



*Pre Lat TE
Anterior view of post-
mastectomy procedure.
Radiated skin visible at
mastectomy scar.*

Pictures courtesy Leah-Marie Gull, CST

Latissimus Musculocutaneous Flap for Breast Cancer Reconstruction

Restoring Anatomical Features Following Mastectomy

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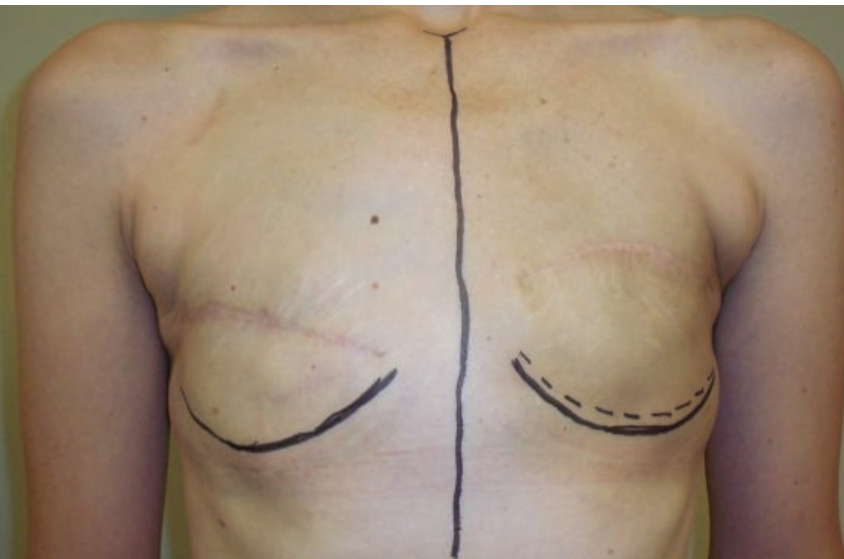
According to the American Cancer Society, more than 288,000 women were diagnosed with breast cancer in 2011–2012. As the US population continues to age, the prevalence of breast cancer is expected to continue to increase. Thus, the choice to undergo breast reconstruction is becoming increasingly commonplace and has proven psychological benefits for many women. The type and the timing of reconstruction is a multifactorial decision based on the need for complementary treatment, lifestyle, desired cosmetic outcome and preference and experience of the surgeon.¹

Breast reconstruction techniques have evolved throughout the past several decades from injection of paraffin directly into the defect to current advanced techniques such as deep inferior epigastric perforator flaps. As reconstruction has become more prevalent in the cancer patient population, the search for the most aesthetically pleasing outcome has gained popularity. Autologous reconstructions, such as the latissimus dorsi musculocutaneous flap, provide previously irradiated breasts a cosmetically acceptable outcome with low risk when a prosthesis and a latissimus flap are used in conjunction with each other.⁹

First characterized as a novel approach to repairing breast amputation in the late 1800s by Italian surgeon, Tanzini, the latissimus dorsi musculocutaneous flap did not gain popularity until the 1970s when the surgical approach began to resemble its modern state. Historically, flap reconstruction was considered unfavorable due to high rates of capsular contracture. However, with the use of tissue expanders placed prior to the permanent implant, the rate of capsular contrac-

LEARNING OBJECTIVES

- ▲ Learn about the history of autologous breast reconstructions
- ▲ Review the relevant anatomy and physiology for this procedure
- ▲ Explain the procedure for a latissimus musculocutaneous flap for breast cancer reconstruction
- ▲ List the steps for skin preparation and draping for this operation
- ▲ Recall the post-op treatment following this type of procedure



Pre op marking 002
Pre-operative marking to show where the IMF is to be recreated after mastectomy. Midline and sternal notch identified.



Pre op marking 001
Posterior view of patient pre-operative markings. Midline and scapula identified.

ture and other complications such as seroma formation have decreased considerably in both delayed and immediate reconstruction patients.⁷ Latissimus dorsi flap patients are immediate or delayed reconstructions following simple or modified radical mastectomy.

