

Pedicled Latissimus Dorsi Flap for Malignant Defects: A Reliable Alternative to Free Flap Reconstruction

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ABSTRACT

Introduction: Wide upper extremity soft tissue defects with exposed bone following malignant tumor excision remain a significant reconstructive challenge. Although free flaps are the gold standard for large coverage, factors such as advanced age, comorbidities, or limited microvascular resources may require alternative approaches. In such settings, the pedicled latissimus dorsi flap provides a reliable and effective reconstructive solution.

Case Illustration: A 70-year-old man presented with a 15 × 12 cm soft tissue defect in the right upper arm extremity following malignant tumor excision, with exposed humerus and complete loss of the deltoid muscle. Reconstruction was performed using a pedicled latissimus dorsi flap to cover the exposed bone, combined with split-thickness skin grafts harvested from the lateral right thigh for residual defects (3 × 3 cm and 5 × 2 cm). The flap remained viable, surgical drains were placed, and the extremity was immobilized with a cast to support healing.

Discussion: The pedicled latissimus dorsi flap provided reliable vascularized coverage for the exposed humerus and compensated for deltoid loss, avoiding the longer operative time and microsurgical demands of free flaps. In this elderly patient, the flap healed successfully with full graft take and complete donor-site epithelialization, demonstrating its safety and effectiveness. These outcomes support the continued use of pedicled LD flaps as a practical alternative for large upper-extremity oncologic defects, especially when patient comorbidities or treatment factors limit free flap reconstruction.

Conclusions: The pedicled latissimus dorsi flap remains a safe and effective option for wide malignant defects of the upper extremity, serving not just as a substitute for free flaps but as a strategic choice that balances surgical safety, functional restoration, and patient-centered outcomes.

KEYWORDS: Latissimus Dorsi Flap, Pedicled Flap, Malignant Defect, Upper Extremity Reconstruction

ARTICLE DETAILS

Published On:
18 December 2025

Available on:
<https://ijmscrs.com>

INTRODUCTION

Soft tissue reconstruction after malignant tumor resection aims to close the defect, protect vital structures (such as bone and prosthetic devices), restore function, and minimize donor morbidity. The choice of reconstructive technique should consider the size and location of the defect, the vascular condition of the recipient site, the patient's general status, and the available facility resources and

surgical skills.¹ In many centers, free tissue transfer has become the standard for large defects due to its flexibility and the possibility of type-specific tissue replacement; however, free flaps are not always ideal, particularly in elderly patients, those with vasculopathy or a history of radiation, or when microvascular resources are limited.² The pedicled latissimus dorsi flap is a regional option that has long been recognized as a “workhorse” in reconstruction due to its reliable

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thoracodorsal vascular supply, ease of mobilization of large muscle tissue, and transpositional potential for covering thoracic, head-neck, and proximal extremity defects.^{3,4} Recent literature suggests that the pediced latissimus dorsi remains relevant in the microsurgical era and effective for covering exposed bone and providing protective bulk without the risk of microsurgical venous/arterial thrombosis inherent in free flaps.¹ However, latissimus dorsi harvesting can lead to donor-site issues such as seroma, hematoma, and impaired shoulder, which need careful postoperative monitoring.^{2,5} Therefore, appropriate patient selection, harvesting technique, and good postoperative management are key determinants of short- and long-term success. This case report aims to add evidence to the use of pediced latissimus dorsi flaps for upper extremity defects resulting from malignant tumor excision in elderly patients, and to compare clinical findings with the latest literature (2020–2025).

CASE ILLUSTRATION

A 70-year-old man presented with a progressively enlarging mass on the right upper arm. The lesion initially appeared as a corn-sized nodule approximately one year earlier and gradually increased in size. Fine-needle aspiration biopsy revealed a pleomorphic tumor cell suggestive of a soft-tissue sarcoma. Subsequent MRI revealed a lobulated mass with solid–cystic components and enhancement in the medial third of the right humerus, involving the triceps muscle and measuring $7.4 \times 7.4 \times 10.7$ cm, consistent with a malignant soft-tissue neoplasm. The MRI also showed a full-thickness tear of the right supraspinatus tendon. The patient underwent 29 sessions of radiotherapy prior to the planned operative management. Clinical examination revealed a mass with irregular margin, suggestive of malignancy (Figure 1).



