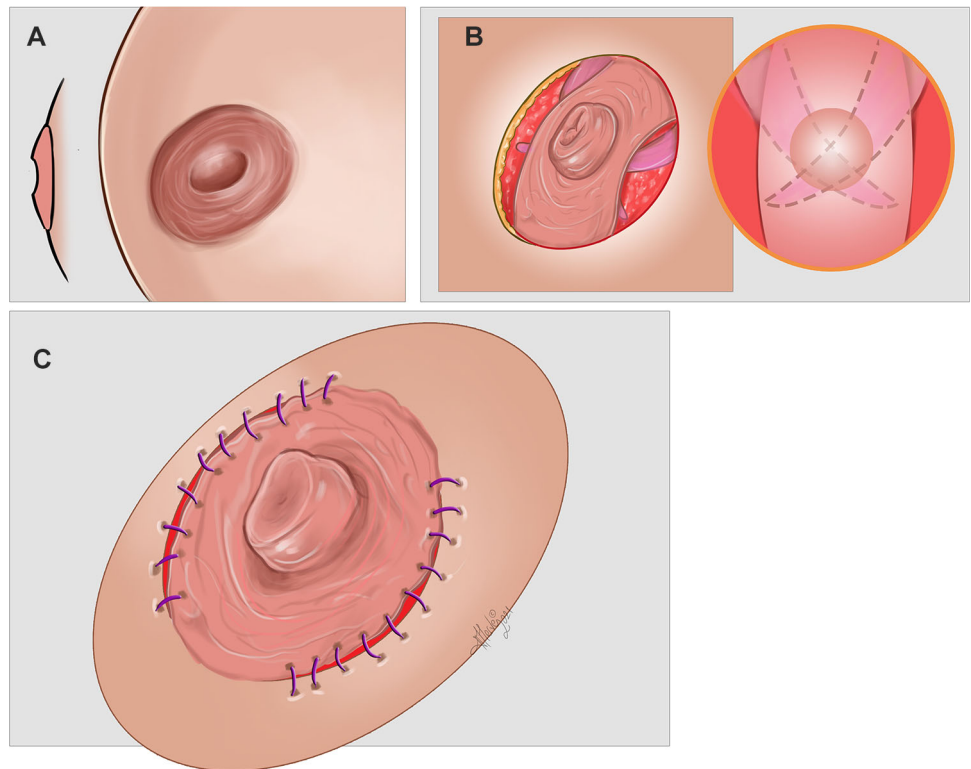
### Statistical Analysis

Nipples were grouped according to their grades. Height gains according to grades were compared with each other

**Fig. 1** Perioperative Photo. **A** Two dermal C-Flaps were elevated, **B** The flaps were passed under the nipple after severing the underlying fibrotic bands, **C** corrected form of inverted nipple



**Fig. 2** Medical illustrations related to the technique. **A** Preoperative view, **B** The reciprocal deepithelialized C flaps, **C** Postoperative view



using nonparametric Kruskal-Wallis one-way analysis of variance test. The data were evaluated with a 95% confidence interval and 5% significance.  $p$  values below 0.05 were accepted as statistically significant.

## Results

Seven patients had bilateral and eight patients unilateral inverted nipples. Seven nipples were grade I, 10 nipples were grade II and 5 were grade III according to the Han and Hong classification [8]. During the operation, none of the grade 2 inverted nipples required transection of lactiferous ducts, however all nipples in grade 3 group needed transection of lactiferous ducts. There were no complications associated with surgery, such as infection, hematoma, permanent sensory disturbance, or nipple necrosis.

Preoperative nipple heights ranged between  $-3$  and  $4$  millimeters (mean,  $0.5 \pm 1.8$  mm). 6-month postoperative nipple heights ranged between  $5$  and  $12$  millimeters (mean,  $8.5 \pm 1.9$  millimeters). Height gain was ranging between  $6$  and  $10$  millimeters (mean,  $8 \pm 1.2$  millimeters). Preoperative and Postoperative nipple heights related to grades are outlined in Table 2.

Grade-groups were compared statistically with each other depending on the distribution of nipple height gain values and the  $p$  value was found to be  $0,10$ . According to this, there was no statistically significant height gain between grades. This shows that this technique can be used in all grades of inverted nipples.

All patients expressed satisfaction with the procedure, with an anatomically correct anatomic nipple projection (Figures 3, 4) and good nipple sensations. Postoperative nipple sensations were evaluated subjectively at eight months after the surgeries, and three out of five patients

