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Nipple Reconstruction

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The challenge of nipple reconstruction is to create a three-dimensional structure from a two-dimensional surface. As we strive to improve our outcomes from nipple reconstruction, our options continue to expand. Numerous techniques have been described. So many techniques have been described, which suggests that no single technique is perfect. The principle limitation of all techniques is premature or excessive flattening attributable primarily to scar contracture. Short- and long-term outcome studies have been reported. Shestak [1] has demonstrated that local flap techniques (Star, Skate, and Bell flaps) will flatten by 50% to 70% over 2 years. This was observed in breasts reconstructed with flaps and with implants. Jabor [2] has demonstrated that the principle determinant of patient dissatisfaction was excessive flattening, followed by color, shape, size, texture, and position. Only 13% of all patients were totally satisfied with their reconstructed nipple–areolar complex. Thus, the search for the ideal nipple reconstruction continues.

There are two basic methods by which a nipple can be surgically reconstructed: the use of local flaps with or without the use of skin grafts, and as a composite free nipple graft from the contralateral breast. The options for local flaps are numerous and include the CV, Tab, Skate, Star, Bell, and Arrow flaps, to name a few [1,3–5]. Skin grafts are used to mimic the areolar surface. The use of a free nipple graft can be considered in women who have a contralateral nipple with excessive projection. Nipple augmentation using supplemental materials is possible with many of these local flap techniques. Various materials are described that can be used at the time of initial nipple reconstruction or as a secondary procedure.

Given the broad scope of this topic and various methods available, this article reviews the author's personal approach for nipple reconstruction based on over 500 procedures. The primary topics include surgical techniques of nipple reconstruction, methods of nipple augmentation, postoperative care of the reconstructed nipple, areolar tattooing, and complications.

Nipple reconstruction

The technique of nipple reconstruction that is most commonly used in the author's practice is the CV flap. However, the majority of nipple reconstructions that the author has performed have used the "elongated C flap." Both of these flaps have the advantage of not requiring the use of skin grafts. The

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Fig. 1. An elongated C flap is outlined on a breast reconstructed with a muscle sparing free TRAM flap. The flap can be oriented in any direction, and the distal aspect of the flap can be positioned along a scar if necessary.

areola is recreated using tattoos. The long-term projection of the nipple using these flaps has ranged from 1 to 5 mm, but the majority of nipples are within a range of 2 to 3 mm. Of the last 500 nipple reconstructions, 42 have required a second operation to increase nipple projection.

Preoperative planning

Planning for the nipple reconstruction is dependent upon the type of breast reconstruction performed and the need for adjuvant treatments. In general, women who have had autologous reconstruction can complete nipple reconstruction 3 months following the reconstruction, whereas women who have had expander/implant reconstruction can complete the process 3 months following the second stage. Women who have had adjuvant treatments such as chemotherapy and radiation therapy have deferred the nipple reconstruction until these treatments have been completed. The outcome following radiation therapy to the

Fig. 2. The elongated C flap is incised through the dermis and into the subcutaneous fat layer.

Fig. 3. The flap is elevated. Minimal superior undermining (flap side) is performed to minimize and vascular compromise to the flap. It is recommended to [Q10] elevate 1 to 2 mm of subcutaneous fat with the flap to provide additional bulk when possible.

reconstructed breast has been less predictable and associated with a higher incidence of delayed healing and tissue necrosis. Nipple reconstruction at the time of the breast reconstruction has not been performed in the author's practice, although there are some who advocate this (reference). [Q9]

Operative technique (primary nipple reconstruction)

Operations are performed in an outpatient surgical setting; however, these can also be performed in an office setting if feasible. On the day of surgery, patients are marked in the standing position. It is recommended that the patient participate in determining the optimal position of the nipple. Some

Fig. 4. Three dermal sutures are placed at this stage. The first suture is applied at the junction of the flap and upper skin edge. The second suture is applied on the opposite side of the flap. These two sutures are approximated to the opposite (nonflap side) edge of the pattern leaving a 1-cm gap in the central third. The third suture is a trifurcation stitch that approximates the dermal corners of the flap to the midpoint of the inferior skin edge.

