

The Role of the Rotational Pedicled Latissimus Dorsi Flap in Post-Mastectomy Reconstruction: Indications, Surgical Considerations, Outcomes and Complications

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ABSTRACT

Background: The pedicled latissimus dorsi flap remains one of the most reliable options for breast and chest-wall reconstruction after mastectomy. Although abdominal free flaps and implant-based techniques are widely used, the rotational latissimus dorsi flap continues to offer important advantages in selected patients, particularly when vascularized tissue is needed, when local skin quality is compromised, or when microsurgical options are unavailable or contraindicated.

Objective: This narrative review analyzes the current role of the rotational pedicled latissimus dorsi flap in post-mastectomy reconstruction, with emphasis on indications, surgical planning, technical variants, clinical outcomes, complications, and its contemporary position compared with implant-based and perforator-based alternatives.

Methods: A structured literature review was performed using PubMed-indexed articles published mainly within the last five years. The search focused on terms related to “latissimus dorsi flap,” “pedicled latissimus dorsi flap,” “mastectomy,” “postmastectomy reconstruction,” “breast reconstruction,” “chest wall reconstruction,” “fat transfer,” “seroma,” “donor-site morbidity,” and “endoscopic latissimus dorsi flap.” Articles were prioritized when they addressed indications, outcomes, technical refinements, fat-augmented reconstruction, implant-assisted reconstruction, salvage procedures, radiotherapy, patient-reported outcomes, and complications.

Results: Current evidence supports the latissimus dorsi flap as a versatile reconstructive option for immediate, delayed, secondary, and salvage reconstruction after mastectomy. Its main strengths include a dependable thoracodorsal pedicle, broad arc of rotation, ability to deliver well-vascularized tissue to compromised recipient beds, and compatibility with implants or immediate fat transfer. Modern refinements include muscle-sparing variants, fat-augmented latissimus dorsi reconstruction, endoscopic or scarless harvest, volume-prediction formulas, ERAS pathways, and adjunct regional anesthesia. The most frequent complication remains seroma at the donor site, followed by wound dehiscence, infection, skin-flap necrosis, hematoma, donor-site scar dissatisfaction, shoulder dysfunction, and flap animation.

Conclusion: The rotational pedicled latissimus dorsi flap should not be considered an obsolete technique. Rather, it remains a reproducible, safe, and adaptable reconstructive workhorse in selected post-mastectomy patients, particularly in irradiated fields, large soft-tissue defects, implant failure, high-risk patients, and centers without routine microsurgical capability. Its contemporary value depends on careful patient selection, meticulous donor-site management, individualized volume restoration, and prevention of seroma and functional morbidity.

KEYWORDS: latissimus dorsi flap; pedicled flap; mastectomy; breast reconstruction; postmastectomy reconstruction; chest wall reconstruction; rotational flap; fat grafting.

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1. INTRODUCTION

Breast reconstruction after mastectomy has evolved from a purely restorative procedure into a patient-centered reconstructive strategy that integrates oncologic safety, soft-tissue coverage, aesthetic restoration, functional preservation, and quality of life. Contemporary reconstructive options include implant-based reconstruction, abdominal free flaps, perforator flaps, local fasciocutaneous flaps, fat grafting, and hybrid procedures. Within this expanding reconstructive armamentarium, the pedicled latissimus dorsi flap (LDF) continues to occupy a relevant and clinically useful position. The latissimus dorsi flap is a classic regional flap based on the thoracodorsal vascular pedicle. Its proximity to the breast and anterior chest wall, reliable vascularity, broad arc of rotation, and relatively straightforward harvest make it particularly useful for post-mastectomy reconstruction and coverage of complex chest-wall defects. Despite the increasing popularity of abdominal free-tissue transfer, the LDF has regained attention due to technical refinements, improved perioperative care, integration with fat grafting, endoscopic harvest, and its usefulness in high-risk reconstructive settings [1–4].

The current role of the rotational pedicled LDF is no longer limited to a traditional muscle-transfer procedure combined with an implant. Recent literature has described multiple modern applications, including fat-augmented latissimus dorsi (FALD) reconstruction, latissimus dorsi with immediate fat transfer (LIFT), muscle-sparing techniques, scarless donor-site approaches, endoscopic-assisted harvest, robotic-assisted harvest, and secondary salvage after implant failure [2,5–12]. These developments have broadened indications and reduced some historical limitations, particularly insufficient volume and donor-site morbidity. Nevertheless, the LDF remains associated with specific complications. Seroma is consistently reported as the most frequent donor-site problem, and wound dehiscence, infection, hematoma, skin-flap necrosis, donor-site contour deformity, functional shoulder impairment, chronic pain, and flap animation may also occur [13–15]. Therefore, a modern review of the LDF must balance its reliability and versatility with a realistic discussion of complications and patient selection.

This narrative review summarizes the current evidence regarding the rotational pedicled latissimus dorsi flap in post-mastectomy reconstruction, focusing on indications, anatomy, surgical considerations, outcomes, complications, and decision-making.

2. METHODS

A structured narrative review was conducted using PubMed-indexed literature published mainly from 2021 to 2026. The search was designed to identify contemporary evidence on

the role of the pedicled latissimus dorsi flap in post-mastectomy breast reconstruction and chest-wall reconstruction.

