Donor-Site Morbidity and Patient Satisfaction Using a Composite Nipple Graft for Unilateral Nipple Reconstruction in the Radiated and Nonradiated Breast

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Background: The number of techniques available for nipple reconstruction underscores the notion that achieving an acceptable result remains a challenge. To better assess the value of a composite nipple graft in unilateral breast reconstruction, a study was performed to evaluate donor-site morbidity and patient satisfaction using a composite nipple graft for unilateral nipple reconstruction following mastectomy and reconstruction in radiated and nonradiated patients.

Methods: A retrospective chart review of all patients who underwent composite nipple reconstruction between October of 1993 and February of 2010 was performed. Medical records were reviewed for outcomes and complications. Each patient was asked to complete a previously validated survey to rate color and projection of both nipples, sensation, and contractility of the donor nipple, and whether she would, in retrospect, have the procedure again.

Results: Fifty-nine patients were identified who underwent nipple reconstruction using a composite nipple graft. Thirty-four patients (57.6 percent) responded to the survey. Four surveys were returned due to an invalid address. Average time to breast mound completion was 6 months. Average time to complete nipple reconstruction was 3.6 months after breast mound completion. Ninety-seven percent of the reconstructions were successful.

Conclusions: Composite nipple reconstruction is a useful technique that should be considered in unilateral nipple reconstruction and should be especially considered in patients whose breast has been irradiated, for which flap reconstruction for the nipple can be riskier. Although it is not possible to use in all patients, no other technique provides a nipple reconstruction that can so closely match the contralateral side in color, texture, and overall appearance. (Plast. Reconstr. Surg. 127: 1, 2011.)

Nipple-areola reconstruction is performed as the final stage, if not one of the final stages, of breast reconstruction. The presence of the nipple is an important part of the breast and helps restore its appearance to a presurgical state, which is psychologically critical for many women who have had a mastectomy. After nipple reconstruction and application of a tattoo, the reconstructed breast mound can be transformed into something that much more closely resembles a breast. There are many different techniques available to reconstruct the nipple.1–12 This supports the notion that achieving consistent quality nipple reconstruction remains a challenge. Shestak et al. reported loss of projection from 20 to 74 percent over the first 6 months with three commonly used flap techniques.13 This is consistent with other studies in the literature which have documented that loss of projection of the reconstructed nipple over time is a common complaint.14,15 The need to maintain projection is impor-
tant in all nipple reconstruction cases. It is, however, especially true when performing a unilateral breast reconstruction in which one is attempting to reconstruct a nipple that matches the contralateral “normal” side. In an attempt to further improve projection of the nipple, plastic surgeons have used allografts and injectable filler materials. Color matching and maintenance of projection following reconstruction have been the most highly correlated with patient satisfaction. Tattooing, which is commonly used to provide color to the reconstructed nipple, has ironically, however, been associated with reducing nipple projection.

Although composite nipple grafting is not possible to use in all patients, no other technique provides a reconstructed nipple that can so closely match the contralateral nipple in terms of shape, color, texture, and long-term projection. Plastic surgeons have anecdotally shied away from composite nipple grafting to avoid violating a normal nipple and potentially destroying an erogenous structure in a patient already missing a sensate nipple on one side. To better understand the value of composite nipple graft, we conducted this study to determine patients’ satisfaction with this method of reconstruction and to measure overall surgical outcomes.

