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Upper Limb Reconstruction with Latissimus Dorsi Flap

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ABSTRACT

The latissimus dorsi flap (LDF) is a surgical technique used by surgeons to rebuild many different types of breast cancer surgical defects, such as modified radical mastectomy, quadrantectomy, and lumpectomy. The LDF can be utilized as an autogenous flap alone, in conjunction with implant-based immediate reconstruction, in conjunction with tissue expanders for a phased reconstruction, or in either case, either immediately or later. During breast reconstruction, the LDF is a dependable soft tissue covering option that offers shape and function with manageable short- and long-term morbidities. When tissue is scarce, the LDF can help by providing tissue volume in autologous reconstruction. It can also serve as a dependable vascular pedicle for implant-based repair in situations when the tissue has been exposed to radiation.

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LATISSIMUS DORSI FLAP WITH BREAST SURGERY INDICATIONS

The LDF has several distinct signs. For patients who are not candidates for the TRAM flap because of past abdominoplasty, prior TRAM, inadequate abdominal skin or fat, or high-risk comorbidities including diabetes, obesity, or tobacco use, the LDF is the first choice of treatment for autogenous breast cancer reconstruction. The LDF can be utilized to supply the ischemic chest wall with well-vascularized tissue in patients whose breasts have undergone radiation treatment. Additionally, the LDF can supply tissue to enhance thin or erratic skin flaps over an implant, rectify faults resulting from a partial mastectomy or lumpectomy, or optimize the cosmetic results of a preventive mastectomy. The latissimus muscle should not be used in conjunction with a posterior lateral thoracotomy, which divides the muscle and its blood supply, or a division of the thoracodorsal nerve during an axillary node dissection, which results in an atrophic muscle [1-3].

LATISSIMUS DORSI FLAP ANATOMY

The posterior trunk is covered by the flat, triangular latissimus dorsi muscle, which rests its superior medial section deep to the trapezius muscle and its remaining portion immediately under subcutaneous tissue. The iliac crest, the inferior angle of the scapula, the spinous processes of the lower 6th or 7th thoracic, lumbar, and superior sacral vertebrae, and the exterior surface of the third or fourth most inferior ribs are among the muscle sources. The muscle fibers extend in the direction of the axilla, where they enter the humerus's intertubercular groove as a wide tendon. Notably, the latissimus dorsi muscle fibers converge superiorly with teres major fibers to create the posterior axillary fold, and they establish an aponeurotic connection with the lower border of the serratus anterior. The latissimus dorsi secures the tip of

the scapula against the posterior chest wall and adducts, extends, and rotates the humerus medially. The muscle is replaceable; the shoulder girdle muscles maintain their functions when it is not there [4-6].

The latissimus dorsi muscle is categorized as type V12 by Mathes and Nahai; the thoracodorsal artery is its major pedicle, while perforators off the lumbar artery and posterior intercostal arteries supply segmental circulation to the muscle. Large in diameter and anatomically variable, the thoracodorsal artery offers a very dependable blood supply. The vessel enters the serratus muscle through the underside of the latissimus in the posterior axilla, branches into the muscle, and then splits into a tiny transverse branch and a big lateral descending branch. Furthermore, anything on the muscle might have a skin island design because to the many musculocutaneous perforators [6].

OPERATIVE TECHNIQUE

Maximizing the soft tissue covering offered by the flap while reducing the extent of donor site defect and donor site problems is the aim of optimum operational technique. Preoperatively, while the patient is in an upright position, markings are made on the following areas: the lateral margin of the latissimus along the posterior axillary line, the superior margin at the tip of the scapula, the inferior margin at the iliac crest, and the midline, inframammary fold, and lateral edge of the breast tissue. The skin paddle can be oriented vertically, obliquely, or transversely; each orientation has benefits and drawbacks for tissue harvesting, dissection, and the final scar [7, 8].