The following search strategy was used in PubMed: (“latissimus dorsi flap” OR “pedicled latissimus dorsi flap” OR “myocutaneous latissimus dorsi flap” OR “muscle-sparing latissimus dorsi flap”) AND (“mastectomy” OR “postmastectomy reconstruction” OR “breast reconstruction” OR “chest wall reconstruction”). Additional searches included combinations with “seroma,” “donor-site morbidity,” “fat transfer,” “fat-augmented latissimus dorsi,” “LIFT,” “endoscopic latissimus dorsi flap,” “implant failure,” “radiotherapy,” and “salvage reconstruction.”

Priority was given to systematic reviews, meta-analyses, comparative studies, institutional case series, technical refinements, and studies evaluating surgical outcomes, complications, patient-reported outcomes, radiotherapy, obesity, salvage reconstruction, fat grafting, and minimally invasive harvest. Older foundational literature was not included in the main reference list because the objective was to build a contemporary review focused on recent PubMed-indexed evidence.

Because this study is a narrative review of previously published literature and does not involve individual patient data collected by the authors, institutional review board approval and informed consent were not required.

3. SURGICAL ANATOMY AND RATIONALE

The latissimus dorsi is a broad, thin, triangular muscle located in the posterior trunk. It is supplied primarily by the thoracodorsal artery and vein, which arise from the subscapular system. This vascular anatomy allows the flap to be transferred as a pedicled regional flap to the anterior chest without microvascular anastomosis. The flap can be harvested as a pure muscle flap, myocutaneous flap, extended myocutaneous flap, muscle-sparing flap, or combined with adipofascial tissue and fat grafting, depending on reconstructive requirements.

The principal reconstructive advantage of the LDF is its ability to transfer well-vascularized tissue into a post-mastectomy field. This is particularly valuable when the mastectomy skin envelope is compromised, when there is prior radiotherapy, when a large chest-wall defect requires coverage, or when an implant requires additional soft-tissue protection [13,16–19]. Because the flap is pedicled, it avoids the complexity and resource demands of microsurgery while still providing vascularized autologous tissue.

The pedicled latissimus dorsi flap is based on the thoracodorsal vascular pedicle and can be rotated toward the anterior chest wall without microvascular anastomosis, as illustrated in Figure 1 [13,20].

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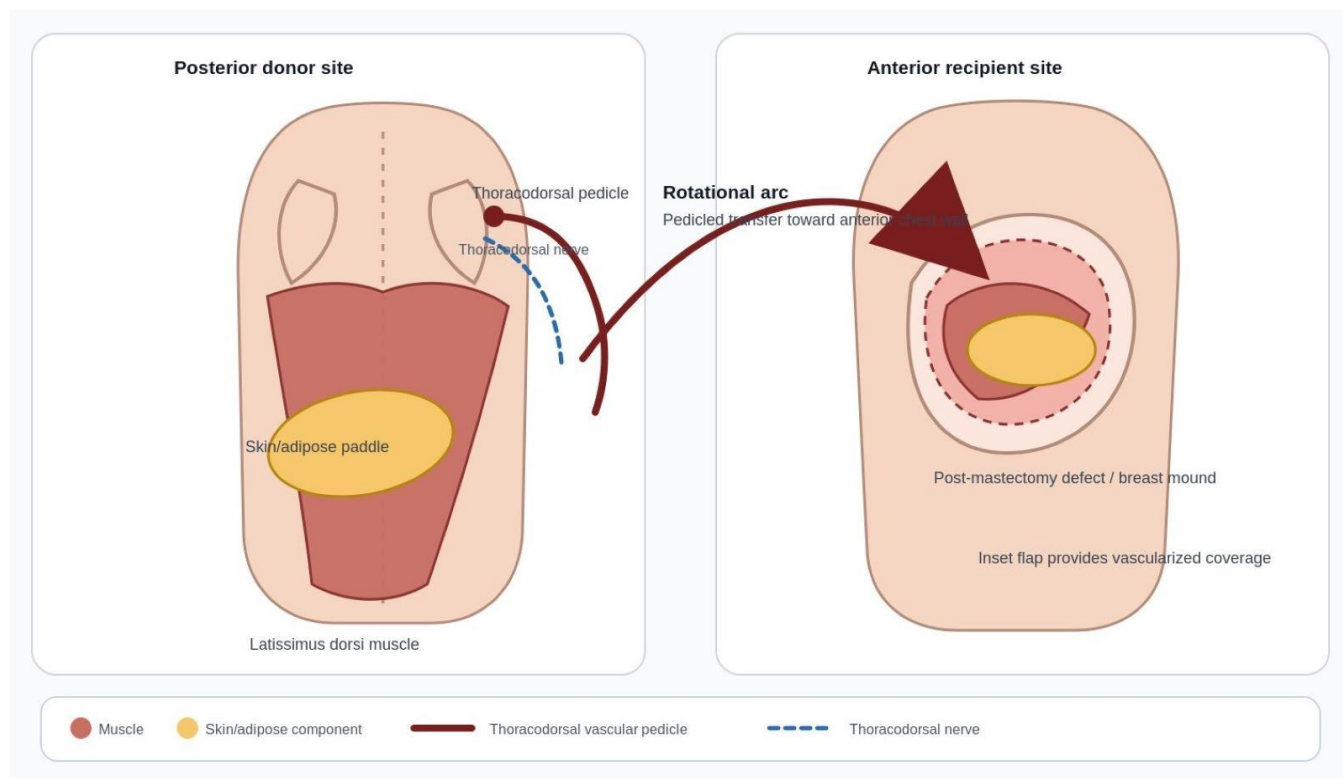


Figure 1. Surgical anatomy and rotational arc of the pedicled latissimus dorsi flap.

