



# The Nipple-Areola Preserving Mastectomy: A Multistage Procedure Aiming to Improve Reconstructive Outcomes following Mastectomy

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**Background:** Ischemia of the nipple-areola complex (NAC) and periareolar tissue is commonly seen following tissue-preserving mastectomies for small invasive and noninvasive cancers. The nipple-areola preserving mastectomy is a multistage procedure in which the NAC and central mastectomy flap tissue is surgically delayed to improve the survivability in patients undergoing mastectomies followed by reconstruction.

**Methods:** We conducted a retrospective chart review of 20 patients undergoing the 2-stage nipple-areola preserving mastectomy: the first stage comprised undermining the NAC and raising the breast skin flaps, with placement of a silicone sheet in the dissected pocket. The second stage followed 2–3 weeks after the NAC delay, with patients undergoing nipple-sparing mastectomies.

**Results:** Mean age was 46.2 years (range, 23–59 years). Indications included breast cancer in 18 patients and BRCA gene mutation prophylaxis in 2 patients. None were actively smoking. Mean time between delay of flaps and breast reconstructions was 16 days (range, 10–35 days). One patient underwent bilateral nipple resection at the time of mastectomies due to a subareolar nipple biopsy positive for ductal carcinoma in situ. One patient underwent left nipple excision after a skin nipple biopsy was positive for metaplasia. No signs of NAC vascular compromise were observed in any of the cases.

**Conclusions:** Our 2-stage approach benefits patients undergoing nipple-sparing mastectomy, especially those at high-risk, by safely increasing survivability of the native breast skin envelope and NAC, while improving oncologic outcomes by identification of subareolar malignancies and sentinel node status before mastectomy and reconstruction. (*Plast Reconstr Surg Glob Open* 2015;3:e538; doi: 10.1097/GOX.0000000000000516; Published online 20 October 2015.)

**S**ound oncologic care and cosmesis are considered among the primary tenants of modern reconstructive breast surgery. Since the advent

of oncologic breast surgery and the radical Halstedian mastectomy, the procedure has seen a steady trend toward increasingly conservative resections, largely driven by improvements in staging, chemoradiation protocols, and outcome-driven data analysis. The skin-preserving mastectomy and more recently the nipple-sparing mastectomy (NSM) were developed as breast-envelope-sparing alternatives for patients with small invasive and noninvasive cancers distant to the nipple-areola complex (NAC) as well as for patients with a strong family history or genetic

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*Received for publication May 19, 2015; accepted August 28, 2015.*

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DOI: 10.1097/GOX.0000000000000516

**Disclosure:** The authors have no financial interest to declare in relation to the content of this article. The Article Processing Charge was paid for by the authors.

predisposition to develop breast cancer.<sup>1,2</sup> The NSM technique can be considered the ultimate conservative complete mastectomy, as the breast parenchyma is excised while the entire breast skin envelope and NAC are spared.<sup>3</sup> Preservation or later reconstruction of the NAC is an important aspect to a woman's quality of life and body image. According to Nahabedian and Tsangaris,<sup>4</sup> up to 80% of postmastectomy patients underwent nipple reconstruction, evidencing the psychological importance of a fully reconstructed breast.

Ischemia of the NAC and periareolar tissue is commonly seen following mastectomy surgery, and although it is often transient and self-limited, survival of the NAC following NSM is a foremost concern for plastic surgeons. Nipple excision secondary to partial or total necrosis has been noted in up to 30% of the cases following NSM.<sup>5–8</sup> Known factors affecting nipple survival include smoking, incision orientation, degree of ptosis, and increased age.<sup>9</sup> On the other hand, preservation of retroareolar tissue, which is required for adequate perfusion and NAC survival, is of major oncologic concern following NSM. As reported by Gerber et al,<sup>10</sup> mastectomy flaps and the NAC are common locations for recurrence following NSM, with rates of 11.7% and 1.7%, respectively, after mean follow-up of 101 months.

The nipple-areola preserving (NAP) mastectomy represents a further advancement in the treatment and reconstructive paradigm for patients with breast cancer. The NAP mastectomy is a multistage procedure in which the NAC and central mastectomy flap tissue is surgically delayed to improve the survivability in patients undergoing mastectomy and subsequent reconstruction. Surgical delay of the tissue promotes an increase in blood supply, and therefore survival, of the NAC and mastectomy flaps. Furthermore, the staged nature of the NAP mastectomy allows sentinel lymph node and subareolar biopsies to be taken when indicated and analyzed to identify NSM candidates and adjuvant chemoradiation protocols before definitive resection and reconstruction.

