

# Promising results after single-stage reconstruction of the nipple and areola complex

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## ABSTRACT

**INTRODUCTION:** Reconstruction of the nipple-areola complex (NAC) traditionally marks the end of breast reconstruction. Several different surgical techniques have been described, but most are staged procedures. This paper describes a simple single-stage approach.

**MATERIAL AND METHODS:** We used a technique based on a local flap for reconstruction of the nipple in combination with immediate intradermal tattooing for reconstruction of the areola.

**RESULTS:** We reviewed the outcome of 22 cases of women who had simple single-stage reconstruction over a period of one year. We found no major and only two minor complications including one case of partial flap necrosis and one case of infection. Only three patients needed additional tattooing after a three-month period. The cosmetic outcome was satisfactory and none of the patients needed corrective procedures. The mean procedure time for unilateral reconstruction was 43 min. (30-50 min.).

**CONCLUSION:** This simple single-stage NAC reconstruction seems beneficial for both patient and surgeon as it seems to be associated with faster reconstruction and reduced procedure-related time without compromising the aesthetic outcome or the morbidity associated with surgery.

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Reconstruction of the nipple-areola complex (NAC) is usually the final step in breast reconstruction and adds the finishing touch to the breast. Several different techniques for NAC reconstruction have been described, but no single method currently serves as the gold standard [1-3]. The most widely used techniques are based on local skin flaps for reconstruction of the nipple in combination with either intradermal tattooing or skin-grafting for reconstruction of the areola [4, 5].

Breast reconstruction is often a staged process extending from months to more than a year, and the NAC reconstruction alone is usually a staged procedure where intradermal tattooing is used for reconstruction of the areola. We describe our experience with one-stage NAC-reconstruction using a simple surgical technique that may be used as an alternative to traditional two-step procedures.

## MATERIAL AND METHODS

We performed simple single-stage NAC reconstruction in 22 women. The NAC reconstructions were performed between July 2011 and June 2012 with clinical follow-up 12 days and three months after surgery.

All data were collected retrospectively by revision of the medical records. Insufficient or ambiguous information was supplemented by telephone interviews. Additionally, body mass index, smoking and relevant comorbidity including diabetes and hypertension were registered. No patients were lost to follow-up.

### Surgical technique

This single-stage technique for NAC reconstruction was based on local random skin-flaps in combination with immediate intradermal tattooing and is a modified version of previously described approaches [6-10].

First, the desired size, shape, colour and location of the new NAC was determined taking the appearance of the contralateral NAC and the patient's preference into account. In order to achieve symmetry, we compared the distance from the nipple to the sternal notch, inframammary fold and centre of the sternum on both sides as well as the diameter of the areola. In most bilateral cases, a standard areola diameter of 4.0 cm was used for the neo-areola, depending on the size of the reconstructed breast.

The principles of the preoperative markings are shown in **Figure 1**. All markings were made with the patient in a standing position in front of a mirror. When the location of the new NAC had been determined, the upper pole of the neo-areola was marked on the breast mound using a permanent marker (**Figure 2A**).

A ring areola marker with a diameter identical to the desired diameter of the new areola was placed on the breast mound. Two circles were then marked, displaced either vertically or horizontally with a distance equal to the desired projection of the new nipple (**Figure 2B**). The circumference of the oval area outlined was then marked superficially on the skin by a scalpel prior to removing the permanent marker (**Figure 2C**). This outline was used as a scaffold for medical tattooing (**Figure 2D**).

After tattooing the area, a full-thickness skin-flap, designed as either a C-V or C-U flap [11], was raised from the central part of the tattooed skin to reconstruct the nipple. The width of the pedicle is largely identical