Fig. 1. Initial defect of the right upper arm.

Wide excision of the malignant tumor in the right deltoid region was performed by the oncology surgery team. Intraoperative evaluation revealed a large soft-tissue defect measuring approximately 15×12 cm, involving the deltoid and biceps with exposure of the humerus and complete loss of deltoid muscle structure and function (Figure 2). The procedure began immediately after the malignant tumor

excision. The patient was positioned in the supine and left lateral decubitus position to facilitate harvesting of the right latissimus dorsi.



Fig. 2. Wide soft tissue defect after tumor excision with exposed humerus and loss of the deltoid muscle.

A lazy-S incision was made under the scapula to expose the latissimus dorsi muscle. The latissimus dorsi muscle flap was elevated and moved through a subcutaneous tunnel to reach the deltoid defect. The flap was used to cover the exposed humerus and was sutured to the surrounding muscles with absorbable monofilament sutures. The nearby fascio-cutaneous tissue was also elevated to help achieve a tension-free closure. Two drains were placed, one posteriorly and one at the donor site, and layered closure was completed.



Fig. 3. Flap harvest and immediate post operative result.

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The remaining muscle surface defects in the deltoid and biceps, measuring 3×3 cm and 5×2 cm, were closed with a split-thickness skin graft taken from the right lateral thigh and secured with a tie-over dressing. The upper extremity was temporarily immobilized with a splint and bandage to protect the flap during the early vascularization phase. Postoperative instructions included maintaining a left lateral sleeping position, use of an air mattress, external warming of the flap using a surgical lamp positioned at 50 cm distance, periodic activation of the posterior vacuum drain, and documentation of daily drain output.

On postoperative day 3, the drains showed a gradual decrease in fluid output. The patient was then transferred to outpatient follow-up, with shoulder rehabilitation postponed until primary healing was achieved. On day 7, the flap appeared viable with no signs of necrosis, the skin color indicated good tissue perfusion, wound dehiscence was not present, and the skin graft was well established on the muscle base (Figure 4).



Fig. 4. Day 7 follow-up: Flap viable, no necrosis, graft well integrated.

At the 1-month follow-up, the flap showed successful healing with stable soft tissue coverage throughout entire right upper arm, and the donor site showed complete epithelization. The skin graft demonstrated approximately 95% take, with remaining raw surface areas managed with regular wound care (Figure 5).



Fig. 5. One month follow-up: stable flap healing, fully epithelialized donor site, and ~95% skin graft take.

At the 2-month follow-up, the flap remained viable, and the residual raw surface from the previous skin graft had significantly decreased in size and showed complete epithelization (Figure 6). The patient demonstrated a normal range of motion in the right upper extremity and expressed satisfaction with the long-term results. Follow-up data at 3 and 6 months were not available because the patient did not return for further evaluation.



Fig. 6. Two-month follow-up, the flap was viable and the residual raw surface had completely epithelialized.

DISCUSSION

Reconstruction of large soft tissue defects after wide oncologic excision in the upper extremity, particularly in elderly patients, is challenging because coverage must restore vascularity, protect exposed structures, and compensate for loss of major muscle units. In this case, a 70-year-old man presented with a 15×12 cm deltoid-biceps defect with exposed humerus and complete deltoid loss after wide excision of a malignant tumor, requiring a reconstructive option that was both reliable and physiologically suitable for his age and condition. A pedicled latissimus dorsi (LD) flap was selected for its consistent vascularity, large surface area, and ability to restore soft-tissue volume and stability. Recent literature (2021–2025) supports the pedicled LD flap as one of the most dependable regional options for extensive upper-extremity reconstruction in high-risk or elderly patients.

The pedicled LD flap has repeatedly been shown to perform well when free flaps are less ideal due to patient comorbidities, radiation history, or limited microsurgical resources.⁴ Anatomic and clinical evidence show that the pedicled LD flap offers a large, well-vascularized tissue mass supplied by the thoracodorsal artery, which makes it ideal choice for covering extensive soft tissue defects without the need for microvascular anastomosis.⁶ In resections involving the shoulder region, this flap provides durable coverage, reduces infection risk, and supports limb preservation, outcomes consistent with the uncomplicated wound healing observed in our patient.⁷ The flap's functional versatility was reaffirmed in series of upper-extremity sarcoma cases where pedicled LD flaps reconstructed areas involving major muscles such as the biceps, triceps, or deltoid, restoring contour and contributing to shoulder and elbow function with

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no episodes of flap loss.⁴ These data support the rationale for using a pediced LD flap for a defect involving total deltoid loss and exposed humerus.