Fig. 5. Final closure of the flap using a running nonabsorbable suture along the limbs and an interrupted nonabsorbable suture along the flap.

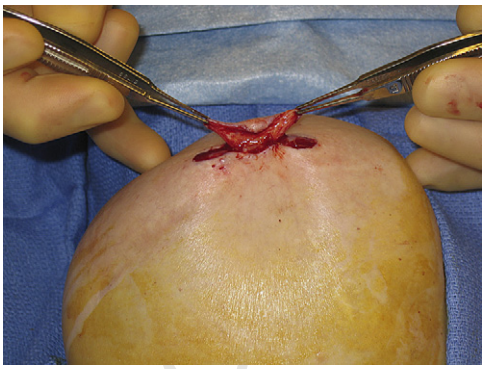

Fig. 7. The CV flap has been elevated, and the first two dermal sutures applied as described in Fig. 4.

patients are interested in symmetry on the horizontal plane, whereas others prefer the nipple to be optimally positioned on the breast mound. Concerns related to the type of anesthetic are addressed before entering the operating room. The breast reconstructed with autologous tissue is often insensate especially when the nipple is performed 3 months following the breast reconstruction. Expander/implant reconstruction is often associated with some degree of sensation at the time of nipple reconstruction. Intravenous sedation can be used for both methods depending on the patient's degree of anxiety and sensation. Intravenous antibiotics are recommended especially for women following implant reconstruction. Local anesthesia using 1% lidocaine without epinephrine is necessary for women who have sensation of the breast mound.

The techniques that the author has used most often include the CV flap and the elongated C flap. The reasons for using these flaps are principally related to their versatility and ease of use. The flaps can be oriented in any direction or location on the breast that facilitates obtaining nipple symmetry. In addition, they can be positioned along a scar as long as the design is oriented such that the blood supply enters away from the old scar (Fig. 1). The viability and survival of the nipple depends on adequate blood supply. The blood supply for these flaps is based upon the subdermal plexus of vessels from the portion of the skin that is not incised. The length of the flap ranges from 3 to 4 cm, and the width of the flap ranges from 1 to 1.5 cm based on the appearance of the contralateral nipple. The technique for nipple reconstruction using the elongated C flap is illustrated in Figs. 2–5. Following the incisions, the tissues are rearranged into the shape of a nipple and sutured. A combination of absorbable and nonabsorbable sutures is used for closure and to maintain the shape. A 4–0 monocril suture is usually used in the dermal layer, and a 5–0 nylon suture is used on the skin. The technique for nipple reconstruction using the CV flap is illustrated in Figs. 6–8. The projection of the reconstructed nipple at completion ranges from 0.8 to 1.5 cm for

Fig. 6. The CV flap is outlined. The dimensions and orientation possibilities are similar to the elongated C flap.

Fig. 8. An alternate suture technique is performed in which the dermal corners for the flap (grasped with forceps in Fig. 7) are wrapped around each other and sutured to the site of the preceding two sutures.

Fig. 9. The typical appearance immediately following nipple reconstruction using the elongated C flap. The projection is approximately 1 cm. The nipple is pointed initially, but this will begin to assume a more natural contour following removal of the sutures at 2 weeks.

the elongated C flap (Fig. 9) and 0.8 to 1.2 mm for the CV flap (Fig. 10). The initial projection of the reconstructed nipple often exceeds the projection of the natural nipple; however, over time, the reconstructed nipple will recontour and flatten by at least 50%. This is usually evident 2 to 3 months following the procedure. A protective shield filled with an antibiotic ointment is applied at the completion of the procedure (Fig. 11). Clinical examples are provided in Figs. 12–16.

Operative technique (secondary nipple reconstruction)

Some women following primary nipple reconstruction are not content with the final outcome. Usually this is due to flattening or poor projection but can also be due to malposition, shape, and texture [2]. Unfortunately, some degree of flattening is observed with all methods of nipple reconstructions

Fig. 10. The typical appearance immediately following nipple reconstruction using the CV flap. The projection is approximately 1 cm.