The vast majority of delayed reconstructive patients have undergone radiation as part of their chosen cancer treatments in addition to one or two mastectomies. The processes of irradiating the tissue surrounding the cancer site leaves significant histological changes to include, but not limited to, atrophy and atypia of the epithelia, calcification in the fibrous tissue walls and thickening of the lumen of vessels.²

RELEVANT ANATOMY AND PHYSIOLOGY

The latissimus dorsi muscle is a broad flat superficial muscle of the lower part of the back that originates mostly in a broad aponeurosis attached to the spinous processes of the vertebrae of the lower back, the supraspinal ligament and the crest of the ilium, and is inserted into the bicipital groove of the humerus. It is the largest muscle in the body, spanning 20 to 40 centimeters, which makes for an ideal muscle to use in the coverage of extremely large wounds. In the event of a complex or massive wound the pedicle can be combined with the serratus, scapular or parascapular flaps to create adequate coverage.⁵ Blood supply is provided by the thoracodorsal artery via the subscapular

artery and nerve innervation is provided by the thoracodorsal nerve.²

The chest muscles lie inferior to breast tissue and the pectoralis fascia. These muscles are composed of the pectoralis major, the pectoralis minor and intercostal muscles of the ribs and can cover portions of the anterior serratus muscle. The pectoralis major muscle originates at the anterior surface of the sternum and inserts into the anterior surface of the medial half of the clavicle.³

SURGICAL INTERVENTION

Positioning and Positioning Aids

This procedure requires equipment for two stages of positioning. For induction, the patient is placed supine on a reversed ACMI surgical bed that has been prepared with the following layers; fitted sheet, bean bag, three-quarter gel pad, fitted sheet and two chuck pads. The patient's legs are dressed in knee-high compression stockings and sequential compression devices to prevent the formation of deep venous thrombosis. The patient's feet are placed in foam booties and the Velcro is secured loosely across the arch. Following induction, the patient is then rotated to the contralateral side, padded with pillows and the beanbag is put under suction to maintain positioning of the patient. Per surgeon preference, the beanbag is to remain under suction until the patient is placed into the supine position. The dispersive electrode for the electrosurgical unit is applied to the thigh, avoiding any bony prominences, joints, implants, tattoos or scars. An axil-



Pre op 1 reconstruction

Left latissimus reconstruction is completed. Healthy myocutaneous flap is shown and expansion through tissue expanders is ongoing.



Interim

Second latissimus surgery has been performed on this patient. Both tissue expanders have been filled to the desired size. The tissue expanders will remain in the patient for 3 months before being exchanged for implants and the nipples reconstructed.

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lary roll is placed under the down arm and the contralateral arm placed in an airplane splint, which is abducted and rotated superiorly. This positioning allows access to the axilla for both dissection and tunneling of the musculocutaneous flap. Two safety straps are used to secure the lower extremities to the bed at two to four inches above and below the knee. The surgical gown is reversed laid across the hips and a drape is taped to the gown and to the edges of the table. This draping technique is used to prevent any adverse adhesive reaction of the skin.

Following the dissection and tunneling of the latissimus dorsi musculocutaneous flap, the beanbag will be deflated, removed and the patient will be returned to the supine position. The patient will need to be positioned upright to ensure proper placement of the implant within the chest pocket and

inframammary fold. This will allow for the implant or tissue expander to be placed with the greatest accuracy.

SKIN PREPARATION AND DRAPING

The patient's skin is prepped beginning at the chin, extending the length of the torso to the level of the iliac crests and down to the table at the sides including the axilla. Per surgeon's preference, the patient is prepped with slightly diluted chlorhexidine cleanser. The surgical site is then blotted to remove excess skin preparation solution so the draping can begin. The surgeon and the assistant drape off the patient using blue towels, a three-quarter drape and a large antimicrobial incise drape that has been cut into thirds. The antimicrobial incise drape is used to affix the blue towels to the sides and across the hips of the patient. A disposable U-bar drape is used to drape off the lower half of the patient and extended out to cover the lower extremities while a top sheet is placed at the neck and secured to two IV poles by the anesthesia provider.

