

# Breast Splint for Prevention of Nipple–areolar Complex Malposition after Direct-to-implant Breast Reconstruction

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**Summary:** Breast reconstruction with immediate placement of breast implants (direct-to-implant methods) following nipple-sparing mastectomy has increased because of the low burden on the patient and good aesthetic results. However, nipple–areolar complex (NAC) malposition after this surgery remains a common complication that has yet to be entirely resolved. Here, we introduce an approach using Duoactive CGF to prevent postoperative NAC malposition. Immediate postoperative fixation of Duoactive CGF cranially to the NAC of the operated breast was applied for 2–4 weeks. This is referred to as a breast splint. In the study, nine patients who received breast splints and 15 patients who did not were enrolled. The NAC position on the splint-treated breast was compared with that on the healthy side within 6 months after surgery. A case with little visual malposition was defined as having a good outcome, based on the deviation in the cranial direction not exceeding the position of the contralateral NAC. Our preliminary data demonstrated that the rate of good outcomes was significantly higher ( $P = 0.028$ ) in cases in which a breast splint was used, compared with those that were not treated with a breast splint (7/9, 78.8% versus 4/15, 26.7%). Postoperative application of a breast splint using Duoactive CGF is a simple and useful method to prevent NAC malposition after breast reconstruction, using a direct-to-implant method. (*Plast Reconstr Surg Glob Open* 2022;10:e3965; doi: [10.1097/GOX.0000000000003965](https://doi.org/10.1097/GOX.0000000000003965); Published online 3 January 2022.)

## INTRODUCTION

Nipple-sparing mastectomy has been shown to be oncologically safe based on wide clinical experience, and immediate breast reconstruction using breast implant surgery (direct-to-implant [DTI]) is increasingly performed for patients with breast cancer.<sup>1,2</sup> However, malposition of the nipple–areola complex (NAC), especially displacement in the cranial direction, often occurs and ruins the aesthetic effect, despite improving the cosmetic appearance.<sup>3–7</sup> Many methods have been described for correcting malposition of the NAC, but these are not always

effective.<sup>3,6</sup> Most methods are aimed at traction of the NAC caudally or suturing the base of the nipple to the pectoralis major muscle at an appropriate location.<sup>3,5</sup> However, this often leads to unsatisfactory results. To address this issue, we have developed a method to prevent shortening and improve displacement by external fixation of the skin on the cephalad side of the breast immediately after breast implant surgery. In this method, we use hydrocolloid dressing as a splint material, which we refer to as a breast splint. Here, we introduce the procedure and show that this approach can prevent NAC malposition after direct-to-implant immediate breast reconstruction.

## METHODS

A hydrocolloid dressing (DuoActive CGF, Convertex, UK) was used as the material for the breast splint, starting in cases treated in April 2020. This material is generally used as a dressing for skin defect wounds that extend to

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the subcutaneous tissue. It was selected as a sealant material because it is adhesive and can be used through sticking only, has sufficient firmness to prevent skin shortening, and has cushioning properties to prevent pressure injury. In the procedure, the distance from the midpoint of the clavicle to the nipple is measured in the sitting position before surgery. A splint is cut at the same length and 20-cm width. Before the beginning of negative pressure on the suction drain at the end of surgery, the skin envelope over the breast implant is pinched up along with the pectoralis major muscle and pulled caudally. Then, immediately after the suction is started, the splint is attached to the breast skin from the lower edge of the clavicle to the nipple at the surgical site. (See Video [online], which displays the procedure for installing the breast splint shown in the photographs from left to right.) The breast splint is set before starting suction pressure to avoid wrinkling of the skin in the area to which it is applied. To protect against skin damage associated with prolonged fixation, use of a skin barrier cream or spray, such as Cavilon Barrier Cream (3M), is recommended. It takes approximately 1 month for the skin and pectoral muscles to adhere, and thus, 1 month is the standard period for attachment of the breast splint. During the hospitalization period, if the CGF develops prominent wrinkles or loses its adhesiveness, it is strongly recommended to be replaced with a new CGF as needed. Furthermore, this replacement should be continued even during each of the weekly outpatient visits. For evaluation of the symmetry of the NAC, a bad result was defined as a case in which the horizontal line of the most caudal edge of the areolar on the affected side exceeded the height of most cephalad edge of the nipple on the healthy side.<sup>4</sup> The symmetry results of the left and right NACs in the nine patients who received breast splints were compared with that in 15 consecutive patients who did not receive breast splints by April 2020. Patients with BRCA or who underwent RRM were not enrolled in this study. Patient demographics in this study are shown in Table 1.