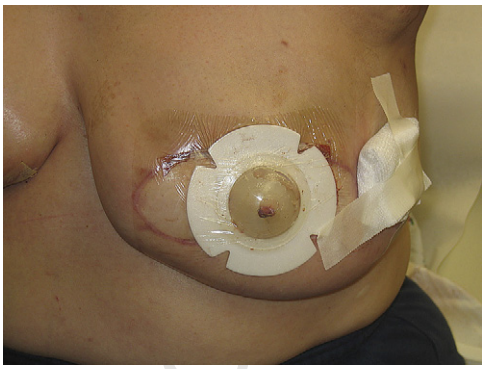

Fig. 11. Following the operation, the nipple shield is applied and filled with an antibacterial ointment. The shield is removed on postoperative day 3, and patients are instructed to shower.

regardless of the technique used. It is expected that the nipple will shrink by at least 50% following the initial creation. However in approximately 10% to 15% of reconstructions, the nipple will flatten beyond expectations and need to be recreated (Fig. 17). Long-term projection of the reconstructed nipple occurs with greater frequency following breast reconstruction using implants rather than flaps. This is primarily because implants exert an additional upward force onto the skin surface, whereas flaps do not. Other reasons for excessive

Fig. 12. Delayed breast reconstruction using a deep inferior epigastric perforator (DIEP) flap and nipple–areolar reconstruction using an elongated C flap. One-year follow-up.

Fig. 13. Immediate unilateral two-stage breast reconstruction using expanders and implants followed by nipple–areolar reconstruction using an elongated C flap. Two-year follow-up.

Fig. 15. Immediate right breast and delayed left breast reconstruction using DIEP flaps and bilateral nipple–areolar reconstruction using CV flaps and AlloDerm. One-year follow-up.

flattening include external pressure, poor design, thin skin and dermis, and lack of subcutaneous fat.

In these situations, the option of secondary nipple reconstruction is discussed. When desired, a CV flap is always performed. The remnant of the flattened nipple is incorporated into the hood or C portion of the flap. The use of supplemental material to increase the volume of the nipple and improve the chances of long-term projection is sometimes used. The author frequently uses an acellular dermal matrix, but other material, such as fat, dermis, cartilage, and bone, can be used primarily or secondarily [5–9].

Method of nipple augmentation

When considering nipple augmentation, patient expectations must be appreciated. Some women have little interest in visibly projecting nipples, whereas other patients have a strong interest. Although nipple augmentation can be performed at the initial nipple reconstruction, the majority are performed secondarily in the author's practice. In general, long-term projection has ranged from 4 to 5 mm following augmentation.

The method of nipple augmentation most commonly used in the author's practice is to use an acellular dermal matrix (AlloDerm, LifeCell Corporation, Branchburg, New Jersey). The details of this technique have been previously described; however, some of the salient features will be emphasized [9]. It is recommended to obtain a 1 × 2–cm piece of thick or extra thick AlloDerm, and use a segment that measures approximately 3 × 6 mm (Fig. 18). Sometimes, the AlloDerm can be folded for additional volume in cases whereby there is enough tissue compliance (Fig. 19). The orientation of the basement membrane should be toward the skin flaps, although this has not been critical in the author's experience. The important concept when using supplemental

Fig. 14. Immediate bilateral two-stage breast reconstruction using expanders and implants followed by nipple–areolar reconstruction using an elongated C flap. Two-year follow-up.

Fig. 16. Immediate left breast reconstruction using a DIEP flap and nipple–areolar reconstruction using an elongated Cflap. Three-year follow-up.

Fig. 17. Immediate right breast reconstruction using a latissimus dorsi musculocutaneous flap and nipple reconstruction using an elongated C flap. The projection of the nipple may decline and the areola tattoo may fade over time as depicted.

material is to place it between apposing skin flaps (Fig. 20). The upper tip of the AlloDerm should be sutured to the superior dermal edge of the local flap to prevent displacement or migration. It is not advised to place the AlloDerm in a subcutaneous pocket under the nipple because this maneuver has not resulted in enhanced projection.

