Aesth Plast Surg (2019) 43:76–82
https://doi.org/10.1007/s00266-018-1247-2

ORIGINAL ARTICLE BREAST SURGERY

Simultaneous Nipple–Areola Complex Reconstruction Technique: Combination Nipple Sharing and Tattooing

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Received: 23 July 2018 / Accepted: 18 September 2018 / Published online: 1 October 2018

Abstract

Background Nipple–areola complex (NAC) reconstruction is the final critical process used to achieve breast symmetry, patient satisfaction, and overall reconstruction completeness. Here, we introduce our simplified simultaneous NAC reconstruction approach with nipple sharing and tattooing that resulted in minimal morbidity, high patient satisfaction, and a shortened total reconstructive period.

Methods Patients who underwent simultaneous nipple sharing and tattooing between July 2012 and December 2017 after the final operative procedure or adjuvant therapy were included. We retrospectively evaluated breast reconstruction type, interval between breast and NAC reconstruction, mean operation time for simultaneous nipple sharing and tattooing, and postoperative complications. Overall patient satisfaction and willingness to undergo simultaneous NAC reconstruction again were assessed.

Results The mean interval between the final operative procedure or adjuvant therapy and NAC reconstruction was 4.4, 4.4, and 6.7 months in non-adjuvant patients, those who underwent chemotherapy, and those who underwent radiotherapy, respectively. The mean operation time for simultaneous NAC reconstruction was 46 min. No major complications such as infection or total nipple loss were observed regardless of breast reconstruction type at least 6 months postoperatively. The average overall satisfaction was 8.0 on a 10-point scale, and 96.9% of patients indicated that they would undergo this simultaneous NAC reconstruction again.

Conclusions Our simplified technique of simultaneous nipple sharing and tattooing is safe and reliable and features high patient satisfaction rates. Additionally, it can be performed in the clinical setting and is convenient for patients and surgeons alike since it features a decreased total reconstruction period.

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Keywords Nipple–areola complex reconstruction · NAC reconstruction · Breast reconstruction · Nipple reconstruction · Nipple sharing · Tattoo

Introduction

In the breast reconstruction process after skin-sparing mastectomy, nipple–areola complex (NAC) reconstruction is the final critical process used to restore symmetry with the contralateral breast and restore a natural status of the affected breast. The overall patient satisfaction rates with NAC reconstruction were 72–88% in previous studies, which reflects the importance and expectations of women about the nipple and areola [1–3]. To achieve symmetry and a natural feeling of the breast as well as patient satisfaction and overall breast reconstruction completeness, NAC reconstruction timing and the technique are very important.

Many surgeons perform NAC reconstruction in two stages with the nipple reconstruction in various flap

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techniques followed by intradermal tattooing or full-thickness skin grafting. The nipple reconstruction is generally performed in 3–5 months after the completion of all operations including secondary revisional procedures to allow swelling and inflammation to subside and maximize breast mound stability [4]. This delayed surgery would allow surgeons to position the new nipple to be symmetrical with that of the contralateral breast. Despite many local flap techniques being introduced for nipple reconstruction, the long-term loss of projection remains the major concern [5, 6]. Allografts and injectable fillers were recently proposed to improve projection [7, 8]. On the other hand, the simplest technique of the past, nipple sharing, has become revalued [9, 10].

Intradermal tattooing is currently the most commonly used procedure for areolar reconstruction because it does not feature donor site morbidity. Tattooing usually occurs at 6–8 weeks after nipple reconstruction, but some studies have reported and advocated for single-stage nipple creation and tattooing [11, 12]. Here, we report our simplified approach to simultaneous NAC reconstruction with nipple sharing and tattooing that results in minimal morbidity, high patient satisfaction rates, and a shortened total reconstruction period.

Materials and Methods

Among the total 176 female patients who underwent both nipple and areolar reconstruction after breast reconstruction by a single surgeon from September 2013 to December 2017, 65 patients who underwent simultaneous nipple sharing and tattooing were included in this study. All patients who underwent two-stage NAC reconstruction, nipple reconstruction with a local flap, or tattooing only were excluded from this study. A retrospective chart review based on a prospectively maintained database was performed to evaluate breast reconstruction type, the interval between breast and NAC reconstruction, the average operation time for simultaneous nipple sharing and tattooing, and postoperative complications. Patient satisfaction was assessed by a 10-point-scale questionnaire in written consent regarding overall satisfaction of simultaneous NAC reconstruction and willingness to undergo simultaneous NAC reconstruction again at 6 months postoperatively (Fig. 1).