The patient is positioned in the lateral decubitus position for unilateral flap elevation or the prone position for bilateral flap elevation in the operating room. The deep fat is left linked to the back skin flaps after dissection, which takes place behind the thoracolumbar fascia. The latissimus is isolated from the trapezius fibers superomedially, the teres major fibers in the axilla, the paraspinous muscle fascia, the lumbosacral fascia, and the vertebral column at the lateral boundary. Following the thoracodorsal vessels' identification, the latissimus is separated close to where it attaches to the humerus. Next, a subcutaneous tube in the axilla is used to transfer the myocutaneous or myofascial flap to the mastectomy defect [7, 8].

After that, the patient is put to sleep, and the surgeon proceeds with the flap placement based on the kind of reconstruction. In a two-stage reconstruction, a tissue expander can be positioned deep to both muscles or between the latissimus and the pectoralis major. The latter position may provide more creative flexibility. For instance, the latissimus positioned inferiorly can provide a natural ptosis, while the pectoralis major can cover the top pole. Next, the latissimus is sutured inferiorly and medially to the fascia and underlying muscle. Extra sutures along the anterior axillary line help to shield the pedicle from undue strain and stop flap or implant migration. To achieve the appropriate volume and projection of the breast in a fully autogenous LDF, the cutaneous paddle is shaped into an asymmetric U and the distal fat and muscle are folded under [7, 8].

Figure 1. Breast reconstruction using latissimus dorsi flap.

COMPLICATIONS

In breast reconstruction with LDF, donor site seroma at the harvest site is the most frequent complication. If the surgical drain has already been removed, the treatment for seromas is either outpatient aspiration or extended suction drainage. The surgeon may employ quilting sutures or a fibrin sealant at the donor site defect at the time of wound closure in order to prevent this morbidity. The patient will also be urged to refrain from using their upper extremities excessively, which might result in shearing pressures, during the postoperative phase [9, 10].

Because the thoracodorsal artery provides a dependable circulatory supply to the LDF, ischemic problems are rare. There is very little chance of flap necrosis, even in individuals who smoke or have diabetes. The rate of partial flap necrosis was reported by Hokin and Silfverskiold to be 7%. Severe flap necrosis is rare and typically results from twisting of the flap on its pedicle causing pedicle thrombosis or vascular pedicle damage during the surgical dissection [9].

Dorsal hernia, loss of shoulder mobility, shoulder weakness, hollowness at the harvest site, and winged scapula are examples of additional donor site morbidity. Smith conducted a literature review involving 11 studies and concluded that while LDF reconstruction does result in impaired shoulder range of motion, strength, and functioning, these effects usually resolve within 12 months postoperatively. Additional studies that demonstrated comparable improvements in shoulder function corroborated Smith's findings [11].

The patient may suffer from device migration, device extrusion, or periprosthetic infection if a tissue expander or implant is employed. At first, capsular contracture was reported to occur often and was a source of contention for the

LDF. Tissue expanders can lessen the surprising aesthetic effect caused by lowered rates of contracture, as reported in more recent case series. This is especially true when permanent implants are placed before the expanders are used.

CONCLUSION

With acceptable perioperative and long-term morbidities, the LDF is one of the many breast reconstruction procedures that is a flexible and dependable way to cover soft tissue for a range of breast abnormalities. The LDF is still utilized in autogenous and implant-based breast reconstruction, both immediate and delayed, despite being surpassed by the TRAM and DIEP flaps for primary autogenous breast reconstruction in the 1980s and 1990s.

Apart from its adaptability, the LDF yields dependable outcomes. Donor site morbidity, while documented, is rare (donor site hernia), treatable (donor site seroma), or goes away with time (shoulder function). In comparison to other breast reconstruction techniques such as the DIEP flap and TRAM flap, the rates of extra postoperative problems are deemed acceptable. The adaptability of this workhorse flap is further enhanced by a group of 277 patients that showed tolerable flap and donor site problems with the LDF in obese and overweight individuals as well.

The extended LDF, the scarless method, and the muscle-sparing LDF or TDAP flap are some of the modifications to the classic LDF that further expand this technique's usefulness to a variety of patient circumstances. Because the surgeon may now define the inframammary fold, induce ptosis, and reduce donor site scarring, the cosmetic result can also be achieved with greater flexibility thanks to these advancements.

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