Postoperative care

Postoperatively, women are permitted to shower the following day. They are instructed to remove the nipple shield 2 days following the operation and then reuse it for 2 weeks to minimize external compression. Pain medication and antibiotics are usually prescribed. Some women, following flap reconstruction, will not require analgesics because they have not yet regained sensation to the reconstructed breast. Sensation is common following breast reconstruction with implants. Sutures are removed 2 weeks following the operation to maintain the shape and projection of the nipple. All women are instructed that the nipple will initially be longer

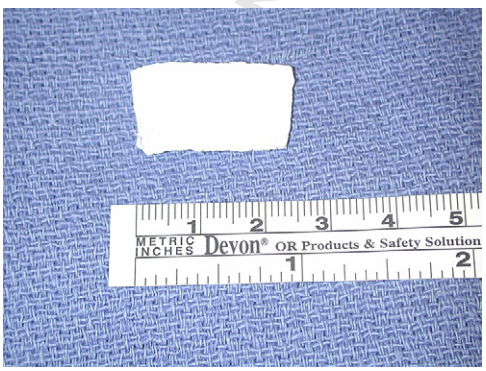

Fig. 18. A 1 × 2–cm piece of thick AlloDerm.

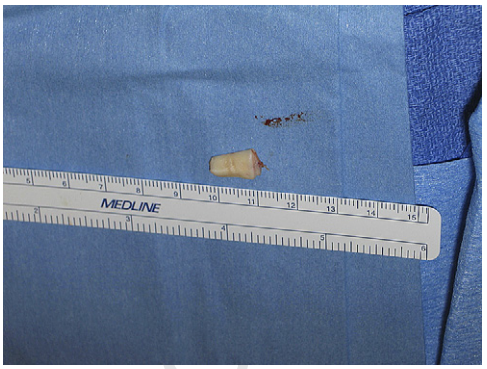

Fig. 19. The AlloDerm is hydrated and then cut into a 1-cm × 6-mm piece. The dimensions may vary based on the size of the skin flaps and available space. The AlloDerm can be folded and sutured to maintain its shape.

and pointed when the elongated C flap is used. However after approximately 1 month, the reconstructed nipple will partially shrink and round out. There is essentially no downtime for this operation, and women usually return to their normal activities the following day.

Areolar tattoo

Creation of an areola is performed approximately 3 months following the nipple reconstruction. Permanent tattooing is performed in the office by specially trained nursing staff (Fig. 21). There are various colors that are available, and the choice is based on the color of the opposite areola (Fig. 22). This procedure requires approximately 20 to 30 minutes per nipple and may or may not require the use of a local anesthetic based on the degree of sensation. Women are instructed that these tattoos may fade over time and that a second tattoo procedure may be desired.

Fig. 20. The AlloDerm is positioned between apposing skin flaps.

Fig. 21. The areola can be tattooed in an office setting as shown.

Complications

Complications following nipple reconstruction are uncommon. The most severe is partial or total nipple necrosis that has occurred in less than 2% of reconstructions (Fig. 23). This is more commonly seen when the nipple reconstruction is performed following radiation therapy. Thus, it is recommended to perform nipple reconstruction before radiation therapy when desired, possible, and feasible. There have been several instances of nipple malposition requiring excision of the first nipple and reconstruction of another nipple. Thus, women and significant others are asked to participate in the decision of determining the location of the nipple on the reconstructed breast.

Summary

Creation of a nipple–areolar complex provides the final touches to the breast reconstruction. It is considered by many women to be an essential and important component of the breast. As with all reconstructive procedures related to the breast, the desire to pursue nipple reconstruction is based on the physical and psychologic needs of the woman. In the 80% of women in the author's practicewho do have nipple reconstruction, the results have been good to excellent in the majority, and satisfaction following the procedure has been high.

Fig. 22. The appearance of the areola immediately following the tattoo procedure.

Fig. 23. Necrosis of a reconstructed nipple following DIEP flap breast reconstruction and radiation therapy.

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