Patient Selection and Surgical Procedure

After the final operative procedure of the reconstructed breast, a single-stage NAC reconstruction with nipple sharing and medical tattooing was recommended if the contralateral nipple was large enough for sharing (generally > 8 mm in projection and 1.5 cm in diameter) according to breast size. Patients who intended future pregnancy or breast-feeding and refused manipulation of the contralateral side were excluded.

The simultaneous nipple sharing and tattooing was typically performed on an outpatient basis by a single surgeon. Prophylactic intravenous antibiotics were given an hour before the surgery. The patient was evaluated and marked in the upright position and landmarks including the sternal notch, midline, and inframammary fold were marked. After the diameter and projection of the normal side's nipple and areola were measured, the new NAC position was determined collaboratively with the patient standing in front of a mirror. An electrocardiographic lead was used to confirm the final size and location. After the design was made, intradermal tattooing was performed. The Amiea Linelle Supreme® permanent makeup device system (MT.DERM GmbH, Berlin, Germany) was used with sterile prepackaged 9-magnum needle cartridges and pigments (Permark pigment; PMT/Permark, Chanhassen, MN, USA). Three to five colors were used separately without mixing. The tattooing was done on all areas of the areola crossing 2–3 mm inside the designed nipple borderline. After the tattooing was completed, half of the contralateral nipple was marked in a dome shape for harvesting. A no. 10 blade was used to cut the nipple in half vertically and preserve half of the nipple base (Fig. 2). The recipient site was de-epithelized with the blade. Pinpoint bleeding was not coagulated; rather, epinephrine-soaked gauze was used. The donor site and the composite nipple graft were sutured using 5-0 Vicryl Rapide absorbable sutures in a simple interrupted manner (Fig. 3). The whole procedure was finished after the application of a simple dressing with a topical antibiotic ointment and foam material. The patient was educated to apply the topical antibiotic ointment once daily at home and change the foam material every other day until the 7-day follow-up. Oral antibiotics were taken for 3 days postoperatively. After a lack of infection and the congestion status were confirmed on postoperative day 7, the patients were allowed to take a shower and apply the antibiotic ointment dressing. Graft patency was confirmed 2 weeks later.

Results

The mean patient age was 49 years (range, 33–66 years). Regarding comorbidities relevant to the vascular physiology, 10.8% of patients had hypertension, 3.1% had diabetes, and 3.1% of patients were active smokers. In addition, 32.3% of patients had a history of adjuvant therapy including chemotherapy or radiotherapy (Table 1).

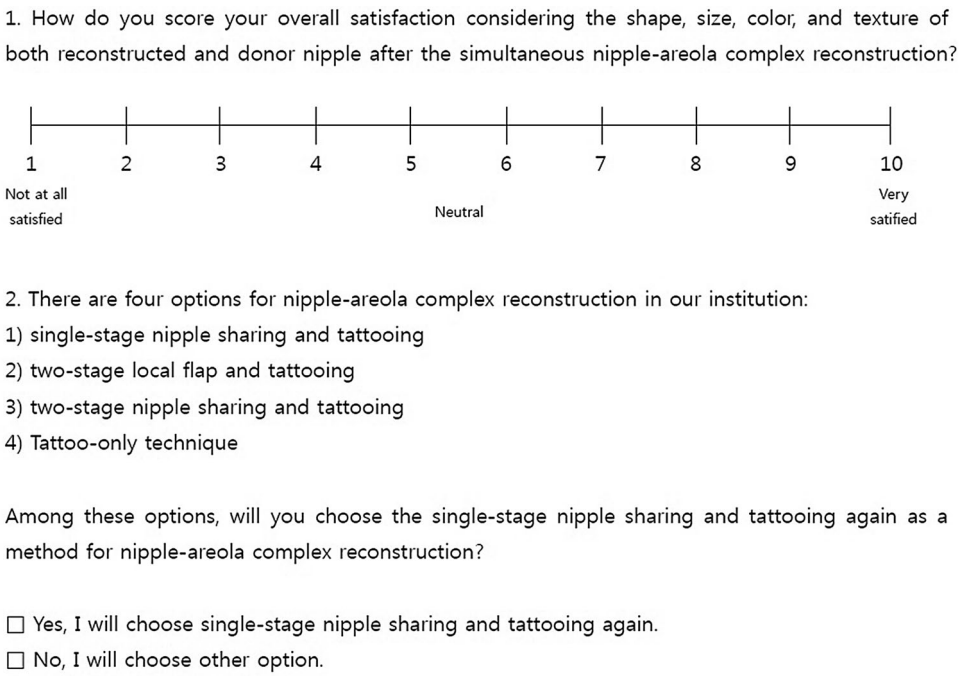

Fig. 1 Treatment satisfaction questionnaire for the patients who had nipple–areola complex reconstruction with simultaneous nipple sharing and tattooing technique