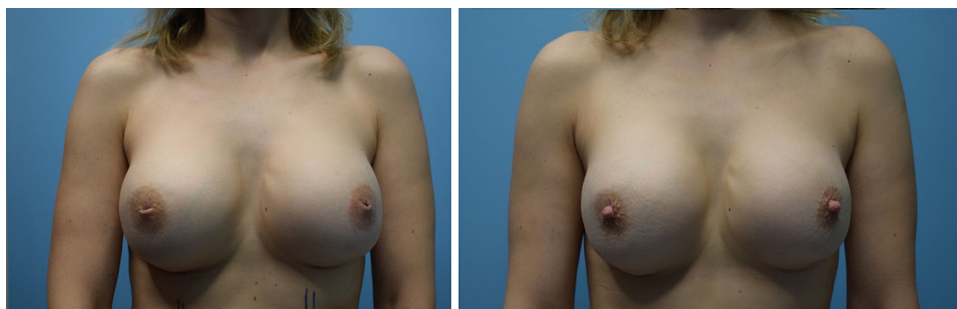
**Table 1** Patients

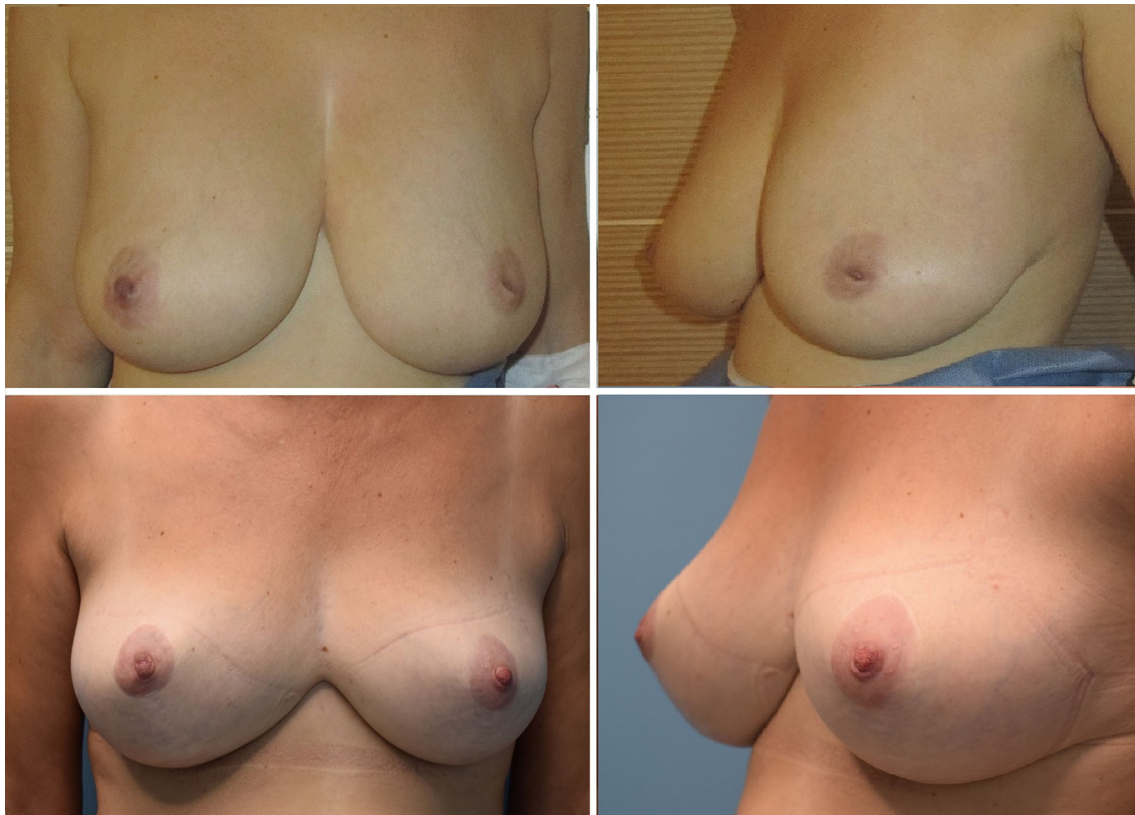
Patient	Nipple	Age	Grade of inversion <sup>a</sup>	Preoperative measurement (in millimeters) <sup>b</sup>	Postoperative measurement (in millimeters) <sup>c</sup>	Gain/Eversion (in millimeters)
#1	#1	28	I	0	10	10
	#2		I	1	9	8
#2	#3	32	II	− 2	7	9
	#4		I	2	11	9
#3	#5	26	II	0	7	7
	#6		I	3	9	6
#4	#7	33	III	− 3	5	8
	#8		II	− 1	5	6
#5	#9	40	II	0	7	7
	#10		II	0	8	8
#6	#11	41	II	3	10	7
	#12		I	4	12	8
#7	#13	29	III	0	10	10
	#14		III	− 2	7	9
#8	#15	30	II	3	11	8
#9	#16	47	II	2	8	6
#10	#17	27	II	1	9	8
#11	#18	26	III	0	8	8
#12	#19	33	I	1	9	8
#13	#20	37	II	− 2	7	9
#14	#21	29	III	0	7	7
#15	#22	30	I	1	11	10

<sup>a</sup>Grades of the nipples were grouped according to Han and Hong's study (REF), <sup>b</sup>Distance between the deepest point of nipple and areola, <sup>c</sup>Distance between the most projectile point of nipple and areola

