

SWIM Flap: Skin-Sparing, Wise Pattern, Internal Mammary Perforator Breast Reconstruction

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The Goldilocks reconstruction, created by Heather Richardson and Grace Ma in 2013,¹ offered a new method of closure after modified radical mastectomy that gives the appearance of a breast, but with no nipple. This technique also allowed for the mastectomy closure lines to be placed in an esthetic location, and had a similar complication rate to mastectomy alone. The Goldilocks reconstruction was so named because it was presented as a possible alternative between traditional breast reconstruction (“too hot”) and no reconstruction (“too cold”). For some patients who wish to avoid the increased risk, operative time, and implants or flaps that reconstruction entails, and the deformity of going without reconstruction, Goldilocks may be “just right.” As the next step in the advancement of this technique, we present the skin-sparing, Wise pattern, internal mammary perforator (SWIM) flap, in a case series of nipple-sparing mastectomy reconstruction, using local tissue advancement flaps only, and preserving the nipples.

METHODS

Seven patients underwent bilateral reconstructions, for a total of 14 breasts, performed by the same mastectomy surgeon and reconstructive surgeon. Six patients had current breast cancer and 1 was BRCA+. Two patients had previous breast cancer and radiation therapy in 1 breast. All 7 patients had large breasts and were at elevated risk for complications related to tissue expander reconstruction.²

The patient was marked preoperatively while sitting upright (Fig. 1). The length of the lower incision was designed to encompass the entire base width of the breast and a significant part of the overhanging axillary roll. The

new horizontal position of the inferior mammary crease was then determined on the superior flap by transposing the inferior mammary crease onto the superior flap. The location of the nipple was then marked 5 cm superior to the inframammary crease; this is unlike a breast reduction in which the nipple is marked closer to the inframammary crease. The classic Wise triangle was then marked, and it varied from person to person, with a wider angle necessary for larger breasts. The nipple-carrying flap was then marked based on medial perforators. For patients with excess fat lateral to the breast, a lateral intercostal perforator (LICAP) flap was marked. The inferior mammary crease marking was continued laterally to the lateral axillary line, anterior to the latissimus dorsi muscle. This was curved upward to the termination of the incision, creating an ellipse.

The mastectomy was performed using the superior lateral incision, which can extend medially to the medial limb of the Wise pattern. The triangle was left with the lower flap or discarded. Caution was taken to avoid injury to the internal mammary arteries, which perfuse the nipple. In cases in which a LICAP flap was planned, in order to preserve necessary blood flow, the lateral fat was not dissected past the lateral intercostal perforators. While the mastectomy was being performed on the first breast, the plastic surgeon de-epithelialized the contralateral breast. The LICAP flap was dissected and then sewn to the medial pectoral fascia (Fig. 2), carefully preserving the intercostal perforators, located between 2.5 and 3.5 cm anterior to the anterior border of the latissimus muscle.^{3,4} The medial nipple flap was then freed from the rest of the de-epithelialized skin. This produced 2 flaps from the inferior de-epithelialized skin: the nipple-carrying flap, which is fed by the internal mammary arteries, and the inferior-based random flap.

The inferior flap was inset over the LICAP flap and generally reached easily to the superior portion of the pectoralis major and the top of the mastectomy defect (Fig. 3). Flaps from the Wise pattern were tacked together with the medial nipple flap underneath, and the nipple position was checked with the patient sitting upright. The final nipple position was determined and

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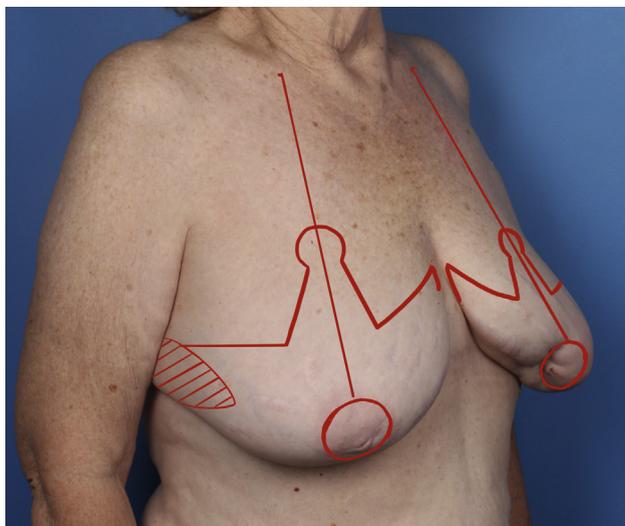