PATIENTS AND METHODS

A retrospective chart review of all patients who could be identified who underwent composite

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### Table 1

<table>
<thead>
<tr>
<th>Question</th>
<th>Very Dissatisfied</th>
<th>Somewhat Dissatisfied</th>
<th>Somewhat Satisfied</th>
<th>Very Satisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. How your reconstructed nipple looks?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>b. How natural your reconstructed nipple looks?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>c. The color of your reconstructed nipple?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>d. The height (projection) of your reconstructed nipple?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>e. How your reconstructed areola looks?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>f. The color of your reconstructed areola?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

### Table 2

<table>
<thead>
<tr>
<th>Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Sensation?</td>
<td>Totallly numb</td>
<td>Much less sensation than before surgery</td>
<td>Somewhat less sensation than before surgery</td>
<td>Sensation unchanged from before surgery</td>
</tr>
<tr>
<td>b. Contractility?</td>
<td>Never contracts</td>
<td>Contracts with vigorous stimulation</td>
<td>Contracts with moderate stimulation</td>
<td>Contracts with normal stimulation</td>
</tr>
<tr>
<td>c. Projection? (height)</td>
<td>Way too small</td>
<td>Somewhat small</td>
<td>A little too small</td>
<td>Adequate</td>
</tr>
<tr>
<td>d. Did your donor nipple contribute greatly to your feelings of femininity/sexuality before surgery?</td>
<td>Not at all</td>
<td>A little bit</td>
<td>Somewhat</td>
<td>Greatly</td>
</tr>
<tr>
<td>e. Has the contribution of your donor nipple to your feelings of femininity/sexuality changed?</td>
<td>Greatly decreased role</td>
<td>Somewhat decreased role</td>
<td>Slightly decreased role</td>
<td>Unchanged role</td>
</tr>
<tr>
<td>f. Was your donor nipple sensation a large contributor to sexual arousal before surgery?</td>
<td>Not at all</td>
<td>A little bit</td>
<td>Somewhat</td>
<td>Greatly</td>
</tr>
<tr>
<td>g. Has the role of your donor nipple in sexual arousal changed?</td>
<td>Greatly decreased role</td>
<td>Somewhat decreased role</td>
<td>Slightly decreased role</td>
<td>Unchanged role</td>
</tr>
<tr>
<td>h. If you could go back in time, would you have this procedure performed again?</td>
<td>Definitely not</td>
<td>Probably not</td>
<td>Probably</td>
<td>Definitely</td>
</tr>
</tbody>
</table>

**Fig. 1.** Survey derived from the BREAST-Q survey to assess donor-site morbidity and patient satisfaction using a composite nipple graft for unilateral nipple reconstruction in the radiated and nonradiated breast.
nipple reconstruction by the senior author (S.L.S.) between October of 1993 and February of 2010 was performed. The study was approved by the Georgetown University Institutional Review Board. For patients who had a mastectomy in which the nipple was resected and who had a contralateral breast with the native nipple intact, a composite nipple graft was offered if the remain-

Fig. 2. Intraoperative photographs of composite nipple reconstruction in a 45-year-old woman who had a right skin-sparing mastectomy for infiltrating ductal carcinoma in addition to a left nipple-areola complex–sparing mastectomy. (Above, left) Recipient site after deepithelialization. Traction suture placed on donor nipple. (Above, right) A no. 11 blade is shown transecting the donor nipple. (Center, left) Donor nipple is closed with purse-string suture. (Center, right) Donor nipple after being closed (lateral view). (Below, left) Composite nipple graft sutured to deepithelialized recipient site. (Below, right) The nipple protector is filled with warm bacitracin ointment.
ing nipple had projection of at least 1 cm. If the donor nipple projection was less than 1 cm or the patient could not accept the risk of decreased sensibility in the donor nipple, alternative reconstruction techniques were offered. Demographic and treatment data were obtained from a retrospective chart review and evaluated for outcomes and complications. Each patient was asked to complete a survey derived from the previously described and validated BREAST-Q survey in which the patient rated the color and projection of both nipples (Fig. 1). Each patient also rated donor-site sensation, contractility, sexuality with respect to the donor nipple, and whether she would still have the procedure again if she could go back in time. Questions pertaining to nipple sensation and contractility were excluded in patients with a history of a unilateral nipple-sparing mastectomy on the side of the donor. Responses to the questionnaire documenting patients’ perceptions of the donor site and satisfaction with the reconstructive outcome were initially solicited either by mail or in person. After no response by mail, a second mailing was sent. If subjects had not responded after two mailings, they were then contacted by telephone.