## PATIENTS AND METHODS

Patients scheduled to have NSMs were offered to undergo the 2-stage NAP procedure. The first stage is performed 2–3 weeks before the scheduled mastectomies and consists of undermining the NAC and raising breast skin flaps, after which a silicone sheet is contoured and placed in the dissected pocket. Sentinel lymph node and subareolar biopsies are concurrently performed. The 2–3-week delay then allows sufficient time for augmentation of the vascularity of breast skin flaps and NAC subdermal plexus perfu-

sion in the absence of the normal dominant blood supply as well as finalization of the pathology results.

## Technique

Under general anesthesia, a transverse incision approximately 1 cm superior to the inframammary fold is made and the flap carefully elevated in the plane separating the subdermal adipose and breast parenchyma by electrocautery. Displacement of the incision cephalad from the inframammary fold allows a higher and wider interspace to be reached permitting microvascular anastomosis without rib resection in future deep inferior epigastric perforator (DIEP) flap patients. Dissection then proceeds cephalad toward the NAC. After fully undermining the NAC, the plane of dissection is extended approximately 5-cm medial, 5-cm lateral, and 2-cm superior to the areolar border, resulting in a trapezoidal pocket. Great care is taken during dissection to divide the breast tissue from the subcutaneous fat without damaging the subdermal plexus vasculature, as this is now the skin flap's and NAC's single source of perfusion. A 20×15-cm piece of 0.050-cm thick nonreinforced silicone sheet (Alliedsil, Allied Biomedical, Ventura, Calif.) is then cut to fit the dissected area and placed between the skin and the breast tissue along with a 15-French Blake drain at the bottom of the pocket. Before closing, subareolar nipple biopsy is sent for permanent pathology. Additionally, sentinel node biopsy can be performed at this stage by the breast surgeon if indicated. After 2–3 weeks, the second stage of the NAP procedure including silicone sheet removal and NSM is performed followed by immediate reconstruction.

## RESULTS

Between January 2014 and February 2015, 20 patients (39 breasts; 19 bilateral, 1 unilateral) underwent the first-stage NAP procedure before NSM and immediate breast reconstruction. Following Institutional Review Board approval, demographics, intraoperative complications, and postoperative results data were collected for retrospective analysis. The mean age was 46.2 years (range, 23–59 years), with a mean body mass index of 23.9 kg/m<sup>2</sup> (range, 18–34.3 kg/m<sup>2</sup>). Indications for mastectomies included breast cancer in 18 patients and prophylaxis due to BRCA gene mutation in 2 patients. None were actively smoking at the time of the 2-stage procedure, as NSM is not offered to active smokers in the senior author's practice. Mean time between delay of the flaps and breast reconstructions was 16 days (range, 10–35 days). Scheduled mastectomies were delayed for 2 additional weeks in 1 patient due to skin flap

edge ischemia without necrosis. Thirteen patients underwent immediate reconstruction with the DIEP flap, 5 patients had immediate implant placement, and 2 underwent placement of a tissue expander, as they desired larger postreconstructive breasts volumes. Neither preoperative nor postoperative radiation therapy was required in any case. Two patients required preoperative chemotherapy; of these, one also underwent postoperative chemotherapy due to ovarian carcinoma. There were no intraoperative complications during either stage of the procedure in all cases. Average discharge time following second stage was 4 days for DIEP-based reconstructions and 1 day for both tissue expander and implant-based reconstructions. Subareolar nipple biopsy was positive for ductal carcinoma in situ in 1 patient, and therefore underwent bilateral nipple resection at the time of mastectomy and reconstruction. Additionally, 1 patient underwent left nipple excision after a skin nipple biopsy was positive for metaplasia. No signs of NAC vascular compromise were observed in any of the cases. There were no infections after either stage. Unilateral nipple inversion was seen in the patient who underwent implant-based reconstruction. One patient required debridement of a small portion of the edge of a skin flap due to necrosis following breast reconstruction. All patients indicated that they were highly satisfied with the reconstructed breasts.

## CASE REPORTS

### Case 1

A 58-year-old woman with a history of left-sided invasive ductal carcinoma of the breast underwent bilateral delay of the NAC 16 days before scheduled mastectomies; the right-sided mastectomy was prophylactic (Figs. 1, 2). She was a nonsmoker with no relevant medical or surgical history. Immediate bilateral reconstruction with the DIEP flap was performed following NSMs (Figs. 3, 4). Her hospital course was unremarkable and no complications were reported postoperatively.