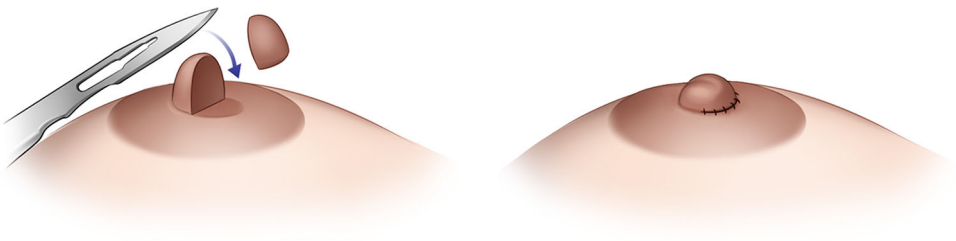

Fig. 2 Schematic drawing representing nipple harvest technique. Left, half of the donor nipple was marked in a dome shape and cut in half vertically. Right, the scar after closure of the donor site would be located at the base of the nipple

Of the total 65 patients, 54 underwent immediate breast reconstruction and 11 underwent delayed reconstruction. Regarding breast reconstruction type, a free transverse rectus abdominis myocutaneous (TRAM) or deep inferior epigastric perforator (DIEP) flap was used in 37 patients, followed by a pedicled latissimus dorsi (LD) myocutaneous flap in 12 patients, pedicled TRAM flap in 9 patients, and silicone implant in 7 patients. There were 7 bilateral cases, including 5 patients who underwent nipple-sparing mastectomy followed by a free TRAM or pedicled TRAM flap reconstruction on the one side and a skin-sparing mastectomy on the other and 2 patients who underwent simultaneous augmentation mammaplasty on the contralateral side (Table 2).

The mean interval between the breast reconstruction or secondary breast procedure and the NAC reconstruction was 4.4 months, excluding 16 patients who underwent postoperative chemotherapy, 4 who underwent postoperative radiotherapy, and 1 who received both adjuvant therapies. The mean interval of the postoperative chemotherapy patients was 4.4 months after completing the chemotherapy and 6.7 months for postoperative radiotherapy patients. The mean operation time for simultaneous NAC reconstruction was 46 min (Table 3). No infection or total nipple loss was observed at least 6 months postoperative, and there were only 2 cases of tip necrosis, both of which resolved in delayed wound healing (Figs. 4, 5, 6, 7). The mean overall satisfaction score of simultaneous NAC reconstruction was 8.0 on a 10-point scale, and 96.9% of patients indicated that they would undergo the simultaneous NAC reconstruction again.

Discussion

The presence of the nipple and areola on the breast mound is very important for many women psychologically post-mastectomy. A study based on a patient survey revealed that women were more confident in social settings, emotionally healthy, and self-confident upon feeling normal