Surgical Technique

The patient is evaluated and marked in the upright position, including measuring and noting the diameter of the patient’s remaining nipple. Key landmarks are marked including the sternal notch, midline, and breast meridians. Measurements are taken, including the distance of the patient’s normal nipple from the sternal notch, midline, and inframammary fold. These measurements are then transposed to the contralateral breast. Using these landmarks and measurements, the location is marked where the composite nipple graft will be placed. If there is a question regarding the correct location, we err on the side of placing the nipple too medially rather than too laterally, and we assess the overall appearance of the location on the breast itself and do not just rely solely on the measurements. After measuring the projection of the normal nipple, we draw a line around the circumference of the donor nipple that approximates 50 percent or slightly more than 50 percent of the height between the base and top of the nipple. It is important to leave at least 50 percent of the donor nipple intact. Lidocaine with epinephrine is infiltrated into the recipient site and the base of the donor nipple-areola complex. First, the site to receive the composite nipple graft is deepithelialized. A 4-0 nylon traction suture is then placed through the tip of the donor nipple, which then can be gently retracted upward using a hemostat. Using a no. 11 scalp knife blade, a stab is made into the middle of the line drawn around the circumference of the donor nipple. The no. 11 scalpel blade is then used to make as even a cut as possible across the previously marked waist of the nipple. The donor nipple is closed using 5-0 chromic sutures. Simple interrupted or a purse-string sutures both work well. The purse-string suture often produces a
more naturally appearing nipple. The composite nipple is sutured to the de-epithelialized area using simple interrupted 5-0 chromic sutures. To minimize blood collecting between the composite graft and recipient site, the area under the grafted nipple is irrigated with normal saline, using a 10-cc syringe and an 18-gauge angiocath. We attach a rigid nipple protector to the breast around and over the grafted nipple. We prefer the sterile, latex-free Gentle Care Surgical Dressing nipple protector (catalog no. 12-1; M. Imonti and Associates, Inc., San Juan Capistrano, Calif.). This nipple protector is filled with warm bacitracin ointment. A semiocclusive dressing (e.g., Tegaderm) is placed over the open hole at the distal aspect of the nipple protector. The nipple protector is removed between 3 and 5 days postoperatively. If a patient has an adverse reaction to bacitracin, Bactroban ointment, or even Vaseline will do (Figs. 2 through 6).

RESULTS

Between October of 1993 and February of 2010, 59 patients were identified who underwent nipple reconstruction with the composite nipple graft technique (Table 1). Eight patients who were identified had a diagnosis of hypertension, one had type II diabetes, and two were taking steroids at the time of reconstruction. The indications for mastectomy were diffuse ductal carcinoma in situ in 15 patients (25.4 percent) and invasive carcinoma in 43 (72.9 percent). One patient (1.7 percent) underwent prophylactic mastectomy. Nineteen patients (32.2 percent) had adjuvant radiation and chemotherapy, 12 (20.3 percent) had chemotherapy alone, two (3.4 percent) had radiation alone, and 26 (44.1 percent) had no adjuvant therapy. Average time to breast mound completion, defined as the time between placement of the tissue expander and exchange of the expander for permanent breast implant, was 6 months. The average time to completion of nipple reconstruction was 3.6 months after breast mound completion. Thirty-four of the nipple reconstructions were performed at the time of implant exchange. All but two nipple reconstructions were successful (96.6 percent). The first failure occurred after the graft dressing was prematurely removed by the patient while showering on postoperative day 6. The second failure occurred after the graft failed to adhere to the recipient site. Thirty breast mounds (50.9 percent) were prosthetic-based reconstructions. Altered pigmentation (hyperpigmentation or hypopigmentation) and hypertrophic scarring were not observed.
Thirty-four patients (57.6 percent) responded to the survey (Table 2). There was no statistical demographic difference between responders and nonresponders to the survey. In comparing radiated versus nonradiated patients, there was no statistically significant difference in terms of demographic characteristics, outcomes, or survey responses. Only the diagnosis of ductal carcinoma in situ was significantly higher in the nonradiated group ($p = 0.005$). When asked about the reconstructed nipple, 92 percent of patients responded that they were somewhat or very satisfied with the appearance of the nipple (Figs. 7 and 8). Eighty-eight percent of responders indicated they were somewhat or very satisfied with the naturalness of the nipple. Ninety-two percent indicated they were somewhat or very satisfied with the color of the nipple. Eighty-five percent indicated they were somewhat or very satisfied with the projection of the nipple. Sixty-three percent of patients indicated the sensation of the donor nipple had decreased only somewhat or not at all. Fifty-four percent indicated that the donor nipple had normal or nearly normal contraction. Fifty percent indicated that the donor nipple had almost adequate or adequate projection. Sixty-three percent