Figure 1. Sketch-enhanced photo showing preoperative markings.

the nipple was brought through (Fig. 4). During the procedure, flap perfusion was checked by trimming the distal flaps; punctate red bleeding indicated good perfusion. Intraoperative steps can be seen in Video 1. The incisions were then closed using 3-0 monocryl with buried interrupted and running subcuticular sutures (Fig. 5). Drains were used. Prevena vacuums were placed at the conclusion of the operation, and vacuums and drains were removed on postoperative day 5, when Steri-Strips were placed. Steri-Strips (3M) were removed on postoperative day 30. Patients were encouraged to perform full range of motion, starting postoperative day 1. Heavy lifting greater than 10 pounds was restricted for 1 month.

RESULTS

Of the 14 breasts that underwent reconstruction, 2 had superficial areola skin necrosis (Fig. 6). All were managed conservatively with nonoperative management, consisting of bacitracin and gauze, and resolved within 3 weeks. There was no infection, seroma, or hematoma. One breast had superficial dehiscence at the trifurcation and underwent 2 weeks of local wound care and healed without surgical intervention. Radiated patients with previous lumpectomy were noted to have more fibrotic tissue at the time of the surgery, but blood flow at the tips of all flaps appeared normal. One radiated patient had fat necrosis of the inferior flap at the location of a fixation suture, and it was surgically excised at 2 months. The fat excision left a divot, and this patient desired fat grafting in the upper pole of the breast.

An additional patient desired a larger volume and underwent fat grafting after 6 months. The other 5 patients were satisfied with their results and desired no additional surgery. Before and after photos (Figs. 7 and 8) show examples of the resulting reconstructed breasts. Breasts are similar in appearance to the results of a breast reduction surgery, with smaller size and typical Wise pattern scars.

DISCUSSION

Our goal was to create a method of reconstruction after mastectomy that preserves the nipple, creates a breast-like mound, and does not require implants or major flaps. The Goldilocks reconstruction¹ is an effective technique to create the appearance of a breast mound using local tissue flaps. It moves the traditional horizontal mid-breast mastectomy scar to the inferior mammary crease, adds a vertical scar component in the breast midline, and has a more Wise-pattern-like closure that allows for the appearance of a breast mound. The Goldilocks, however, does not preserve the nipple.

The SWIM flap technique does have some similarities to the tissue rearrangement used in oncoplastic reduction. Similar to the SWIM flap, the oncoplastic reduction uses a Wise-pattern closure and pedicled blood flow to the nipple to remove large tumors and yields better cosmesis than traditional lumpectomy.⁵ The pedicled blood flow to the nipple in oncoplastic reduction, however, comes through the preserved breast tissue and therefore varies based on the area resected. Lateral and superior tumors use an inferior pedicle technique. Inferior tumors more commonly use a superior or medially-based pedicle.⁶ Unlike the SWIM flap, which is performed after a complete mastectomy, patients treated with oncoplastic reduction still require radiation. In addition, while the SWIM flap relies on the vascular supply within the dermal flap, in oncoplastic reduction, the blood flow is within classic inferior, superior, and medial pedicles of the breast tissue itself. The oncoplastic technique, however, leaves breast tissue behind and is therefore not an option for those requiring or desiring mastectomy.

The goal still remains to perform a complete mastectomy, but preserve the nipple. The case report, "Goldilocks Mastectomy with Bilateral In Situ Nipple Preservation via Dermal Pedicle"⁷ is a single case report that preserved the nipple by keeping the nipple and areola attached to the entire de-epithelialized medial, superior, and inferior skin. The Wise pattern was designed similar to the original Goldilocks procedure. However, we found that this technique, severely restricts the surgical