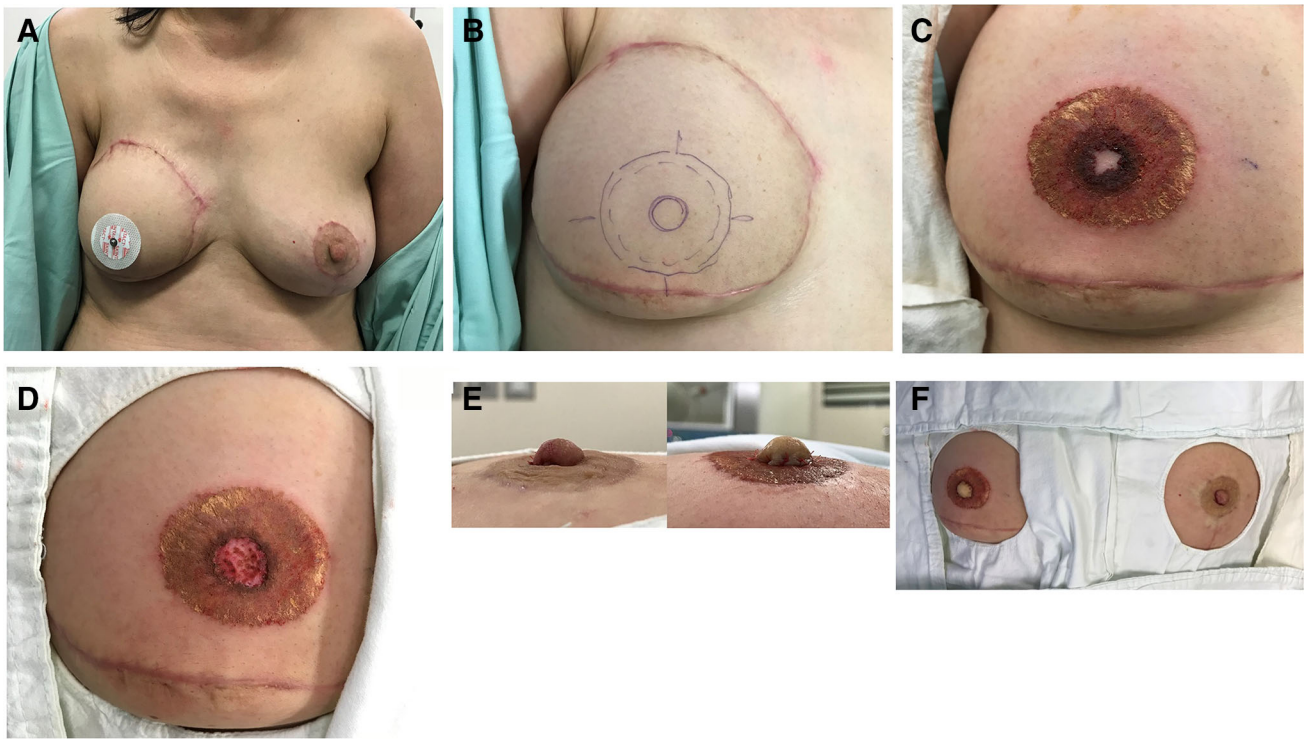

Fig. 3 Surgical steps of simultaneous nipple–areola complex (NAC) reconstruction with combination nipple sharing and tattooing. **a** Preoperative determination of new NAC position using an electrocardiographic lead. **b** Preoperative design of nipple sharing and areola tattooing. **c** The tattooing was done on all areas of the areola crossing 2–3 mm inside the designed nipple borderline. **d** The new nipple site was de-epithelized, and pinpoint bleeding was controlled by epinephrine-soaked gauze. **e** The donor and composite nipples were sutured using 5-0 Vicryl Rapide absorbable sutures in a simple interrupted manner. **f** Immediate postoperative photograph of one patient's NAC

Table 1 Patient demographics

Variable Total patients (n = 65)	No. of patients (%)
Sex	
Female	65 (100%)
Mean age, years (range)	49 (33–66)
Comorbidities	
Hypertension	7 (10.8)
Diabetes	2 (3.1)
Smoker, active	2 (3.1)
Adjuvant treatment	
None	44 (67.7)
Chemotherapy	16 (24.6)
Radiotherapy	4 (6.2)
Chemotherapy + radiotherapy	1 (1.5)

Table 2 Prior breast reconstruction details

Variable Total patients (n = 65)	No. of patients (%)
Breast reconstruction timing	
Immediate	54 (83.1)
Delayed	11 (16.9)
Breast reconstruction type	
Free TRAM or DIEP	37 (56.9)
Pedicled LD	12 (18.5)
Pedicled TRAM	9 (13.8)
Silicone implant	7 (10.8)
Breast reconstruction side	
Unilateral	58 (89.2)
Bilateral	7 (10.8)
Donor side reconstruction type	
Free TRAM	3 (4.6)
Pedicled TRAM	2 (3.1)
Augmentation mammaplasty	2 (3.1)

TRAM transverse rectus abdominis myocutaneous, *DIEP* deep inferior epigastric perforator, *LD* latissimus dorsi

and attractive [13]. Similarly, women who underwent nipple-sparing mastectomy had better psychosocial and sexual well-being than those who underwent skin-sparing mastectomy [14]. Thus, for patients who undergo skin-sparing mastectomy, NAC reconstruction is the essential

Table 3 NAC reconstruction details

Variable	Total patients (n = 65)
Operative time, min (mean ± SD)	46 ± 12
Interval[a], months (mean ± SD)	
No adjuvant therapy	4.4 ± 1.8
Postoperative chemotherapy	4.4 ± 1.8
Postoperative radiotherapy	6.7 ± 2.0