PROCEDURE

Once the patient is properly positioned and draped, the first incision is performed on the chest, through the previous mastectomy scar. The scar is infiltrated with local containing epinephrine and opened in its entirety. Through this incision the pectoralis major is released from its costal attachments at the inframammary fold and minimally at the inferior aspect of the sternum. Radiation has transformed



Anterior view of markings and positioning



Posterior view of markings and positioning



Superior cutaneous flap dissection from latissimus



Latissimus flap raised from attachment points



Latissimus tunneling through axilla



Anterior view of tunneled latissimus. Ready for setting and tissue expander insertion.



The flap is sewn into place following tissue expander placement.

the skin and pectoralis muscle into thin and undesirable tissue. In most cases, the pectoralis provides little assistance in daily living activities and will continue to atrophy following the dissection.

Once released, the skin is then dissected from the muscle following the pectoralis tendon high into the axilla to create the anterior portion of the passageway needed for the latissimus dorsi flap. Damp sponges are placed into the chest wound and attention was turned to the patient's back.

A 17 x 7 cm ellipse was previously marked obliquely on the patient's back following relaxed lines of tension. The superior edge of the cutaneous flap outline is used for the initial incision. This edge is injected with local containing epinephrine, incised and the incision was carried down to the latissimus muscle. The superior cutaneous flap is raised first and dissected toward the axilla. The skin is temporarily pulled inferiorly and manipulated to ensure that the donor site as marked can be comfortably closed. The inferior border of the cutaneous flap is incised and taken inferiorly until 8 cm of latissimus muscle is exposed. The cutaneous paddle is intentionally placed high on the latissimus muscle to allow for the suturing of the muscle to the inframammary fold at closure. The distal end is dissected away from its origin at the posterior crest of the ilium and is continued from the lateral surface of the lumbar vertebrae (L1-5), thoracic vertebrae (T7-12) and the posterior surface of the lower three ribs.⁸ Larger perforating blood vessels are ligated and divided using hemoclips. The muscle harvest is then completed and the pedicle remains attached. Precautions are taken to not elevate the serratus muscle or any of its fatty tissues and to protect the serratus branch of the thoracodorsal trunk. If the blood supply from the main thoracodorsal trunk has been sacrificed at the time of mastectomy, collateral circulation via reverse flow from the serratus branch of the artery can provide alternate blood supply.

Once a clear tunnel is formed via the axilla, a 2-0 nylon suture is placed in the lateral edge of the musculocutaneous flap to assist in transfer and correct orientation through the axilla. The suture should pass through both skin and muscle to prevent traction on perforating vessels while the flap is passed through the tunnel. This flap is then passed to the front of the patient and is stapled into place and covered with an antimicrobial incise drape for a temporary hold during repositioning.

Two 15-round Blake drains are placed inferior to the wound edge using a #15 blade for the stab incision and sewn into place using a 3-0 nylon suture. The wound is closed with 3-0 and 4-0 polyglactin 910 at the deep and superficial

layers. A 4-0 poliglecaprone 25 is used to close the skin.

For the transition, the CST remains sterile as the surgeon and first assist remove the drapes and beanbag and reposition the patient to the supine position for the tissue expander placement and flap inset. Removal of the beanbag allows for the patient to be safely seated in the upright position during the next phase of the procedure. The arms are rested comfortably on ratcheted arm boards that have been prepared using a 90-degree wedge covered with one egg crate and a blue towel. This is secured to the arm board using three bands of silk surgical tape. The arms are placed in an abducted position to relax the pectoralis muscles during surgery and minimize traction on the brachial plexus. A second egg crate is placed over the patient's arm, covering from elbow to wrist and a gauze bandage roll is used to circumvent the padding. This is secured with two bands of silk tape. Special attention is paid to the IV site, ensuring the IV clamps and flanges do not press into the patient's skin once draped. If this is a concern, a 2x2 gauze can suffice as padding between the IV tubing and the patient. It is crucial the arms and padding are tightly secured to the arm boards as the patient will be placed in a sitting position intermittently throughout the procedure. Finally, a pillow is placed under the patient's knees to relieve lower back strain and a safety strap is placed two inches above the knee.