Original schematic showing the posterior donor site, latissimus dorsi muscle, thoracodorsal vascular pedicle, thoracodorsal nerve, skin/adipose paddle, and arc of rotation toward the anterior post-mastectomy chest-wall defect. The flap can be transferred as a pedicled regional flap to provide vascularized soft-tissue coverage for breast or chest-wall reconstruction. Original illustration by the authors, based on published descriptions of latissimus dorsi flap anatomy and reconstruction [13,20,21].

The arc of rotation allows the flap to reach the anterior thoracic wall, lower pole of the breast, axilla, and central post-mastectomy defect. Traditional harvest involves a posterior or posterolateral donor-site incision. However, contemporary approaches attempt to reduce donor-site visibility through anterior, scarless, axillary, endoscopic, or robotic-assisted techniques [2,8,10,18,22,23,24,25].

4. CURRENT INDICATIONS

4.1 Immediate Post-Mastectomy Reconstruction

Immediate reconstruction with the LDF is appropriate when breast reconstruction is planned at the time of mastectomy and the patient requires robust soft-tissue coverage. The flap may be used alone in selected patients with small-to-moderate breast volume or combined with an implant when additional projection is necessary [3,7,19,23,26].

Immediate LDF reconstruction is particularly useful in patients with thin mastectomy flaps, questionable skin perfusion, or anticipated need for improved lower-pole implant coverage. It can also be considered when acellular dermal matrices are unavailable, contraindicated, or cost-

prohibitive. Recent studies have reported favorable safety profiles for single-stage latissimus-implant reconstruction and expanded LDF techniques [3,7].

4.2 Delayed Reconstruction

Delayed reconstruction remains a common indication for the LDF, especially in patients previously treated with radiotherapy or those who did not undergo immediate reconstruction. In delayed settings, the LDF provides healthy vascularized tissue to a scarred or irradiated recipient bed, improving soft-tissue quality and allowing either autologous or implant-assisted reconstruction [4,27,28].

Muscular and myocutaneous variants may both be used in delayed reconstruction. Comparative data suggest that patient satisfaction can be high with either approach, while muscle-only or muscle-sparing techniques may reduce donor-site scar burden in selected patients [4,9].

4.3 Salvage After Implant Failure

One of the strongest contemporary indications for the LDF is salvage reconstruction after implant-related complications. Capsular contracture, implant exposure, infection, mastectomy skin-flap necrosis, and implant loss are challenging scenarios in which implant exchange alone may be insufficient. The LDF can introduce vascularized tissue, improve coverage, and permit either implant replacement or conversion to a more autologous reconstruction [29].

This indication is particularly relevant after post-mastectomy radiotherapy, where implant-only reconstruction carries higher risk of failure. Recent studies support LDF

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replacement or combined implant-LDF strategies as useful rescue options after serious implant complications [19,29].

4.4 Large Chest-Wall Defects and Locally Advanced Breast Cancer

In patients undergoing mastectomy for locally advanced breast cancer, recurrent disease, angiosarcoma, or extensive soft-tissue resection, primary closure may not be possible.

The rotational LDF can provide reliable coverage of anterior chest-wall defects and may facilitate timely wound healing, reduce exposed structures, and prevent delays in adjuvant therapy [13,30].

In extensive resections for locally advanced or large breast tumors, the pedicled LDF may provide reliable chest-wall coverage and facilitate closure of complex defects, as shown in Figure 2 [13].



Figure 2. Latissimus dorsi flap coverage after wide excision of a large breast tumor.

Preoperative and postoperative views of a male patient with a large breast cancer treated with wide excision and latissimus dorsi flap defect coverage. Reproduced from Banys-Paluchowski et al. [13] under the Creative Commons Attribution 4.0 International License. Cropped and arranged for layout.

In these cases, the reconstructive objective may be functional coverage rather than aesthetic breast mound restoration. The LDF can also serve as a bridge to later definitive reconstruction, including abdominal flap reconstruction once oncologic surveillance and tissue healing are adequate [30].

4.5 High-Risk Patients and Limited Microsurgical Availability

The LDF is useful in patients who are poor candidates for abdominal free flaps, including those with inadequate abdominal tissue, previous abdominal surgery, comorbidities,

smoking, coagulation disorders, or preference for shorter surgery [14,31,32]. It is also relevant in centers without reliable microsurgical infrastructure. Marchica et al. emphasized that pedicled LDF and thoracodorsal artery perforator-based options remain valuable alternatives to microsurgery in selected high-risk patients [14].

4.6 Small-to-Medium Breast Volume Reconstruction

Autologous reconstruction with LDF alone is often limited by insufficient volume. However, this limitation has been reduced by extended flap designs, FALD, LIFT, and staged or immediate fat grafting [15,16,21,28,33,34,35]. These techniques are particularly appropriate for small-to-medium breast volumes and for patients who prefer to avoid implants. The main contemporary indications for pedicled latissimus dorsi flap reconstruction after mastectomy are summarized in Table 1 [3,4,7,13,14,19,23,26-32].

Table 1. Main indications for pedicled latissimus dorsi flap reconstruction after mastectomy.