### Case 2

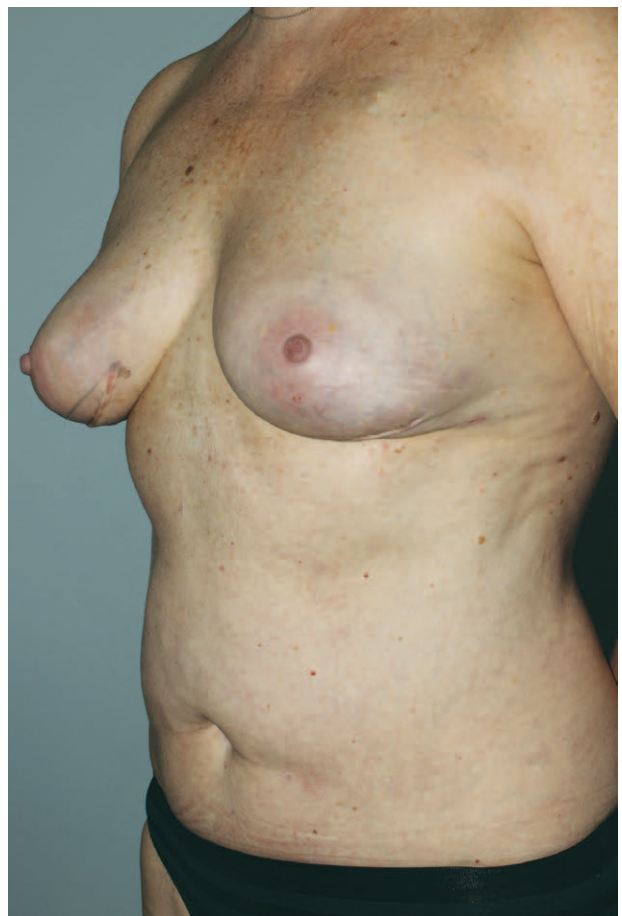
A 40-year-old woman with a history of BRCA-1 mutation opted to undergo prophylactic mastectomies. She was a nonsmoker with a history of ovarian cancer and laparoscopic hysterectomy with bilateral oophorectomy; additionally, she required preoperative and postoperative chemotherapy. Bilateral delay of the NAC was performed 14 days before NSMs and immediate reconstruction with DIEP flaps (Figs. 5–8). Her hospital course was unremarkable and no complications were reported postoperatively.

## DISCUSSION

NSM is an outstanding technique in the treatment and prophylaxis of breast cancer—a key



**Fig. 1.** Postoperative view of the patient 5 days following bilateral delay of the flaps.



**Fig. 2.** Both breasts revealed no signs of vascular compromise during inspection.

example of the ever-advancing paradigm in breast surgery. It is considered an oncologically safe procedure with a similar rate of local recurrence when compared to skin-sparing mastectomy.<sup>11</sup> Moreover, preservation of the NAC routinely affords superior aesthetic results when combined with implant-based or autologous tissue breast





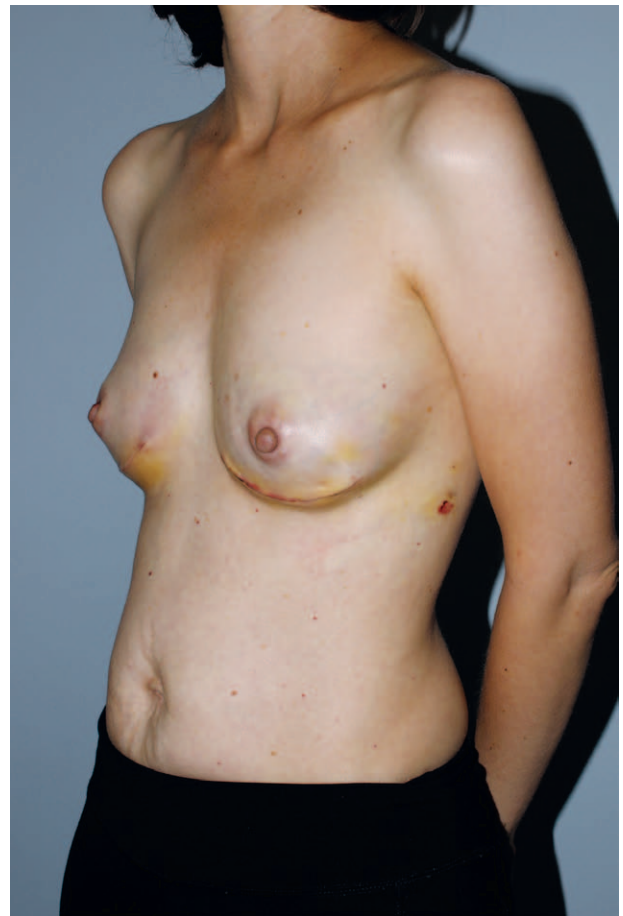
**Fig. 3.** Postoperative results 8 months after bilateral reconstruction with the DIEP flap.