Once the patient is secured, she is placed in a full upright sitting position by use of the mechanical bed. The surgeon then adjusts the patient's shoulders, arms, hips and torso until the patient is sitting straight and shoulders are level. The patient is returned to the supine position, the antimicrobial incise drape is removed and the patient's skin is again prepped from the chin to umbilicus and down to table level. New drapes are placed and any equipment that may have had its sterility compromised is replaced. The patient is again draped and the surgeon and assistant change their gown and gloves, before all staples are removed from the flap site and the previously dissected pocket is checked for hemostasis.

Attention is now turned to elevating the inferior mastectomy flap appropriately. Prior to beginning the surgery, the inframammary fold was marked bilaterally on the patient. Dissection to the inframammary fold is done carefully, and symmetry is checked against the opposite side by bringing the patient to an upright position. If uncertain, the fold also can be checked against the approximate site of the pectoralis muscle insertion. The subpectoral dissection is performed by transecting the pectoralis muscle from the inframam-

mary fold and leaving a small cuff at the medial insertion site. The edge of the latissimus muscle is sewn into the medial cuff of the pectoralis muscle at the inframammary fold using 3-0 polyglactin 910s in an interrupted figure-eight fashion.

The width of the pocket is then measured and a compatible expander is chosen. The pocket is copiously irrigated with triple antibiotic irrigation and wound edges painted with betadine solution. The triple antibiotic irrigation is comprised of 100,000 units of bacitracin, 160mg of cefazolin and 2 grams of gentamicin mixed with a liter of 0.9% saline. The surgeon changes its gloves and the expander is opened to the back table and bathed in triple antibiotic solution. The tissue expander is infolded so as to present the back plate at the inframammary fold and completely flattened prior to insertion by using suction and a 21-gauge butterfly needle placed into the central port causing the air to be completely evacuated. If the expander is tabbed, the tabs are sewn in with 3-0 polyglactin 910 sutures. These tabs are located at the 4, 6 and 8 o'clock orientation of the expander. This technique is used to maintain positioning during post-op fill and the 3 to 6 months the tissue expander will remain implanted to allow the skin and muscle to relax and expand. Sterile injectable saline is added to the expander via the same 21-gauge butterfly needle found within the manufacturer's packaging of the expander. The expander is filled just enough as not to cause undue stress and tension on the skin. After being filled, the amount of saline is documented in the patient's chart along with the style, size and manufacturer's tracking number of the implant. A dose of 10 mL of 0.5% bupivacaine hydrochloride is placed into the pocket via a 10 mL control-top syringe without a needle attached. The remainder of the latissimus muscle is inset into the fold and laid out along the lateral edge of the tissue expander to provide full muscle coverage of the tissue expander. Superiorly, the latissimus muscle is draped over the pectoralis muscle and 3-0 polyglactin 910s are used in a figure-eight fashion to tack the edge of the latissimus to the pectoralis. A third 15-round Blake drain is placed through a stab wound and the drain is placed into the lower aspect of the pocket. The drain is sewn in with a 3-0 nylon suture.

If necessary for adequate and aesthetically pleasing closure, the mastectomy flap is tailored. If the patient has been radiated, this tissue is often very thin and does not stretch

well. The tissue from the tailoring is then set to pathology as mastectomy scar and reviewed for any cancerous signs. The musculocutaneous flap is also tailored and inset with 3-0 and 4-0 polyglactin 910s and a 4-0 poliglecaprone 25 is used at the skin.

Once all sutures and bulbs for the drains are placed, the drapes are removed and the remaining blood and fluids are wiped from the patient. A binder is placed to secure all dressings and provide slight compression on the wound sites. The circulator properly labels all drains to identify side, date, location and size of drain. The drains are secured to the patient's binder and the Foley catheter is left in place.

The patient is reversed, extubated and taken to the

Once the patient is properly positioned and draped, the first incision is performed on the chest, through the previous mastectomy scar.

recovery room. All sponges and needles counts are counted prior to closure.

