



Keyhole Flap Nipple Reconstruction

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Summary: Nipple-areola reconstruction is often one of the final but most challenging aspects of breast reconstruction. However, it is an integral and important component of breast reconstruction because it transforms the mound into a breast. We performed 133 nipple-areola reconstructions during a period of 4 years. Of these reconstructions, 76 of 133 nipple-areola complexes were reconstructed using the keyhole flap technique. The tissue used for the keyhole dermo adipose flap technique include transverse rectus abdominus myocutaneous flaps (60/76), latissimus dorsi flaps (15/76), or mastectomy skin flaps after tissue expanders (1/76). The average patient follow-up was 17 months. The design of the flap is based on a keyhole configuration. The base of the flap determines the width of the future nipple, whereas the length of the flap determines the projection. We try to match the projection of the contralateral nipple if present. The keyhole flap is simple to construct yet reliable. It provides good symmetry and projection and avoids the creation of new scars. The areola is then tattooed approximately 3 months after the nipple reconstruction. (*Plast Reconstr Surg Glob Open* 2016;4:e703; doi: 10.1097/GOX.0000000000000691; Published online 5 May 2016.)

Nipple reconstruction is an integral component of breast reconstruction because it transforms the mound into a breast. Many different nipple reconstruction techniques have been described in the literature, as well as nipple-sharing techniques and 3D tattooing. Several of the most popular local flaps result in multiple scars around the reconstructed nipple-areolar complex. For example, the C-V flap has 2 lateral scars, and the star flap results in 3 scars. A flap not commonly used or described is the keyhole flap, which results in 1 visible vertical scar with good patient satisfaction and long-term results.

METHODS

In our retrospective review, we looked at 133 nipple-areola reconstructions during a period of 4 years

from 2000 to 2004. Of the 133 reconstructions, 76 of 133 nipple-areolar complexes were reconstructed using the keyhole flap technique. Fifty-seven of 133 nipple-areolar complexes were reconstructed using other techniques such as the star flap, skate flap, and nipple-sharing techniques. The tissue used for the keyhole dermo adipose flap technique include transverse rectus abdominus myocutaneous flaps (60/76), latissimus dorsi flaps (15/76), or mastectomy skin flaps after tissue expanders (1/76). The average patient follow-up was 17 months. Outcomes measured were as follows: (1) significant loss of projection (>50%), (2) delayed wound healing/skin graft loss, and (3) need for revision. Written informed consent was obtained preoperatively from all patients for the use of their photographs.

TECHNIQUE

The patient is marked in the upright position for optimal nipple placement. The procedure can be

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Received for publication October 21, 2015; accepted March 2, 2016.

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DOI: 10.1097/GOX.0000000000000691

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 Division of Plastic Surgery, Houston Methodist Hospital.

Supplemental digital content is available for this article. Clickable URL citations appear in the text.

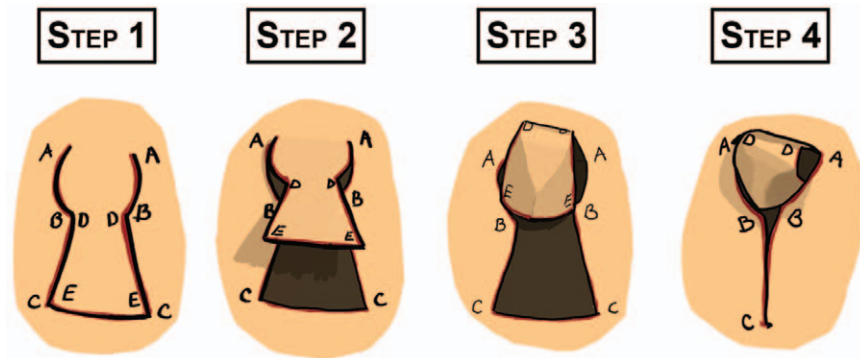


Fig. 1. A to A, 1.5 to 2 cm; A to E, 2 to 2.5 cm; E to E, 1.5 to 2 cm. Step 1: The incision of the keyhole is made through the dermis into the subcutaneous fat. Step 2: The flap is elevated distally with a thickness of 5 mm and tapered to 8 mm proximally, thus preserving the blood supply to the flap. Step 3: The flap is folded on itself. Step 4: E to E is sutured at the base of B to B. Points B to B and C to C are sutured together.

done in the operating room or in the office setting under local anesthesia without epinephrine (to assess capillary refill after the procedure). The basic design of this flap is a keyhole-shaped random pattern flap. We make the flap 30% to 40% larger than the desired final size, because of the long-term loss of projection. The base width of the flap is about 1.5 to 2 cm, which determines the width of the future nipple. The length is approximately 2 to 2.5 cm, which determines the projection. During elevation of this flap, the distal flap thickness is approximately 5 mm and tapered proximally to approximately 8 mm. The flap is then folded on itself, and sutures are placed on each side at the fold. This is performed carefully without a tight closure to maintain blood supply to the reconstructed nipple. The vertical limb is closed, and then the rest of the incisions are sutured. Continuing the incision vertically or horizontally in the existing scar may eliminate the dog-ear. The areola is then tattooed approximately 3 months after the nipple reconstruction (Figs. 1–3; **See video, Supplemental Digital Content 1**, which demonstrates keyhole flap nipple reconstruction. This video is available in the “Related Videos” section of the Full-Text article on PRSGlobalOpen.com or available at <http://links.lww.com/PRSGO/A190>).