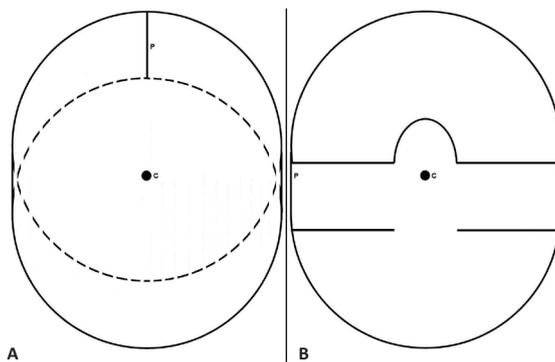
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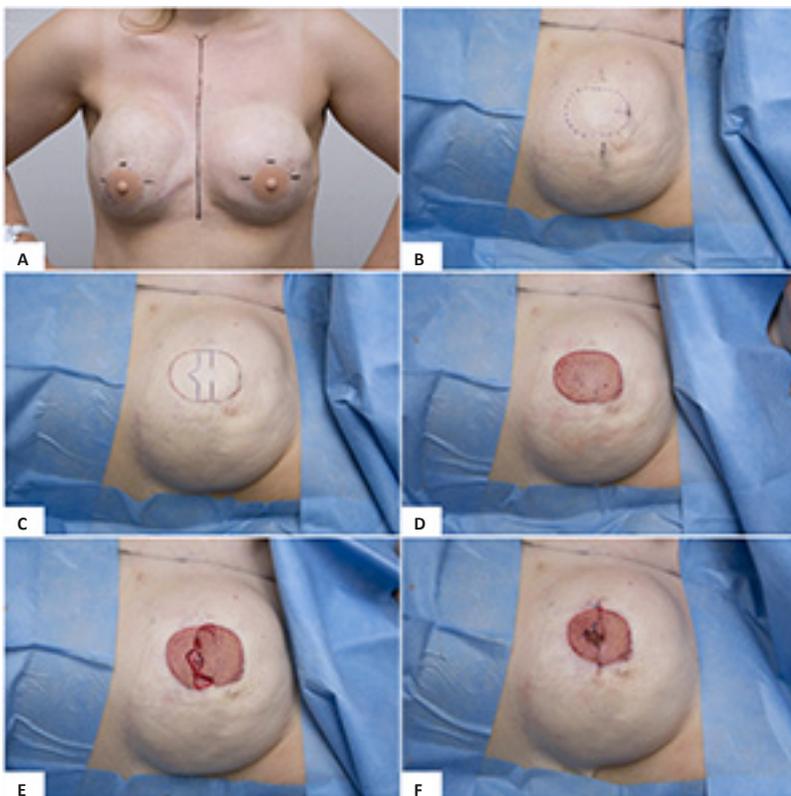
**FIGURE 1**

A sketch of the markings made on the breast.  
**A.** The outline of the oval area for tattooing formed by the two vertically displaced circles. **B.** The placing of the flap centrally on the tattooed skin. C = centre; P = desired projection of the nipple.



**FIGURE 2**

Nipple and areola reconstruction after a bilateral, prophylactic mastectomy followed by immediate reconstruction. **A.** The preoperative markings are made on the breast mound. **B.** The oval area is outlined using the ring areola marker. **C.** The circumference of area I marked on the skin using a scalpel. **D.** The area is tattooed. **E.** The flap is raised with a superiorly placed pedicle at the subdermal level. **F.** The nipple is reconstructed and the donor defect is closed.



to the diameter of the nipple, and the vertical height of the two opposing wings was identical to the projection of the new nipple. The C-shaped area was raised as a dermal flap (Figure 2E).

Finally, the wings of the flap were assembled and sutured to create the new nipple whilst the C-flap pro-

vided the top. The donor-site defect was closed using un-dyed nylon pulling the oval skin-area together forming a round areola (Figure 2F).

The reconstructed NAC was then covered by a protective dressing comprising a layer of meche vaseline gaze followed by a foam dressing covered by an occlusive film. The procedure was performed in the outpatient clinic. The dressing was removed five days post-operatively by a nurse and replaced with a protective breast pad. Sutures were removed in office after 12 days.

*Trial registration:* not relevant.

## RESULTS

A total of 22 women were included in this study (Table 1). The median age was 53.5 years (36-69 years). The median body mass index (BMI) was 24.5 (20.0-37.9) and four of our patients were smokers (18.2%). Co-morbidity included one case of diabetes (4.5%) and five cases of hypertension (22.7%). A large proportion of the patients had adjuvant therapy in relation to their breast cancer treatment including radiation therapy (n = 10, 45.5%), chemotherapy (n = 8, 36.4%) and antihormone therapy (n = 13, 59.1%). In all cases, radiation and chemotherapy were given prior to the NAC reconstruction whilst antihormone therapy was continuous following the mastectomy and thus both before and after NAC reconstruction. The median time from mastectomy to NAC reconstruction was 14.5 months (5-63 months).

Unilateral NAC reconstruction was performed in 16 (72.7%) patients, while six (27.3%) patients had a bilateral reconstruction, resulting in a total of 28 reconstructed breasts. A total of 12 (57%) women had a skin-sparing mastectomy followed by an immediate reconstruction using either an expander or a silicone implant in combination with an acellular dermal matrix. The remaining ten (43%) patients had a delayed reconstruction of the breast based on a flap deriving from the patient's back.

Complication rates and incidence of re-tattooing were recorded. Complications were classified into "major" if surgical intervention was needed or "minor" if the complication was treated conservatively. No patients experienced major complications. Minor complications were few and included one (3.6%) case of a small partial flap necrosis, which did not require surgical revision, and one (3.6%) case of wound infection, which was treated by orally administered antibiotics. There was no association between co-morbidity and complication rates; however, both patients who experienced complications were smokers.

Three patients and a total of four (14.3%) nipples needed additional tattooing three months after surgery due to fading of the colour. One of these patients was the one who experienced partial flap necrosis.