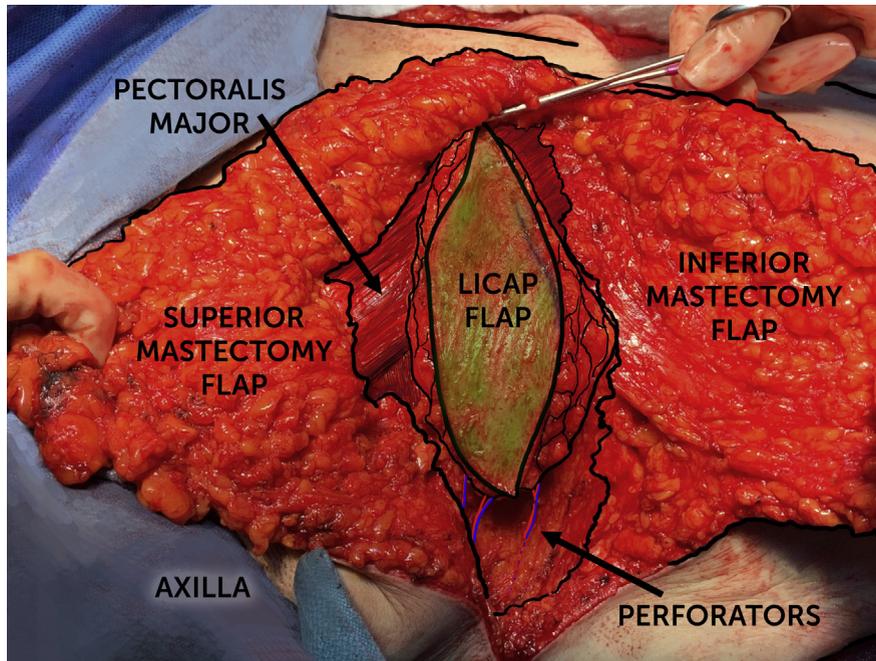


Figure 2. Sketch-enhanced photo showing inset of the lateral intercostal artery perforator (LICAP) flap (shaded in green) onto the medial pectoral fascia.

translocation of the nipple, as the dermis cannot be released in any way to allow for superior movement without compromising blood flow.

In the SWIM flap, the superior attachments to the nipple are cut, leaving the nipple perfused by the internal mammary perforators, the dominant blood flow to the mastectomy flap, and allows for easy inset of the nipple. The SWIM flap is a reliable method, in our case series,

of preserving and relocating the nipple to give the appearance of a breast. The LICAP flap further recruits fat in patients that may have fat just lateral to the breast that is often irritating to them in traditional mastectomy. In our practice, the procedure is performed jointly by the mastectomy surgeon and the reconstructive surgeon, who work concomitantly. The mastectomy incision offers wide access and is straightforward, which is an advantage

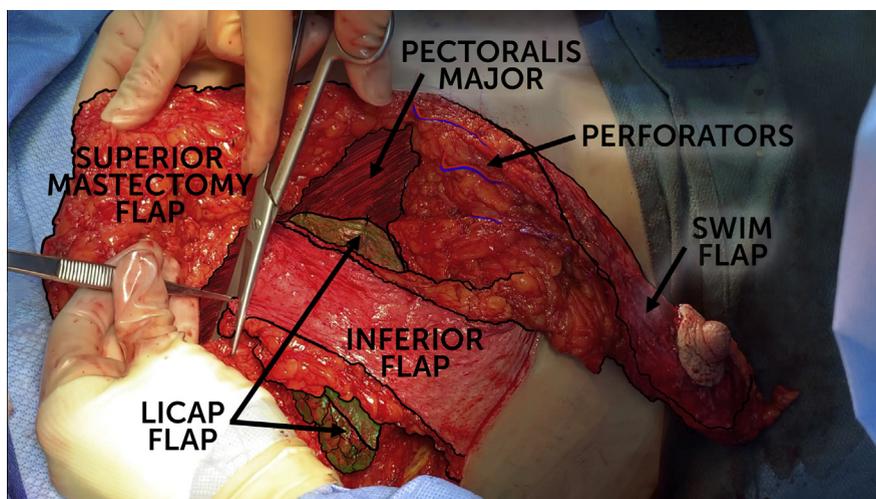


Figure 3. Sketch-enhanced photo showing inset of the inferior flap over the lateral intercostal artery perforator (LICAP) flap (shaded in green); flap is being trimmed to check perfusion.