Fig. 5. A 38-year-old woman underwent left mastectomy with immediate reconstruction with a single-pedicle ipsilateral TRAM flap. She had a revision left reconstruction 5 months later that included a composite nipple graft. She also underwent a right nipple-sparing mastectomy. (Left) Preoperative view. (Right) Postoperative view.

Fig. 6. A 33-year-old woman underwent right mastectomy with immediate reconstruction with tissue expander and AlloDerm. She then exchanged the tissue expander for an implant, had right composite nipple reconstruction and left breast augmentation 6 months later. (Left) Preoperative view. (Right) Postoperative view.
of respondents indicated the role of the donor nipple in their femininity/sexuality was only slightly decreased or unchanged after surgery. Eighty percent indicated that they would probably or definitely undergo this procedure again.

**DISCUSSION**

There are many potential advantages to nipple reconstruction with a composite nipple graft. Although in bilateral nipple reconstruction some degree of symmetry is easier to achieve as long as the same technique is used on each side, in unilateral breast reconstruction, achieving symmetry is more difficult. The more commonly used techniques for nipple reconstruction (e.g., CV, star, and skate flaps) produce a nipple with poor color and texture, and usually inadequate projection. Sufficient skin must be available to create the nipple and additional scars often left on the reconstructed breast with these flap techniques. Meanwhile, no additional skin is required to perform a composite nipple graft. Although tattooing will help with the color of a nipple flap reconstruction; it rarely is able to achieve a realistic long-term match to the natural nipple, and tattooing usually contributes to a reduction of nipple projection. In a composite nipple reconstruction, no tattooing of the nipple is necessary. A composite graft has its greatest advantage in women with large nipples, which are the most challenging to match using other reconstructive techniques. A composite nipple technique in those patients provides a dual benefit by both reducing the large donor nipple and reconstructing the absent nipple at the same time.

Reluctance to employ the composite nipple graft technique can be explained in part by a concern over causing pain, numbness, disfigurement, or scarring of the donor nipple, or creating any other sort of emotional or psychological distress. It has become commonplace, however, to operate on the contralateral breast to help improve symmetry in unilateral breast reconstruction. Such procedures include breast reduction, mastopexy, and breast augmentation. Although the risks and benefits are discussed with each patient, in most cases, we believe the benefits outweigh the risks. Before undertaking this study, we encouraged prospective patients to confer with previous patients who had undergone this procedure. One purpose of this study was to provide better information to help inform women as they contemplate this decision. Meanwhile, the small amount of other published information has also found that patients tolerate the procedure well and have little donor-site morbidity.