Broader clinical experience demonstrates similarly favorable outcomes in non-oncologic settings. A multi-center review of 20 upper-arm defects reconstructed with pediced LD flaps reported high flap survival and minimal major complications, with preserved donor-site function.⁸ This parallels the good donor site healing and satisfactory functional range of motion seen in our patient during follow-up. Studies on pediced LD coverage for large elbow and arm wounds reported high rates of successful coverage even for defects larger than 150 cm², with the flap acting as a robust option when other local flaps would be insufficient.⁹ Combined approaches, such as LD with scapular flaps, have also been effective for even larger sarcoma-related defects, showing the adaptability of regional flap strategies in extensive reconstructions.¹⁰ Although a composite flap was not necessary in our case, these studies highlight the robustness of pediced options for large upper-extremity wounds.

Compared with free flap reconstruction, pediced LD flaps offer practical advantages in older or higher-risk patients. Free flaps provide excellent versatility but require microsurgical expertise, prolonged operative time, and reliable recipient vessels, all of which increase perioperative risk in elderly or irradiated patients. Retrospective studies show that pediced flaps have shorter operative times, lower blood loss, and reduced risk of total flap necrosis.¹¹ In clinical practice, these differences translate into safer reconstruction for comorbid patients, such as those in our case. Pediced LD flaps have also demonstrated the ability to cover exceptionally large defects. Reports on post-traumatic and complex arm reconstruction show high flap survival with few severe complications, reinforcing the suitability of this flap even outside oncologic scenarios.⁸ This reflects its reliability in our case, where both defect size and complexity required a robust and well-perfused flap. Multiple series have documented strong overall outcomes: zero total flap losses, occasional minor graft or donor-site issues, and consistently successful coverage.⁸ This corresponds closely to the clinical course of our patient, whose flap showed positive perfusion and high graft take with no ischemic events.

Functional results following pediced LD transfer are also encouraging. Studies of sarcoma patients undergoing LD transfer report meaningful recovery of shoulder elevation and favorable Musculoskeletal Tumor Society scores.⁴ Although we did not perform a functional tendon transfer, our patient's early return of shoulder range of motion mirrors these reports and indicates that pediced LD reconstruction can support early rehabilitation. Complication patterns are generally manageable and seldom compromise flap survival.⁴ In our patient, the absence of necrosis and good perfusion patterns at early follow-up further reflect the favorable complication profile documented in the literature. In addition,

data from breast reconstruction—an area with extensive LD flap literature—demonstrate consistently high patient satisfaction, favorable donor-site outcomes, and reliable performance even in radiated tissues.¹¹ While derived from a different anatomical context, these findings reinforce the broad reliability of LD flaps.

Comparative studies evaluating pediced versus free flaps for large defects show that both approaches can achieve good functional and aesthetic outcomes, but pediced flaps remain beneficial when free flaps pose higher risk or require longer operative duration.¹¹ Some reports note specific complication differences, yet rates of total flap failure remain comparable, validating pediced flaps as a sound alternative in medically complex cases.¹³

Taken together, the current evidence supports the pediced LD flap as a safe, reliable, and effective alternative to free flap reconstruction for malignant upper extremity defects with exposed bone, especially in elderly patients or those with prior radiation exposure, and compatible functional outcomes explain its success for this patient and reaffirm its ongoing role in complex oncologic reconstruction.

CONCLUSIONS

The pediced latissimus dorsi flap is a safe and dependable solution for extensive upper-extremity oncologic defects when free-flap reconstruction is not feasible. This case reinforces its advantages in coverage and vascular reliability, and highlights the need for long-term functional follow-up.

CONFLICT OF INTEREST

All the authors declare that there are no conflicts of interest.

ETHICS APPROVAL

Informed consent has been acquired from the patient. The patient's provided written informed consent to be published as a case report

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