## CASE REPORTS

### Case 1

A 51-year-old woman with cancer of the left breast underwent Nipple-sparing mastectomy and DTI, and a silicon breast implant (MV12 Natrelle 133, Allergan) was inserted. No preventive measures for NAC malposition were taken. The NAC position evaluation was “bad” at 6 months after surgery (Fig. 1).

### Case 2

A 45-year-old woman with cancer of the right breast underwent Nipple-sparing mastectomy and DTI, and a silicon breast implant (MV13 Natrelle 133, Allergan) was inserted. Fixation with Duoactive CGF was started at the end of the surgery and continued for 1 month. After 6 months, the symmetry of the NAC position was almost maintained (Fig. 2). The NAC position evaluation was “good.”

## RESULTS

The rate of good outcomes was significantly higher in cases in which a breast splint was used, compared

## Takeaways

**Question:** Nipple malposition after immediate placement of breast implants following nipple-sparing mastectomy remains as a common complication yet to be resolved.

**Findings:** Immediate postoperative fixation of Duoactive CGF cranially to the nipple of the operated breast can prevent postoperative nipple malposition.

**Meaning:** Nipple malposition after immediate placement of breast implants following nipple-sparing mastectomy can be avoided by using Duoactive CGF.

with those that were not treated with a breast splint (7/9, 78.8% versus 4/15, 26.7%;  $P = 0.028$ ). Three representative postoperative images of breasts for good and bad results in terms of NAC position are shown in the Supplemental Digital Content 1. (See figure, Supplemental Digital Content 1, which displays three representative postoperative images of breasts showing good and bad results in terms of NAC position. <http://links.lww.com/PRSGO/B872>.)

The material used for the breast splint, DuoActive CGF, did not damage the skin while serving to maintain skin elongation. There were no major skin problems in cases treated with a breast splint.

## DISCUSSION

The breast skin in the standing position is maximally tractioned caudally by the gravity of the breast.



**Fig. 1.** A 51-year-old woman with cancer of the left breast. The NAC on the reconstructed side is displaced to the cranial side by about 3 cm compared with that on the healthy side. Many cases in which a breast splint was not used had the NAC moved to the cranial side. The position of the NAC was evaluated as “bad” in this case.