Indication	Clinical scenario	Why LDF is useful
Immediate reconstruction	Thin mastectomy flaps, implant-assisted reconstruction	Adds vascularized tissue and improves coverage
Delayed reconstruction	Reconstruction after oncologic treatment	Provides vascularized tissue to scarred field
Salvage after implant complications	Implant exposure, infection, capsular contracture	Reinforces or replaces failed prosthetic reconstruction

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Prior/planned radiotherapy	Irradiated chest wall or high-risk implant-only case	Improves soft-tissue quality and coverage
Large chest-wall defect	Locally advanced tumor or extensive skin resection	Broad arc of rotation and dependable coverage
High-risk patient	Not ideal candidate for free flap/microsurgery	Pedicled flap avoids microvascular anastomosis
Small-to-medium autologous reconstruction	Patient prefers avoiding implants	FALD/LIFT improves volume with fat transfer

LDF: latissimus dorsi flap; FALD: fat-augmented latissimus dorsi flap; LIFT: latissimus dorsi flap with immediate fat transfer. The table summarizes contemporary indications reported in recent PubMed-indexed literature on post-mastectomy reconstruction using pedicled latissimus dorsi flap techniques.

5. TECHNICAL CONSIDERATIONS

5.1 Preoperative Planning

Preoperative planning should include patient goals, oncologic treatment plan, prior radiation, body habitus, breast size, donor-site tissue availability, shoulder function, smoking status, comorbidities, and expectations regarding scars and symmetry. In patients requiring implant-assisted reconstruction, skin-flap quality and radiotherapy risk are critical considerations.

A careful physical examination of the back should assess soft-tissue thickness, skin redundancy, previous scars, and donor-site contour. Radiologic or anthropometric assessment may help estimate available flap volume in selected cases. Recent work has proposed formulas such as LD-V and FALD-V to estimate flap and fat-graft volume preoperatively [16,33]. Such tools may improve planning, especially when total autologous reconstruction is intended.

5.2 Patient Positioning

Traditional LDF harvest often requires lateral decubitus or position changes, which may increase operative time. Newer approaches aim to reduce operative complexity by allowing harvest without major repositioning or through anterior, axillary, scarless, or endoscopic routes [7,8,18,22]. No-position-change approaches may reduce surgical time while maintaining adequate flap harvest in selected patients [7].

5.3 Flap Design

The skin paddle can be oriented transversely, obliquely, vertically, or in a modified fleur-de-lis pattern depending on the defect, breast shape, and donor-site closure. Extended designs incorporate additional adipose tissue over the muscle to improve volume. Modified fleur-de-lis and bra-line approaches aim to increase skin and soft-tissue availability while optimizing scar concealment and posterior contour [17,36].

For implant-assisted reconstruction, the flap is frequently used to cover the lower pole or reinforce compromised mastectomy skin. In autologous reconstruction, extended flap harvest and fat grafting are used to enhance projection and volume.

Contemporary LDF reconstruction includes several technical variants, ranging from the traditional myocutaneous flap to extended, muscle-sparing, fat-augmented, and scarless/endoscopic approaches (Figure 3) [15,16,18,21,22,24,25,34,35].

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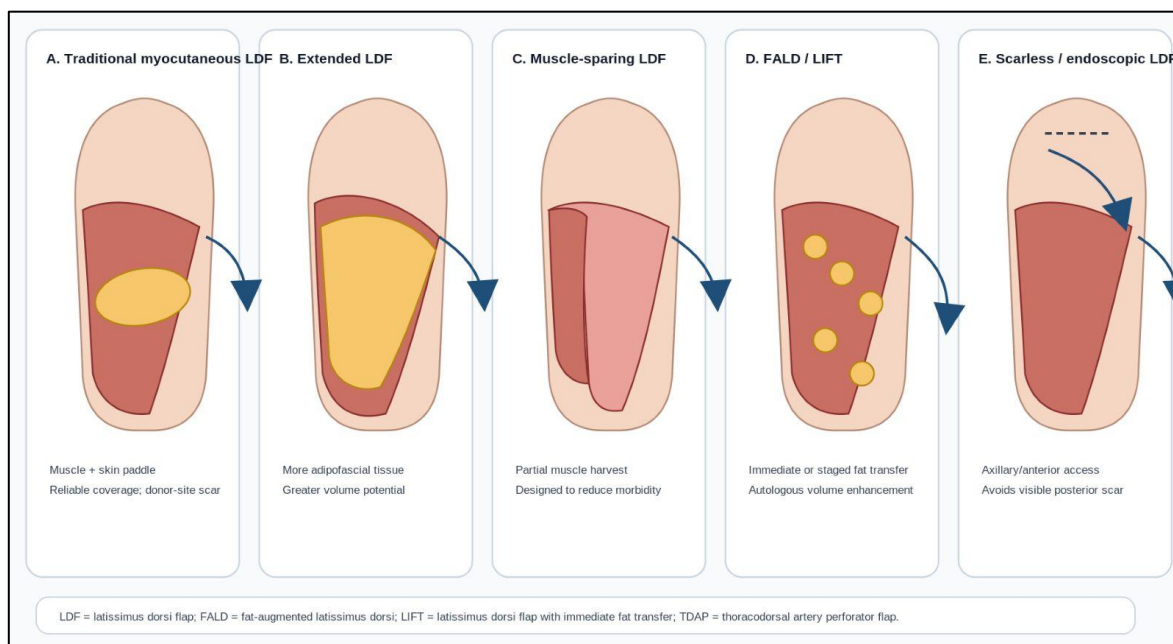


Figure 3. Technical variants of latissimus dorsi flap reconstruction after mastectomy.