**Fig. 5.** Appearance of the breasts after 6 days following bilateral flap delay.



**Fig. 4.** No complications developed postoperatively, achieving total satisfaction.



**Fig. 6.** The NAC in both breasts without any signs of necrosis.

reconstruction, ultimately resulting in improved quality of life and psychological well-being in this patient population.

Nahabedian and Tsangaris<sup>4</sup> report up to 80% of patients undergoing breast reconstruction requested nipple reconstruction, providing valuable insight

into the importance of the NAC to a woman's body image and quality of life. Nipple reconstruction is the standard of care in patients who have had skin-sparing mastectomies or total mastectomies followed by breast reconstruction. Many reconstructive techniques have been developed to recreate native nipple anatomy; however, diminishing projection over



**Fig. 7.** Photographs taken after 6 months. The patient underwent bilateral reconstruction with the DIEP flap.



**Fig. 8.** Her postoperative course was uneventful, with both flaps healing nicely.

time and loss of sensation, along with subsequent tattooing sessions, are factors that often result in patient dissatisfaction.<sup>12</sup>

For patients undergoing NSM, decreased sensitivity and projection as well as the possibility of nipple loss must be considered. Published rates of nipple necrosis in NSM range from 2% to as high

as 29%,<sup>13,14</sup> with steady high rates reported in patients who received radiation or those with history of smoking.<sup>15–17</sup>

Viability of the NAC is dependent on preservation of its blood supply, as complications typically follow aggressive dissection and undermining of the subareolar space and surrounding skin.<sup>18</sup> Age, smoking, and orientation of the skin incision have also been associated with poor results following NSM.<sup>19,20</sup> Our 2-stage procedure, the NAP technique, aims to improve the survival of the NAC following conservative mastectomy. Improving the blood supply of a tissue by creating a surgical wound, the so-called delay phenomenon or vascular delay, is a well-known technique in plastic surgery. Jensen et al<sup>21</sup> set the foundations for the surgical delay of the NAC in a comprehensive description of 31 breasts, where they assessed its advantages with similar results to ours. Although the exact underlying mechanism remains unclear, it is thought that delay-induced ischemia stimulates vascular hypertrophy, augmentation of collateral flow, and opening of choke vessels. Its use has proven particularly beneficial in procedures where the risk of partial or total flap loss and fat necrosis is increased.<sup>22</sup> The rationale for placement of the silicone sheet during the NAP first stage is based on this premise. By interposing it between the NAC-central breast skin and the underlying vascular parenchyma, the silicone sheet serves as a barrier to prevent revascularization from beneath and results in augmentation of the overlying tissue's blood flow through the subdermal plexus vasculature peripherally. An additional benefit of predissection and placement of the silicone sheet is facilitation of the subsequent mastectomy by serving both to expedite the procedure and limit further dissection of the delicate skin flaps and NAC.

Given the ongoing changes and constant financial pressures of modern medicine, the NAP technique is not without its drawbacks. Disadvantages of the 2-stage procedure include the additional cost and time required for multiple procedures. However, in the same light, complications and additional procedures required based on final pathology are costly as well. The ability to perform sentinel node and subareolar biopsies before definitive reconstruction is invaluable and potentially offsets a portion of both the financial and time opportunity costs, in addition to assisting the surgeon and patient in deciding on the optimal reconstructive route. Furthermore, additional cost savings may be afforded with the NAP method by eliminating procedures for debridement of nonviable breast skin, excision of nonviable NACs, and

subsequent nipple reconstruction and tattooing. Future investigation may help to further elucidate these cost trade-offs.

## CONCLUSIONS

We believe that our 2-stage approach, with rearrangement of the NAC and breast skin flaps, benefits patients undergoing mastectomy, especially those at high-risk, by safely preserving the native breast skin envelope and NAC. To enhance the potential exhibited in this case series, additional studies with larger sample size and NSM control cohort are needed to compare NAP outcomes with regards to complications and costs in various patient populations as well as in autologous and implant-based reconstructions.

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