NAC nipple–areola complex, *SD* standard deviation

[a]Interval between the last treatment including breast reconstruction, secondary breast procedure, or adjuvant therapy and the NAC reconstruction

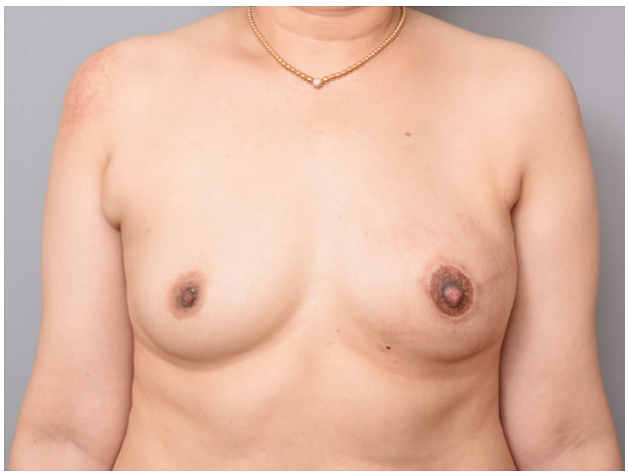

Fig. 4 One-month postoperative photograph after simultaneous nipple–areola complex reconstruction of a 48-year-old patient with a history of immediate breast reconstruction of her left breast using a free transverse rectus abdominis myocutaneous flap

and ultimate breast reconstruction phase in terms of restoring its previous appearance.

The reconstructed nipple must match the shape, size, color, and texture of that on the contralateral side. Many local flaps fail to match these characteristics, and no standard method has been established. In such situations, nipple sharing should be considered. Although nipple sharing was a popular method in the past, it is now used less often due to several concerns of both surgeons and patients including: (1) violation of the normal contralateral nipple, (2) potential donor site morbidity such as decreased erogenous sensation, and (3) graft failure. For minimal violation, we prefer to take a vertical half slice rather than horizontal half slice or vertical pie-shaped piece when harvesting the donor nipple. It is a simpler and easier technique because only one vertical incision across the nipple is needed compared to two oblique incisions in a vertical pie-shaped piece. The scar after the closure is better located at the base of the nipple rather than at the

Fig. 5 Twelve-month postoperative photograph after simultaneous nipple–areola complex reconstruction of a 44-year-old patient with a history of immediate breast reconstruction of her left breast using a pedicled latissimus dorsi flap and adjuvant radiotherapy

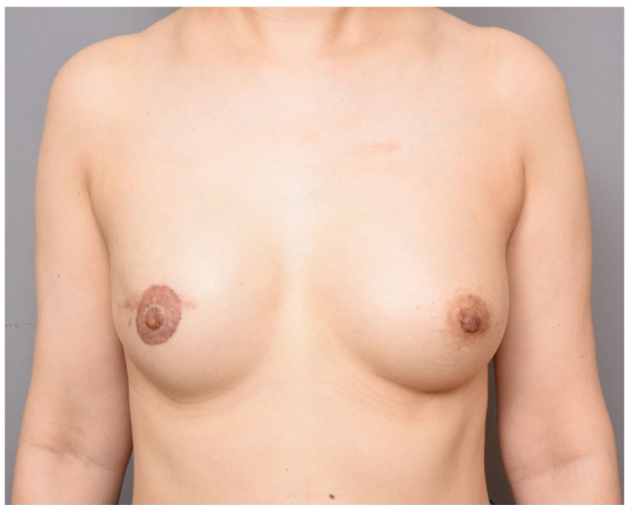

Fig. 6 Fifteen-month postoperative photograph after simultaneous nipple–areola complex reconstruction of a 46-year-old patient with a history of immediate breast reconstruction of her right breast using a silicone implant and augmentation mammaplasty of her left breast

center of the nipple which results from a horizontal half slice or vertical pie-shaped piece (Fig. 2). Our previous study demonstrated that 89.7% of patients indicated that the sensation of the donor nipple had decreased only somewhat or not at all and 86.2% indicated that the donor nipple had normal or nearly normal contraction. Moreover, 83.0% of the patients indicated that the donor nipple had almost adequate or adequate projection [15]. A similar result was reported by other surgeons that the overall

Fig. 7 Four-year postoperative photograph after simultaneous nipple–areola complex reconstruction of a 42-year-old patient with a history of immediate breast reconstruction of the right breast using pedicled transverse rectus abdominis myocutaneous (TRAM) flap after a nipple-sparing mastectomy and of the left breast using a free TRAM flap after a skin-sparing mastectomy

acceptance of the donor site was excellent and a changed sensation was unrealized in 87% of patients with residual erectile function [10]. Most importantly, graft failure is rarely reported, even in irradiated patients [9].