Original schematic comparing five commonly described LDF-based reconstructive strategies: traditional myocutaneous LDF, extended LDF, muscle-sparing LDF, fat-augmented latissimus dorsi flap/latissimus dorsi flap with immediate fat transfer, and scarless or endoscopic LDF. These variants allow individualized reconstruction according to breast volume, donor-site tissue availability, implant requirement, functional concerns, and patient preference regarding visible donor-site scarring. Original illustration by the authors, based on PubMed-indexed technical and outcomes literature [15,16,18,21,22,24,25,34,35].

5.4 Pedicle Preservation and Rotation

The thoracodorsal pedicle must be identified and preserved. Careful dissection around the pedicle is essential to prevent vascular compromise. Once mobilized, the flap is rotated through a subcutaneous tunnel toward the anterior chest. The tunnel must be wide enough to avoid pedicle compression, twisting, or kinking.

The humeral insertion can be managed according to reconstructive goals and surgeon preference. Detachment may increase mobility but can influence function and animation. Preservation may reduce morbidity but limit reach in some cases. Flap inset should recreate the breast footprint or cover the chest-wall defect without tension.

5.5 Integration With Implants

The LDF can be combined with a tissue expander or permanent implant. In single-stage reconstruction, the implant provides volume while the flap provides vascularized soft-tissue coverage [3,19,23]. This hybrid approach remains useful in patients with inadequate autologous volume but sufficient tolerance for prosthetic material.

When radiotherapy is anticipated, careful counseling is required. Radiotherapy may increase capsular contracture,

fibrosis, implant malposition, and reconstructive revision. However, LDF coverage may reduce catastrophic implant exposure and provide more robust soft-tissue support than implant-only reconstruction [19].

5.6 Integration With Fat Transfer

Fat-augmented techniques represent one of the most important modern developments in LDF reconstruction. LIFT and FALD procedures aim to convert the LDF into a more autologous reconstructive option by adding immediate or staged fat grafting [15,16,21,28,33,34,35].

The advantages include avoidance or reduction of implant use, improved contour, improved upper-pole fullness, and better correction of volume deficiency. Limitations include the need for adequate donor fat, risk of fat necrosis, unpredictable resorption, and possible requirement for secondary grafting [21].

5.7 Minimally Invasive and Scarless Harvest

Endoscopic, axillary, anterior, robotic, and “no-back-scar” approaches attempt to preserve the advantages of the LDF while minimizing donor-site scar burden [2,8,10,18,22,23,24,25,27]. These techniques may improve patient satisfaction with the donor site, but they require specialized experience and may increase operative complexity.

6. OUTCOMES

6.1 Reliability and Flap Survival

The LDF is consistently described as a reliable flap with low complete flap-loss rates. In a large single-institution evaluation, Banys-Paluchowski et al. reported that the LDF remained useful for immediate reconstruction, defect coverage after large tumor removal, conversion after implant

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complications, and delayed post-mastectomy reconstruction, with rare serious adverse events and low flap-loss rates [13].

6.2 Aesthetic Outcomes

Aesthetic outcomes depend on breast size, flap volume, implant use, fat grafting, skin-paddle design, and contralateral symmetrization. Traditional limitations include insufficient volume and visible donor-site scarring. However, recent techniques such as FALD, LIFT, extended LDF, bra-line back-lift LDF, and scarless approaches have expanded aesthetic potential [15,16,22,28,33,34,36].

Comparative evidence suggests that muscle-sparing LDF and LDF-based strategies can achieve favorable aesthetic satisfaction and, in selected patients, may compare favorably with implant-only reconstruction [1,37].

6.3 Patient-Reported Outcomes

Patient-reported outcomes are increasingly important in reconstructive breast surgery. Satisfaction is influenced not only by breast shape but also by donor-site scar, back contour, number of surgeries, recovery, complications, and functional limitations. Studies using BREAST-Q and related instruments suggest that LDF reconstruction can produce high satisfaction when expectations are aligned and indications are appropriate [4,5,9,26,27,36].

6.4 Functional Outcomes

Because the latissimus dorsi contributes to shoulder adduction, extension, and internal rotation, functional morbidity is an important concern. Most patients tolerate harvest well, particularly when not elite athletes or highly dependent on upper-body strength. Nevertheless, shoulder stiffness, weakness, pain, and limitation of range of motion can occur [9,38]. Muscle-sparing, thoracodorsal perforator-based, and minimally invasive variants aim to reduce these functional consequences [9,14,25].

6.5 Reconstruction in Obese Patients

Obesity affects reconstructive planning. Increased body mass index may increase the thickness of the LDF and provide more donor tissue, but it may also increase wound complications, donor-site morbidity, seroma, and implant-related problems [31,32]. Recent radiologic and outcomes-based studies support individualized assessment rather than exclusion based on BMI alone [31,32].

7. COMPLICATIONS

Common complications and preventive strategies are summarized in **Table 2** [13,15,18-24,27,29,31,39].

Table 2. Common complications of pedicled latissimus dorsi flap reconstruction and prevention strategies.