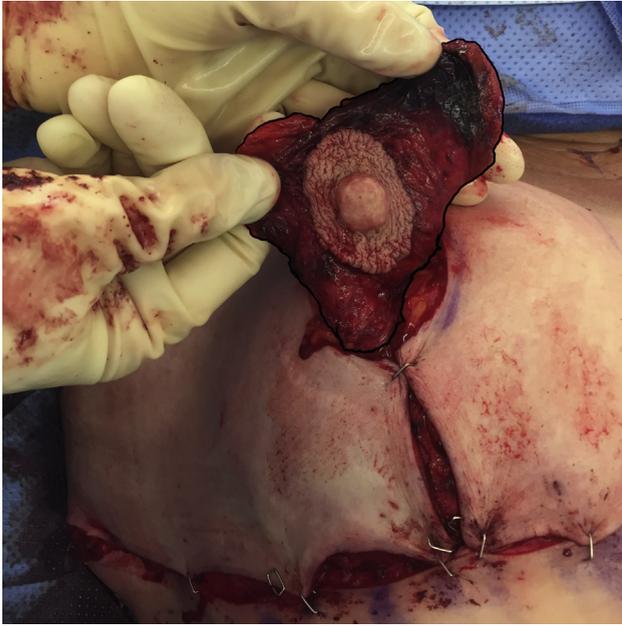


Figure 4. Sketch-enhanced photo showing internal-mammary-artery-perfused nipple. Note: flap is thin but nipple is viable.

in this type of nipple-sparing mastectomy. The surgeon performing the mastectomy needs to be cautious when dissecting around the intercostal perforators, as the surgeon may be accustomed to removing excess axillary fat. The mastectomy surgeon must also avoid damaging the internal mammary artery perforators, which are only sometimes visible and can be easily dissected away from the breast tissue. Good communication between the mastectomy surgeon and the plastic surgeon is critical in order to avoid injury to the vessels adjacent to the breast tissue, such as internal mammary vessels and intercostal



Figure 5. Intraoperative photo after skin closure, of a 72-year-old patient.

perforators, which can be marked by the plastic surgeon before mastectomy. Only breast surgeons with low mastectomy flap necrosis rates should consider partnering in this reconstruction method, as stripping the subcutaneous fat and vessels will not produce acceptable mastectomy flaps for the reconstruction. As the plastic surgeon affixes the stacked flaps, each flap can be tested for perfusion. For patients with previous lumpectomy and radiation, extra care should be taken not to place tension on the flaps or constrict the fat with sutures. A free nipple graft can be considered if the SWIM flap appears ischemic intraoperatively. If the skin over the medial breast requires excision because of tumor invasion or proximity, then the SWIM flap cannot be used.

Because only the residual dermal fat can be used in the reconstruction, predicting the size of the reconstruction is difficult, and patients should be well informed of this before the procedure. Even patients with very large breasts may have very little subcutaneous fat and therefore have smaller reconstructions than might have been expected. Generally, we prefer giving low expectations for the final volume because there is little ability to vary the outcome at the time of the mastectomy. Final size is largely dependent on the patient's natural layer of subcutaneous fat. A large breast with a thin layer of subcutaneous fat may have a smaller final cup size than a small breast with a thick layer of subcutaneous fat. Good mastectomy technique should remove all breast tissue and preserve the



Figure 6. One-week postoperative photo of a 52-year-old patient, showing right areolar ischemia.



Figure 7. Preoperative photo (left) and 1-year postoperative photo (right) of a 70-year-old patient, with previous left lumpectomy and radiation.

subcutaneous fat, which is oncologically sound, preserves nipple viability, and allows for adequate volume to create a breast mound.

The before and after photos show that the results are similar in appearance to a significant breast reduction. All patients underwent double mastectomy with SWIM flap reconstruction. Although all the patients in this series desired double mastectomy, SWIM reconstruction could be used in unilateral mastectomy patients, but it would produce a large discrepancy in breast size, which may have to be addressed with a contralateral surgery.

CONCLUSIONS

The SWIM flap allows for a mastectomy reconstruction with the use of local flaps only, the appearance of a breast

mound, and preservation of the nipple. It may be a viable alternative to mastectomy alone, with a superior cosmetic outcome, especially in large-breasted women desiring reconstruction. Addition of the LICAP flap, for the right patient, can add additional volume. Many patients are not candidates for traditional reconstruction secondary to size or radiation history, or may have other risk factors and have no reconstruction alternative. Small-breasted women, especially with no ptosis, are not good candidates for this technique, as it relies on extra skin for creation of the reconstruction. Goldilocks/SWIM may be the only reconstruction option for a challenging patient population. It may also be an alternative to tissue expander/implant or free-flap reconstruction in a patient wishing to avoid either a permanent prosthesis or a secondary donor site.



Figure 8. Preoperative photo (left) and 6-month postoperative photo (right) of a 39-year-old patient, with left breast cancer.

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