RESULTS

We encountered significant loss of projection in 5 of 76 (6.6%) nipples reconstructed with this technique. Only 1 tissue expander (1/76) in the study showed significant loss of projection. Therefore, the keyhole flap was no longer used in tissue expander-based breast reconstruction. Long-term follow-up has shown good results with excellent patient satisfaction. Patients maintain good projection, and the scar is minimal (Fig. 4).¹



Fig. 2. Bilateral transverse rectus abdominus myocutaneous breast reconstruction 15 months after bilateral keyhole nipple reconstruction with circumareolar closure.

DISCUSSION

There are many methods of nipple-areola reconstruction, most of which have good patient satisfaction. Losken et al² evaluated the long-term outcomes of the C-V flap, which resulted in only 42% of patients being satisfied with their projection. However, the overall patient satisfaction with their reconstruction was 81%. More recently, Halvorson et al³ described 3D nipple-areola tattooing having a patient satisfaction rate of 84%, with



Fig. 3. The patient after bilateral mastectomies with bilateral latissimus dorsi flap reconstruction with implants 3 months postoperatively.



Video Graphic 1. See Supplemental Digital Content 1, which demonstrates keyhole flap nipple reconstruction. This video is available in the “Related Videos” section of the Full-Text article on PRSGlobalOpen.com or available at <http://links.lww.com/PRSGO/A190>.

no projection. Jabor et al⁴ compared the keyhole flap with many other nipple reconstruction flaps and showed that patient satisfaction was 86%. The most common complication of the keyhole flap was the loss of projection. Shestak et al had compared the skate flap, star flap, and bell flap⁵ (similar to the keyhole flap) and determined that the best long-term nipple projection was obtained with the skate and star flaps. The bell flap had maximum loss of projection, and Shestak et al⁶ discouraged its use. However, we make the flap 30% to 40% larger than the desired final size, because of the anticipated long-term loss of projection. In addition, the study by Shestak et al did not take into account patient satisfaction.

Based on the studies in which patient satisfaction was evaluated, in addition to our own experience, a large amount of projection is not always what the patient desires. The keyhole flap can have a significant loss of projection. However, we account for that factor in making the reconstructed nipple larger. A longer keyhole pattern will result in more projection, but will also result in a longer vertical scar. Therefore, patient preference of projection versus scar needs to be balanced and discussed with the patient. Most patients were satisfied with their overall nipple reconstruction with the keyhole flap. Looking at the 3D nipple-areola tattooing, patients have a nipple-areola image and a perception of projection, but no actual projection. In these patients, the satisfaction rate was 84%. These studies indicate that the expectation presented to patients may greatly influence their satisfaction. Projection may be more important to some patients and less so in others.

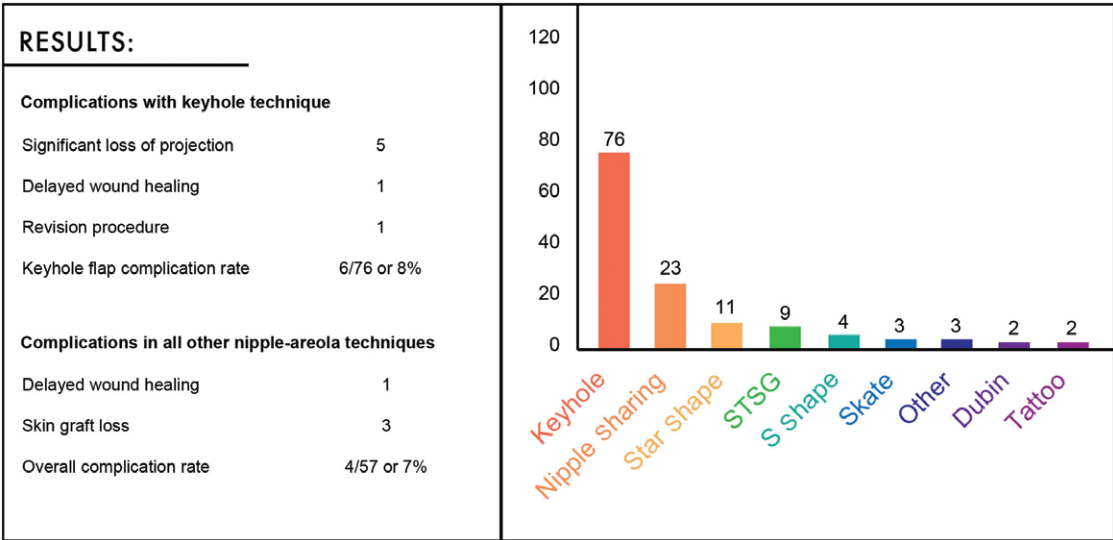


Fig. 4. Complication rates of keyhole flap versus all other nipple-areola techniques.

The optimal situation for using the keyhole flap in nipple reconstruction is after autologous breast mound reconstruction. Autologous breast reconstruction is ideal, as tissue expander based reconstruction is generally not as favorable, because the skin flaps are thinner with less blood supply. Skin-sparing mastectomy with autologous reconstruction yields the best scar results, because there is essentially only a visible vertical scar and the periareolar scar is hidden.

The keyhole flap is not commonly described and has several advantages. These include (1) good cosmesis, (2) less scars, and (3) predictable long-term outcomes with good patient satisfaction.

CONCLUSIONS

Keyhole flap nipple reconstruction is a safe, simple, and reliable method for nipple reconstruction in patients with autologous breast reconstruction. It has a low incidence of minor complications and high patient satisfaction. This is a valuable technique because of desirable cosmesis, less scars, and predictable long-term outcomes.

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