Complication	Site/timing	Risk factors	Prevention/management
Seroma	Donor site, early postoperative	Dead space, obesity, extensive dissection	Drains, quilting sutures, compression, aspiration
Wound dehiscence	Donor or recipient site	Tension, obesity, smoking, diabetes	Tension-free closure, optimize comorbidities
Infection	Donor/recipient site	Implant use, necrosis, prolonged drainage	Antibiotic protocol, drain care, early treatment
Skin-flap necrosis	Recipient site	Thin flaps, radiation, poor perfusion	Perfusion assessment, vascularized LDF coverage
Hematoma	Donor or recipient site	Coagulopathy, inadequate hemostasis	Hemostasis, drain monitoring, evacuation if needed
Donor-site scar deformity	Back/flank, late	Large paddle, poor closure	Scar planning, bra-line/endoscopic/scarless options
Shoulder dysfunction	Early or late	Muscle harvest, poor rehabilitation	Muscle-sparing if suitable, physiotherapy
Flap animation	Late	Innervated muscle transfer	Counseling, fixation/denervation strategies

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Fat necrosis / volume loss	FALD/LIFT	High-volume grafting, radiation	Conservative/staged fat grafting
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LDF: latissimus dorsi flap; FALD: fat-augmented latissimus dorsi flap; LIFT: latissimus dorsi flap with immediate fat transfer.

Seroma remains the most common donor-site complication reported after LDF reconstruction, whereas complete flap loss is uncommon [13]. Prevention requires meticulous dead-space control, adequate drainage, tension-free closure, early recognition of wound complications, and structured shoulder rehabilitation.

7.1 Seroma

Seroma is the most common complication after LDF reconstruction. It usually occurs at the donor site and may require repeated aspiration, prolonged drainage, compression, quilting sutures, fibrin sealants, or ultrasound-guided drainage. In the large single-institution series by Banys-Paluchowski et al., seroma was reported as the most common complication, occurring in approximately one quarter of patients, with a substantial proportion requiring aspiration or drainage [13].

Seroma prevention should be considered a central component of LDF surgery. Practical strategies include meticulous hemostasis, preservation of lymphatic channels when possible, quilting or progressive-tension sutures, closed-suction drains, compression garments, early but controlled mobilization, and careful postoperative follow-up.

7.2 Wound Dehiscence and Infection

Wound dehiscence and surgical-site infection are less frequent than seroma but clinically important. They may occur at the donor site or recipient site and are more likely in smokers, obese patients, diabetics, irradiated tissue, and patients with large dead space. Preventive measures include tension-free closure, careful drain management, antibiotic prophylaxis according to institutional protocols, and optimization of modifiable risk factors.

7.3 Skin-Flap Necrosis and Hematoma

Mastectomy skin-flap necrosis can compromise implant-based reconstruction. One advantage of the LDF is that it provides vascularized coverage, which may protect against implant exposure in selected cases [18,19,23]. Hematoma is less common but can threaten flap perfusion and should be managed promptly.

7.4 Donor-Site Morbidity

Donor-site morbidity includes seroma, scar widening, contour deformity, pain, hypertrophic scarring, and dissatisfaction with posterior trunk appearance. Scarless, anterior, axillary, bra-line, and endoscopic approaches aim to reduce visible donor-site sequelae [18,22,23,27,36].

However, these methods may not be appropriate for all patients and require careful technique selection.

7.5 Shoulder Dysfunction

Shoulder dysfunction may manifest as weakness, reduced range of motion, stiffness, or discomfort. Preoperative counseling is important, particularly for athletes, manual laborers, and patients with preexisting shoulder pathology. Early physiotherapy and structured rehabilitation should be integrated into postoperative care.

7.6 Flap Animation

Flap animation is a distinctive complication in which contraction of transferred muscle causes visible breast movement or distortion. A retrospective analysis of more than 200 cases specifically evaluated animation after LDF breast reconstruction, highlighting the need to consider muscle denervation, fixation technique, and patient expectations [38].

8. COMPARISON WITH OTHER RECONSTRUCTIVE OPTIONS

8.1 LDF Versus Implant-Only Reconstruction

Implant-only reconstruction is less invasive at the donor site and may offer shorter initial operative time. However, it depends heavily on mastectomy skin quality and is vulnerable to complications in irradiated or thin soft-tissue envelopes. Systematic review evidence suggests that LDF reconstruction may be associated with lower revision rates, more natural aesthetic outcomes, and greater patient satisfaction in selected patients, although it carries donor-site morbidity [1]. The choice between implant-only and LDF-assisted reconstruction should consider radiotherapy, skin quality, patient preference, breast size, implant tolerance, and willingness to accept a donor-site procedure.

8.2 LDF Versus Abdominal Free Flaps

Abdominal free flaps such as DIEP and TRAM offer large autologous volume and often excellent aesthetic outcomes. However, they require microsurgical expertise, longer operative times, and have abdominal donor-site considerations. The LDF is less technically demanding, avoids abdominal morbidity, and can be useful in patients who are not candidates for abdominal flaps [14,21,35]. The LDF may not replace free flaps in all patients, but it remains valuable when microsurgery is unavailable, contraindicated, or not preferred.

8.3 LDF Versus Thoracodorsal Artery Perforator and Muscle-Sparing Options

Thoracodorsal artery perforator flaps and muscle-sparing LDF variants attempt to preserve muscle function while

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providing regional tissue. These may be especially useful when partial breast reconstruction or limited-volume replacement is required [9,14,25]. However, perforator dissection may be technically more demanding and may provide less bulk than traditional LDF.