**Table 2** Preoperative and postoperative measurements

Grades	Numbers of nipples	Preoperative mean measurements (in millimeters)	Postoperative mean measurements (in millimeters)	Mean height gain (in millimeters)
Grade I	7	1.71	10.1	8.4
Grade II	10	0.4	7.9	7.5
Grade III	5	− 1	7.4	8.4

**Fig. 3** Patient #7 with bilateral inverted nipples. Preoperative and postoperative photos



**Fig. 4** Patient #13 with left unilateral inverted nipple. Note that bilateral breast reduction surgery was performed as well. Upper row, Preoperative photos; lower row, postoperative photos

with preoperative grade 3 inversions had postoperative decrease in nipple sensations. However these patients expressed high-level of satisfaction as other patients did. No patients required an additional or repeat procedure. However, there were nulliparous patients, whose breast functions could not be ascertained.

## Discussion

An inverted nipple is a condition in which a portion of or the entire nipple is buried below the plane of the areola. Inverted nipples cause many associated problems such as poor hygiene, breast-feeding difficulties, repeated inflammation, psychological distress, and dissatisfaction with one's appearance[4–7, 11, 12]. Our study introduces a new and easily performed procedure for the correction of inverted nipples.

Results obtained from our study were quite successful. The height gains of the patients can be accepted as adequate based on the satisfaction of included patients. Postoperative mean nipple measurements were between 7.4 and 10.1 and average height gain was  $8 \pm 1.2$  millimeters. Although this data show that all grades of inverted nipples

were corrected efficiently with C-flaps, grade III inverted nipples have a special importance because eversion needs transection of the lactiferous ducts to release and mobilize the nipple totally. Gleaned from this, patients who have future plans for breast feeding should be given detailed information about the possible risk for decreased breast-feeding capacity.

With our technique, as the fibrotic tissue is released through blunt dissection perpendicular to the nipple, the ducts are not damaged and lactation function is preserved. The scar is much less apparent because it is aligned within the transition zone between areola and surrounding skin. The design of the C-flaps supports the nipple eversion, and elevating the flaps from a location out of the nipples leads to preservation of the nipple size. In addition, nipple inversions are also corrected with a permanent purse-string suture and no early nor late recurrences were experienced as a result of the suture choice. The application of enough tension to maintain projection, while avoiding constriction of the blood supply, is a delicate balance that must be achieved. This minimally invasive technique represents a practical and safe method for the treatment of inverted nipples of all stages.

The main issues in the treatment of severe inverted nipple are failure to achieve adequate nipple projection, increased risk of damage to the milk ducts, and postoperative scarring [5]. Although many surgical techniques have been introduced, each method carries a drawback inherent in the technique itself, including sensory disturbance of the nipple caused by complicated operative technique, marked scarring of the nipple areola, destruction of breast function in other donor regions, and incomplete correction [13]. To avoid these complications, a few minimally invasive and nonsurgical corrections of the inverted nipple have been advocated by scholars. The methods of correcting inverted nipples are classified as conservative methods and operative treatments. The conservative methods which refer to grade I nipples include vacuum aspiration, manual traction, or continuous equipment traction [12]. McGeorge [14] has claimed that inverted nipples can be corrected with the application of vacuum suction and that surgery is unnecessary.

Although such conservative methods are efficient in the treatment of grade I inverted nipples, they are inefficient for the treatment of grade II and III inverted nipples. The correction of grade II and III inverted nipples generally requires surgery. Many surgical methods have been devised to correct inverted nipples of varying severity. The current surgery methods can be classified into 3 groups; the first method is to create tightness at the neck of the inverted nipple. The second is to add bulk beneath the nipple after sacrificing its ductal system. The third method uses duct-saving, partial areolar excision, myotomy of areolar mamillary bundles, and maintenance of divided retaining tissue by buried sutures. Skoog, Spina, Schwager, Kim, and Pereira et al. [4, 15–18] have all described various dermal flaps and dermoglandular flaps that aim to preserve the main lactiferous ducts. These procedures require multiple areolar incisions that may result in significant scarring and deformity of the nipple-areolar complex.

Main limitations of the study included the small number of patients and a relatively short follow-up period when compared to previous studies [5, 19–21]. Under normal circumstances, remodeling phase of wound healing is completed near totally at eight months after surgeries however future studies with larger patient series and longer follow-up periods are needed to reveal more accurate outcomes of the technique.

## Conclusion

The C dermal flaps technique can safely be used in the correction of different stages of the inverted nipples including middle and advanced stages. The location of

flaps, relatively well-hidden scar tissue at donor site, low complication rates, low recurrence rates and high patient satisfaction levels make this technique a good surgical option. Future studies are needed to reveal lactation capacity of the grade III nipples after using our technique.

**Acknowledgements** The authors would like to thank Merve Evren for medical illustrations.

## Declarations

**Conflict of interest** The authors declare that they do not have any conflict of interest.

**Ethical Approval** This article does not contain any studies with human participants or animals performed by any of the authors.

**Informed Consent** This is a retrospective case study and for this type of study formal consent is not required.

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