SPECIAL CONSIDERATIONS

The skin of the back is slightly different in both color and texture than the skin of the chest. Many patients will have varying levels of skin differences of their reconstructed breasts. The reconstructed breasts will also have little to no sensation. The reconstructed nipples have no sensation at all as they are constructed from the skin and fatty tissues of the transferred skin. The areola color for the nipple reconstruction can be tattooed on with medical grade ink during an office visit. Patients are encouraged to match the color of their areolas to a color sample prior to mastectomy.

Patients will have one or two scars on their back that may prove to be difficult to hide under a bra or swimsuit. These scars can be horizontal, slightly diagonal or longitudinal along the lateral aspect of the body depending on the surgeon's approach.

If the inframammary fold is compromised during the mastectomy, or the patient has elected an immediate reconstruction, the surgeon may opt to use a cadaver derived implant or an animal-derived implant called. These dermal grafts are used within the wound and sewn to the fold using non-absorbable braided sutures in a figure-eight pattern.

POST-OPERATIVE CARE

The patient will spend as many as three days in the hospital to ensure adequate pain management, flap health and to monitor drainage. The three drains that are placed are removed when drainage volumes decline, typically at day 7 to 14 post op. Patients may shower after the breast drain is removed, typically two to seven days post op and a regular diet can be resumed immediately. Patients are cautioned to limit pulling, pushing and reaching with the affected arm.

COMPLICATIONS

In general, autologous breast reconstruction is more invasive and time intensive than a mastectomy or implant reconstruction. Flap procedures result in larger and multiple incisions that take longer to heal and may require a longer hospital stay. Post-operative complications can include seroma, infection, wound dehiscence, asymmetrical persistence, hematoma, implant rejection and necrosis. Complications are more readily seen in patients who are obese or tobacco smokers. Some studies have shown that complications in the reconstructed breast were more frequent in the irradiated patients (39%) than in the nonirradiated patients (25%).⁴

RESTORING FUNCTION

Following reduction surgery, many women are able to return to active lifestyles following a six-week hiatus from strenuous activities. These activities can include, but are not limited to, running, biking, climbing, cleaning, sitting straight and traveling. The latissimus dorsi muscle is considered expendable because no significant loss of adduction or rotation of the arm occurs if the other muscles of the shoulder girdle are intact. In patients who use crutches or are wheelchair bound, it is suggested that they consider other options before sacrificing the latissimus dorsi muscle.⁶

For those who are affected by cancer and have elected to remove their breast tissue prophylactically due to family history or tested positive for the BRCA gene, the support of their medical team and friends and family can make the process more comfortable not only for the acceptance of the physical transformation but for the mental transformation as well. The unknown of what one will look like after reconstruction can be a heavy burden on women and their partners. Many books have been published showing real women in various stages of reconstruction. These books can help couples and individuals to understand their bodies will have sensuality after surgery and to provide comfort in the journey they are about to embark on.

Finding natural breasts that are identical is rare, as nature often does not produce perfect symmetry. Reconstructive surgery provides an opportunity to create more symmetrical breast since surgeons can essentially start from a blank canvas. An autologous tissue reconstruction, such as a latissimus musculocutaneous flap, is an extensive and multi-staged process that can provide patients seeking breast reconstruction a more aesthetically pleasing outcome. When a patient elects to have only one side reconstructed, it may be advised to have an augmentation, mastopexy or reduction on the contralateral side to ensure symmetry. There are a growing number of options for breast cancer patients and educating oneself on the best option for their specific diagnosis is the first step.



ABOUT THE AUTHOR

Leah-Marie Guill became a surgical technologist after working as a veterinary assistant and falling in love with the surgical procedures and advancements she observed. She is a Certified Surgical Technologist, and earned her associate degree in surgical technology from the College of Western Idaho and a bachelor of science from the University of Idaho in physical education with an emphasis in biology. She currently works as a private assistant for a plastic surgeon in Boise, Idaho, and is the vice president of the Idaho State Assembly of the Association of Surgical Technologists.

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