8.4 LDF Versus Local Fasciocutaneous Flaps

Local fasciocutaneous flaps can close selected chest-wall defects but may be insufficient for extensive post-mastectomy wounds, irradiated tissue, or defects requiring substantial vascularized tissue. The LDF remains advantageous when more robust tissue transfer is needed. A practical comparison between pedicled LDF and other reconstructive options after mastectomy is presented in Table 3 [1,2,9,13,14,19-26,29,30,35,37].

Table 3. Comparison between pedicled latissimus dorsi flap and other reconstructive options after mastectomy.

Option	Advantages	Limitations	Best scenario
Pedicled LDF	Reliable vascularized tissue, broad rotation arc, useful in irradiated/complex fields	Seroma, donor-site scar, possible shoulder morbidity	Salvage, complex defects, implant reinforcement
Implant-only	Shorter surgery, no flap donor site	Higher risk with radiotherapy/thin skin, capsular contracture, exposure	Good skin envelope, low radiation risk
Abdominal free flaps	Large autologous volume, natural contour	Microsurgery, longer operative time, abdominal morbidity	Full autologous reconstruction
TDAP / muscle-sparing regional flap	Muscle preservation, lower functional morbidity	Technically demanding, less bulk	Selected partial/total reconstruction
Local fasciocutaneous flaps	Local tissue, less extensive dissection	Limited reach and volume	Small superficial chest-wall defects

LDF: latissimus dorsi flap; TDAP: thoracodorsal artery perforator flap; DIEP: deep inferior epigastric perforator flap; TRAM: transverse rectus abdominis myocutaneous flap. This comparison is intended as a practical decision-support summary and should be individualized according to patient anatomy, oncologic treatment, radiotherapy status, donor-site availability, implant preference, and local microsurgical resources.

9. PROPOSED DECISION-MAKING ALGORITHM

Based on current indications and patient-specific reconstructive needs, we propose a practical decision-making algorithm for selecting an LDF-based strategy after mastectomy (**Figure 4**) [13,14,19,21,29].

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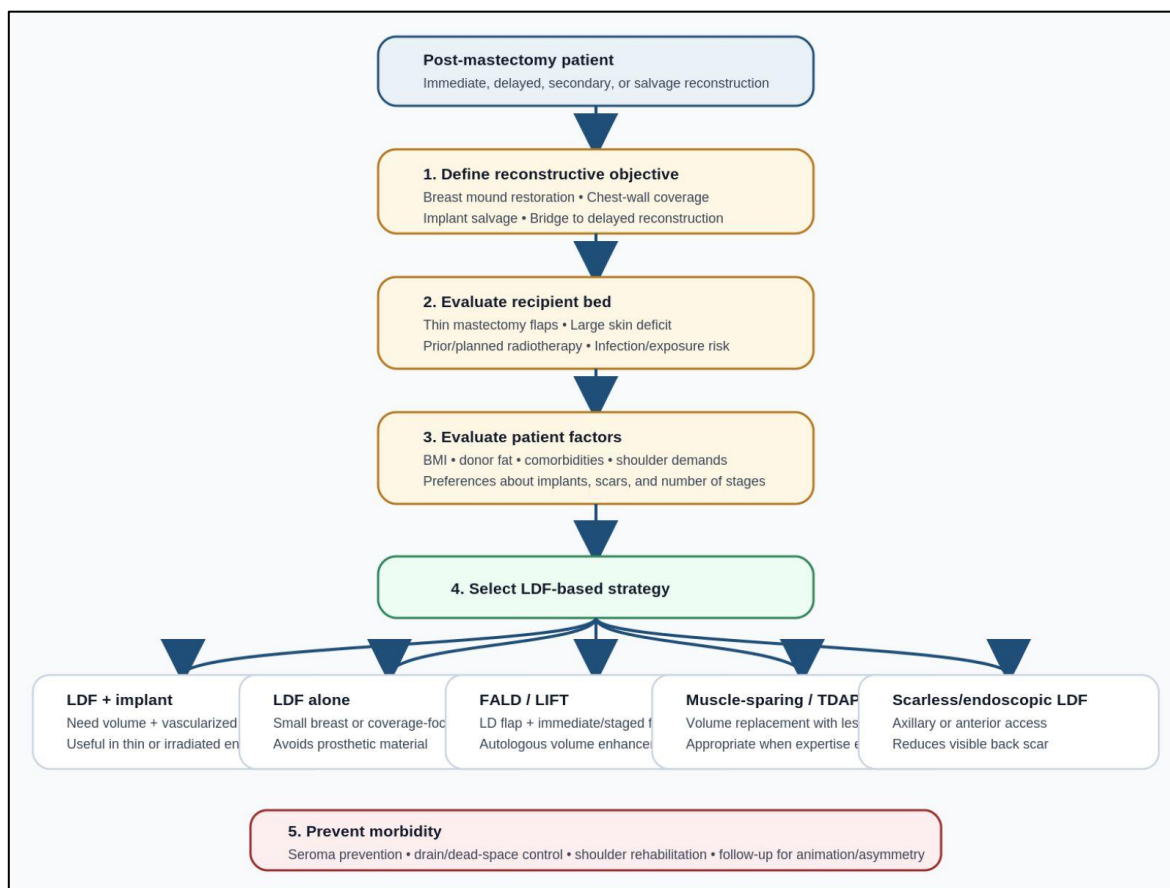


Figure 4. Decision-making algorithm for pedicled latissimus dorsi flap reconstruction after mastectomy.