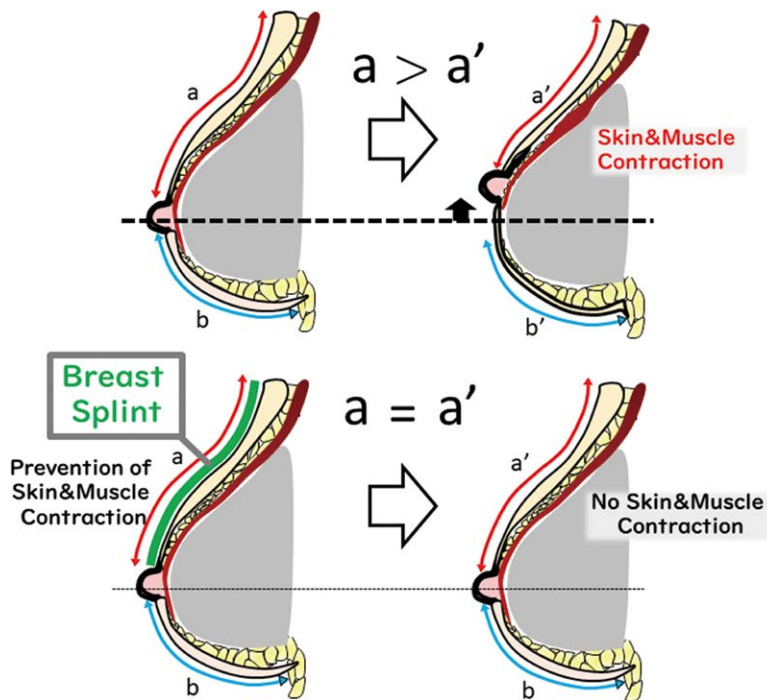


**Fig. 2.** A 45-year-old woman with cancer of the right breast. With use of a breast splint, left-right symmetry of the NAC position was obtained. This case is representative of a “good” outcome.

Therefore, after the mammary glands are excised (especially if the area extending from the nipple to the head is widely detached), the release of caudal traction, loss of supportive tissue, and atrophy of the breast skin and pectoralis major muscle due to insufficient blood flow

may result in NAC deviation toward the cranial side. The primary reason for nipple migration is shortening of the soft tissue, including skin, subcutaneous tissue, and muscle, on the cranial side (Fig. 3). NAC malposition often has a significant negative impact on breast symmetry and requires revision surgery. Typical methods to address this problem include suturing of the base of the nipple to the pectoralis major muscle by traction and fixing it in place.<sup>3,5,7</sup> However, the anatomically correct position may not be determined in a supine position during surgery. In addition, traction suture by a single point or a few sutures is unlikely to be maintained for a long time, and in the worst case, the traction thread may detach. The more straightforward surgical techniques such as capsule release and crescent mastopexy typically improve but do not entirely correct malposition, whereas the more extensive surgeries such as nipple graft or transposition result in significant scarring of the breast and sensory disturbance.<sup>3,8</sup> Recently, a method to correct the position of the NAC by converting the layer where the breast implant is inserted from the subpectoral to the prepectoral plane was also reported.<sup>9</sup> The solution we propose here is fundamentally different from previous ideas in that it is a preventive treatment before these problems arise and does not require surgery.

The prevention of NAC malposition with a breast splint introduced here was already applied for normal two-stage breast reconstruction with breast implants by the authors.<sup>10</sup> This technique provides an excellent solution to these problems, including the case of DTI



**Fig. 3.** Diagram showing the mechanism of displacement of the NAC in the cranial direction. Installation of a breast splint is thought to have the effect of preventing shortening due to contracture of the breast skin and pectoralis major muscles cranial to the NAC.

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**Table 1. Patient Demographics**

	BS-	BS+	P
No.	15	9	
Age (y)	51.1 ± 9.1	49.8 ± 8.3	0.72*
BMI (kg/m <sup>2</sup> )	21.1 ± 2.9	20.5 ± 1.3	0.69†
DCIS	11	6	0.73‡
Operation side (Rt.)	8	5	0.92‡
Chemotherapy	6	3	0.74‡
Smoking	4	2	0.81‡

\*Independent *t* test.

†Mann-Whitney *U* test.

‡Pearson's  $\chi^2$  test.

Values are presented as mean ± SD or median. BS-: The patient group that did not receive breast splints; BS+: The patient group that received breast splints.

(Fig. 3). The advantages of DuoActive CGF include simple use just by pasting, a documented history of usage in other body regions and fields, and excellent safety. In addition, the material is moderately supple, but does not easily expand or contract with the skin; thus, it works very well as a splint. Disadvantages include the possibility of contact dermatitis and additional psychological stress placed on the patient. Also, although the softness of the material is an advantage in terms of the burden on the skin and lack of wrinkling, it may bend slightly and then have an insufficient sealant effect. In such cases, reinforcement with a double layer or a breast band is required.

Treatment with a breast splint using the method described here should be continued until completion of adhesion of the detached skin envelope and pectoralis major muscle in the proper position. Considering the burden on the skin, we initially used fixation for about 2 weeks before the first outpatient visit, but the effect was insufficient in some cases. A fixation period of about 1 month is currently recommended, but a further study of the appropriate period for fixation is required.

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