The mean procedure-time was assessed to 43 min. (30-50 min.).

All patients included in this study were reported by the consulting surgeon at the three month check-up to have an aesthetically satisfying result. The patients also reported a high level of satisfaction with the aesthetics of the neo-NAC at the clinical consultation, and none of the women had a wish for further corrective surgery.

## DISCUSSION

In this series of 28 cases of single-stage NAC reconstructions, we found no major and only two minor complications, which is equivalent to a total complication rate of 7.1%. This rate is higher than rates published in previous studies, where the incidence of infection, necrosis and wound rupture varies between 0 and 2% [6-9]. None of the complications in our study required surgical revision or resulted in lasting morbidity except fading of the colour of the NAC in the case of the partial flap necrosis.

The incidence of additional tattooing due to fading of the pigmentation three months after surgery was low with a total number of four nipples corresponding to a rate of 14.2%. This rate is in accordance with previously published data reporting rates ranging from 10 to 40% [6-9]. The follow-up period of three months used in this study was, however, short and a prolonged window for follow-up may result in an increase in this rate.

Among the patients who had a two-stage NAC-reconstruction in our department during the twelve-month period prior to the introduction of the single-stage technique, the rate of additional tattooing three months after surgery was five cases out of 28, corresponding to 17.9%. There seems to be no obvious difference between the rates observed when applying the single or two-stage approach, respectively.

During the past two decades, ten articles describing the use of single-stage techniques for NAC reconstruction have been published. Five were based on intradermal tattooing in combination with a local flap, whereas the remaining five techniques made use of skin-grafting for reconstruction of the areola [12-16]. In 1993, Hugo et al published a retrospective series of 90 cases of women who had single-stage NAC reconstruction with double-opposing pennant flaps in combination with tattooing. The mean follow-up time of 18.8 months and they described no complications in terms of infection or necrosis, but 40% of the women had a need of additional tattooing [6]. Similar results were published later that year by Eskenazi in another retrospective series comprising 100 NAC reconstructions. Complications included one case of partial necrosis and only a 10% ratio of additional tattooing [7]. The average follow-up time for their study was 14 months. Two additional retrospective series including 50 and 100 cases were pub-

 TABLE 1

Patient demographics (N = 22).

Age, years, median (range)	53.5 (36-69)
Body mass index, kg/m <sup>2</sup> , median (range)	24.5 (20.0-37.9)
<b>Smokers, n/N (%)</b>	
Adjuvant therapy	4/22 (18.2)
Radiation	10/22 (45.5)
Chemotherapy	8/22 (36.4)
Hormone therapy	13/22 (59.1)
<b>Breast reconstruction, n (%)</b>	
<i>Unilateral</i>	
Immediate	6
Delayed	10
Total	16 (72.7)
<i>Bilateral</i>	
Immediate	4
Delayed	2
Total	6 (27.3)

lished in 1994 and 2003, respectively, by Teimourian & Duda and Vandeweyer, both of which studies reported a complication rate of 0% [8, 9].

As opposed to the two-stage procedures, our simple single-stage NAC reconstruction procedure not only saves time in theatre, preparations and handling of the patient, it also reduces the duration of the entire breast reconstruction eliminating a 2-3-month waiting period between nipple reconstruction and tattooing. Thus, the single-stage NAC reconstruction is beneficial to both surgeon and patient, as the procedure allows for a more rapid termination of the reconstruction and hence contributes to a more speedy rehabilitation of the patient. Several other papers have addressed the issue of a reduction in procedure time and mentioned this as one of the benefits, but have offered no hard data on this particular area [6-9].

There are no published data that compare the single-stage techniques to the traditional two-stage approaches, nor are there any prospective studies on this subject. As shown, all retrospective series report low rates of complications, but a varying need for additional tattooing. All papers describe the results of the reconstruction as aesthetically satisfying to both patient and surgeon, though none presents any objective measure to validate this finding [6-10].

Despite the fact that the advantages of single-stage NAC reconstruction have been published before, these techniques seem to have been continuously overlooked by plastic surgeons in general. We find that the previously published studies provide some evidence of low complication rates and a varying, but acceptable need of additional tattooing when using these techniques. Our results are in line with this.

The technique presented in this paper is based on the use of two acknowledged and widely used approaches for reconstruction of the nipple and areola. It was previously demonstrated that both techniques produce satisfying, reliable and reproducible results with low complication rates and a high level of patient satisfaction [11, 17]. For many years, the paradigm has been that complete healing of the reconstructed nipple is needed before tattooing can be completed. Our results do not support this paradigm.

In conclusion, single-stage NAC reconstruction seems beneficial for both patient and surgeon in terms of a faster reconstruction and reduced procedure-related time without compromising the aesthetic outcome or the morbidity associated with the surgery. The technique is easy to perform and requires no additional equipment.

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