Here, we demonstrated the simultaneous NAC reconstruction technique with combination nipple sharing and areolar tattooing. To the best of our knowledge, this is the first report of a single-stage technique of nipple sharing and tattooing. One reason that most surgeons prefer two-stage NAC reconstruction may be the possibility of infection. However, three previous studies of single-stage NAC reconstruction with a local flap and tattooing reported no cases of infection, including Vandeweyer, who reported that the procedure was performed using unsterilized pigment and no prophylactic antibiotics [11, 12, 16]. Our study findings correlate with those of the previous studies because we observed no cases of infection with the use of one dose of prophylactic intravenous antibiotic and 3 days of oral antibiotics, even in patients who underwent radiotherapy or chemotherapy. The patients changed their dressings once daily themselves for 3 weeks and had only 2 outpatient clinic visits during that time. This simplified postoperative management method did not lead to any serious complications, and the patients were satisfied with not having to visit the hospital frequently.

Although a healthy skin flap may be necessary for composite nipple survival, 5 of our composite nipple grafts survived on an irradiated skin flap. This result correlates with those of the previous studies [9, 10] and provides even more powerful confirmation of safety by the addition of simultaneous intradermal tattooing. In addition, use of a flap in a breast mound including a silicone implant did not affect graft survival and caused no complications. In bilateral cases in which a nipple-sparing mastectomy was performed on the contralateral side, the spared nipples were reliable for use as donors for sharing. Patients with comorbidities including hypertension and diabetes as well as current smokers were all safe candidates for simultaneous NAC reconstruction.

From the patient perspective, the largest difference between breast reconstruction and that of other body parts may be the time required to reach the final outcome. Multiple operations or procedures are usually needed to achieve a satisfactory natural breast. However, Jabor et al. [3] reported that decreased patient satisfaction was related to increased length of time between breast reconstruction and NAC reconstruction. The long period required for the total reconstruction and the multiple operations and outpatient clinic visits make patients tired and reluctant, leading to low satisfaction rates. Therefore, shortening the reconstruction period is essential to achieving higher patient satisfaction rates. Our simultaneous strategy shortens the total reconstruction period by at least 6–8 weeks and prevents frequent hospital visits for subsequent dressing changes. In addition, in the setting of a single surgeon doing both tattooing and nipple sharing as in our institution, it will be cost-effective without logistical difficulty compared with in the setting of an aesthetician doing the tattooing. Here, this resulted in a high satisfaction rate in our survey in that 96.9% of patients would do it all over again.

As mentioned above, there are some reports regarding single-stage NAC reconstruction with a local flap and tattooing [11, 12, 16]. However, after experiencing some cases of simultaneous local flap and tattooing, we found some technical difficulties and limitations, especially on the part of the border of the nipple base and incision scar on the areola where the scars could not be perfectly concealed by the tattoo. Thus, we now apply two stages for the cases of NAC reconstruction using a local flap and tattooing. Otherwise, we usually recommend single-stage nipple sharing and tattooing in patients with nipple sizes larger than 8 mm in height. These criteria came from our previous study which resulted in 4.0 mm in projection after 6 months and 1 year without any hypopigmentation [15]. This projection is comparable to the value of 3.69 mm from a study that evaluated aesthetically perfect breasts [17], with an addition of symmetry in size, shape, color, and texture with the contralateral nipple, which could not be achieved with a local flap. Particularly for Asian women, as their average nipple height was reported as

0.9 cm [18], there will be many candidates for nipple sharing, with resulting satisfactory size of both nipples.

Conclusions

In conclusion, our simplified technique of simultaneous nipple sharing and intradermal tattooing was proven safe and reliable with excellent clinical results and high patient satisfaction. It is a simple, fast, and straightforward technique that can be performed in the clinical setting and is convenient for both patients and surgeons. Furthermore, this technique shortens the total reconstruction period. We highly recommend the use of this technique for selected patients in various situations as the final step in breast reconstruction.

Acknowledgements None of the authors has a commercial associations or financial interests to disclose. All authors have contributed to this paper and agreed in its readiness for submission. This article has not been submitted elsewhere simultaneously.

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