Evidence-informed algorithm for selecting a latissimus dorsi flap-based reconstructive strategy according to the reconstructive objective, recipient-bed quality, patient-related factors, and need for volume restoration. Options include LDF with implant, LDF alone, fat-augmented latissimus dorsi flap/latissimus dorsi flap with immediate fat transfer, muscle-sparing or thoracodorsal artery perforator-based reconstruction, and scarless/endoscopic approaches. Original algorithm by the authors, based on PubMed-indexed evidence regarding indications, outcomes, salvage reconstruction, radiotherapy, fat transfer, and complications [13,14,19,21,29].

Step 1: Define reconstructive objective

- Aesthetic breast mound reconstruction
- Chest-wall defect coverage
- Salvage after implant failure
- Preparation for delayed definitive reconstruction

Step 2: Evaluate recipient site

- Mastectomy skin quality
- Previous or planned radiotherapy
- Wound contamination or infection
- Extent of soft-tissue defect

Step 3: Evaluate patient factors

- BMI and donor-site tissue availability
- Smoking, diabetes, vascular risk
- Previous abdominal or thoracic surgery

- Shoulder function and occupational demands
- Preference regarding implants and scars

Step 4: Select reconstructive strategy

- LDF + implant: insufficient autologous volume, need for soft-tissue coverage
- LDF alone: small-volume reconstruction or coverage-focused objective
- FALD/LIFT: patient desires autologous reconstruction and has adequate fat donor sites
- Muscle-sparing or TDAP: lower-volume needs and desire to reduce functional morbidity
- Endoscopic/scarless harvest: strong preference to avoid visible back scar and appropriate surgical expertise

Step 5: Prevent complications

- Seroma prevention protocol
- Drain and dead-space management
- Shoulder rehabilitation
- Early detection of mastectomy skin compromise
- Long-term follow-up for animation, asymmetry, fat necrosis, and implant-related problems

10. DISCUSSION

The rotational pedicled latissimus dorsi flap remains relevant because it solves problems that implant-only reconstruction and some free-flap procedures cannot always address. It is local, dependable, technically familiar, and capable of

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delivering vascularized tissue to the post-mastectomy chest. Its role is especially strong in complex patients: irradiated fields, thin mastectomy flaps, locally advanced tumors, salvage after implant failure, high-risk patients, and settings where microsurgical reconstruction is not feasible [13,14,19,28,29,30].

The modern LDF differs from the traditional flap in several ways. First, fat grafting has transformed the flap from a volume-limited option into a more versatile autologous platform [15,16,21,28,33,34,35]. Second, muscle-sparing and perforator-based designs attempt to reduce functional morbidity [9,14,25]. Third, minimally invasive and scarless harvest techniques address one of the main patient concerns: the posterior donor-site scar [8,18,22,23,24,27]. Fourth, ERAS protocols and regional anesthesia may improve postoperative recovery and analgesia [12,39].

Despite these advances, the LDF has not eliminated its classic limitations. Seroma remains the most common adverse event, and donor-site morbidity continues to influence patient satisfaction [13]. Furthermore, the flap may not provide enough volume for larger breasts without an implant or multiple fat-grafting sessions. Patients must be counseled regarding the possibility of revision procedures, asymmetry, donor-site scar, and shoulder symptoms.

An important contemporary point is that the LDF should not be positioned as a competitor to all other reconstructive options, but as a complementary option. For some patients, DIEP flap reconstruction is ideal. For others, implant-only reconstruction is appropriate. However, for patients needing vascularized tissue without microsurgery, the rotational pedicled LDF remains highly valuable. The best reconstructive plan is individualized rather than technique-driven.

11. LIMITATIONS OF CURRENT EVIDENCE

Most contemporary studies on LDF reconstruction are retrospective case series, institutional experiences, or technical reports. Randomized controlled trials are rare. Patient selection varies across studies, and outcomes are influenced by surgeon experience, radiotherapy, implant use, fat grafting, mastectomy type, and postoperative protocols. In addition, aesthetic outcomes and patient-reported outcomes are not uniformly measured.

Another limitation is heterogeneity in terminology. “Latissimus dorsi flap” may refer to muscle-only, myocutaneous, extended, muscle-sparing, fat-augmented, implant-assisted, endoscopic, or scarless approaches. Future studies should separate these techniques more clearly and report standardized outcomes including seroma, flap loss, shoulder function, patient satisfaction, fat necrosis, implant-related complications, and long-term revisions.

12. CONCLUSION

The rotational pedicled latissimus dorsi flap remains a versatile, reliable, and clinically relevant option for post-mastectomy reconstruction. Its value is strongest in patients requiring vascularized soft-tissue coverage, those with prior or planned radiotherapy, large chest-wall defects, salvage after implant failure, high-risk surgical profiles, or limited access to microsurgical reconstruction.

Modern refinements—including immediate fat transfer, fat-augmented reconstruction, muscle-sparing variants, endoscopic and scarless harvest, volume-prediction tools, ERAS pathways, and regional anesthesia—have expanded the utility of the flap and improved its aesthetic and functional profile. However, donor-site seroma remains the most frequent complication and should be addressed through meticulous surgical technique and standardized postoperative protocols.

Rather than an obsolete reconstructive method, the pedicled latissimus dorsi flap should be regarded as a contemporary reconstructive workhorse whose success depends on individualized indication, technical precision, patient counseling, and complication prevention.

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