As with any other graft, a composite nipple graft must survive off of a new blood supply from the subjacent deepithelialized skin flap. Although unirradiated flaps or healthy skin overlaying the pectoralis major muscle might be ideal to achieve this goal, 21 of our composite nipple grafts have survived on radiated sites, including very thin radiated mastectomy flaps overlaying not muscle but implants or acellular dermal matrix material. This is powerful additional confirmation of Zenn and Garofalo’s reported 100 percent success with two nipple grafts on irradiated skin. As with any other graft, a composite nipple graft must survive off of a new blood supply from the subjacent deepithelialized skin flap. Although unirradiated flaps or healthy skin overlaying the pectoralis major muscle might be ideal to achieve this goal, 21 of our composite nipple grafts have survived on radiated sites, including very thin radiated mastectomy flaps overlaying not muscle but implants or acellular dermal matrix material. This is powerful additional confirmation of Zenn and Garofalo’s reported 100 percent success with two nipple grafts on irradiated skin. As with any other graft, a composite nipple graft must survive off of a new blood supply from the subjacent deepithelialized skin flap. Although unirradiated flaps or healthy skin overlaying the pectoralis major muscle might be ideal to achieve this goal, 21 of our composite nipple grafts have survived on radiated sites, including very thin radiated mastectomy flaps overlaying not muscle but implants or acellular dermal matrix material. This is powerful additional confirmation of Zenn and Garofalo’s reported 100 percent success with two nipple grafts on irradiated skin.
with local skin flaps. In many patients with radiated skin, particularly thin skin over implants, we have often chosen not to reconstruct a nipple at all rather than risk losing the skin flaps and potentially exposing the implant. In our study, not a single composite nipple graft was lost on any of the 21 patients who had this procedure performed on a radiated breast.

As previously noted, 85 to 92 percent of patients responded that they were somewhat or very satisfied with the appearance, projection, and naturalness of the nipple, which is comparable to the 87 to 93 percent of patients in Zenn and Garofalo’s study who noted a reasonable or better than reasonable result in size, shape, and color. Sixty-three percent of patients had somewhat or no decrease in donor nipple sensation compared with 47 percent of patients in Zenn and Garofalo’s study who considered their donor nipple sensation to be “normal.” Eighty-eight percent of patients reported they would probably or definitely undergo this procedure again, which is comparable to Zenn and Garofalo’s study result of 87.7 percent.21

Traditionally, the nipple-areola complex was resected during a mastectomy. As the concept of nipple-sparing mastectomies becomes more widely accepted, there may be more opportunities to utilize a composite nipple graft, as more native nipples might be preserved even on just one side of a bilateral mastectomy.

Nipple reconstruction using a composite graft from the opposite breast can be successful in over 95 percent of patients, even on a radiated recipient skin flap. Approximately 90 percent of surveyed patients were satisfied with the appearance, naturalness, color, and projection of the reconstructed nipple. Eighty percent of responders indicated that they would undergo the procedure again. For those patients who indicated decreased contribution of the donor nipple to her feelings of femininity/sexuality, sensation, or sexual arousal, one must acknowledge confounding factors that may contribute to this decreased contribution. Such factors that might be occurring coincident with the treatment of breast cancer include psychological changes (e.g., depression, fatigue, anx-
Fig. 8. Graphic representation of survey results. Note that total percentage may not equal 100, due to the effects of rounding.
iety, stress, poor body image, changes in relationship) and physiological changes (e.g., hormonal, influences of chemotherapeutic agents, medications, menopause, and medical diseases). Because our study lacked a control group, we were not able to fully evaluate such confounding factors in contributing to a decreased feeling of femininity/sexuality, sensation, or sexual arousal. The composite nipple graft technique is uniquely valuable for reconstruction of the radiated breast and in women with a very large remaining nipple who need a nipple reconstructed. The color, texture, and naturalness of the nipple reconstructed using a composite graft cannot be duplicated by any other technique.

**CONCLUSIONS**

Nipple reconstruction with a composite nipple graft is a useful technique that should be considered in unilateral nipple reconstruction and especially considered in patients whose breast has been irradiated, for which flap reconstruction for the nipple comes with added risks. Although it is not possible to use in all patients, no other technique offers a nipple reconstruction that can so closely match the contralateral side in color, texture, and overall appearance.

**REFERENCES**


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