

# Use of Modified V-Y Latissimus Dorsi Myocutaneous Flap for Closure of Huge Anterior and Posterior Chest Wall Reconstruction, Our Experience: A Case Report

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## Abstract

Reconstruction of chest wall defects after tumor resection is challenging. With the advancement of reconstructive surgery, more options are available for chest wall reconstruction. Workhorse flaps like the musculocutaneous latissimus dorsi flap are frequently employed. Its modification to the V-Y design of the latissimus dorsi myocutaneous flap allows huge chest wall defect closure with substantial benefits, especially for cancer patients. We describe our experience using this flap design in five patients and the difficulties we faced. All patients underwent immediate chest wall reconstruction with a modified V-Y latissimus dorsi myocutaneous flap with minimal complications and donor site morbidity.

**Keywords:** Modified V-Y latissimus dorsi flap, Chest wall reconstruction, Breast reconstruction

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## INTRODUCTION

Significant chest wall defects frequently occur after resection of malignant tumors like breast carcinoma or sarcoma.<sup>1</sup> Late detection of these tumors is common, especially in Asian countries, often presenting as large, ulcerated masses requiring complex reconstruction after removal. Surgical management is often debated among surgeons and oncologists to ensure complete excision while optimizing cosmetic outcomes.

The conventional latissimus dorsi (LD) myocutaneous flap was modified to a V-Y skin island design, allowing closure of substantial anterior and posterior chest wall total thickness defects without causing donor site morbidity or need for skin grafting with acceptable cosmesis.<sup>2</sup> This provides a reliable single-stage reconstructive option and is particularly beneficial where microsurgical expertise is limited.

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Modifications to the skin island design have further expanded its utility<sup>3</sup> and its ability to withstand radiotherapy and chemotherapy further proves its superiority. We describe our experience with the modified V-Y LD flap for huge anterior and posterior chest wall reconstruction.

### MATERIALS AND METHODS

Between January 2022 and March 2023, 5 patients aged 37-74 (mean 49.8) underwent chest wall reconstruction with an extended V-Y LD myocutaneous flap. Comorbidities were present in some patients. After discussion with the primary tumor team, patients were selected based on defect size and location.

Two patients who had breast carcinoma underwent mastectomy ± axillary clearance, while three sarcoma patients had wide local excision. All patients underwent immediate reconstruction due to the anticipated huge defect after wide excision that necessitated definitive soft tissue coverage. The flap was designed pre-operatively while the patient was in a lateral or erect position, arm ipsilateral to the tumor in 90 degrees abduction, similar to the conventional design of the latissimus dorsi flap with careful consideration towards the pedicle, the thoracodorsal artery. However, the difference lay in the skin island design that was drawn akin to an isosceles triangle for its lateral borders, and the flap was oriented either in vertical, horizontal, or oblique direction following the defect. Next, the distal end of the flap is marked at the meeting point of the two lateral borders, signifying the leading edge. Margins were confirmed, and the primary tumor team excised the tumors and subsequently handed them over to the plastic reconstructive surgeon.

The patient was positioned in lateral decubitus for flap harvest. The incision was deepened until LD was visualized. The modified V-Y LD flap was raised while preserving the thoracodorsal artery. The flap inset was adjusted for tension-free defect coverage without pedicle compromise. The skin island and donor site were sutured in 2 layers; dermal and skin layers. Drains were placed underneath the flap and donor site to prevent fluid collection. The donor site that could not be closed was skin-grafted. The drains were removed after a reduced output trend of less than 30 cc/day was observed.

Patients were monitored closely for vascular compromise and signs of infections by administering intravenous antibiotics until all drains were removed. Patients were nursed in lateral or supine positions to prevent tension and pressure. Flaps were kept warm, and arm elevation and shoulder abduction were avoided. Patients were discharged and followed up until satisfactory healing before referral for adjuvant therapy after histopathology reports.

### Patients

**Case 1:** An unstable elderly patient with comorbidities came with fungating bleeding recurrent breast carcinoma and underwent simultaneous tumor excision and flap raise. The donor site was grafted. Intraoperative complications required transfusion, inotropes, and ICU admission for weaning; postoperative graft loss due to supine positioning and wound breakdown at the leading edge of the flap due to tension. The patient initially improved with conservative management, and secondary suturing was attempted but later died from disease progression (Figure 1).



**Figure 1** A) Bleeding fungating breast carcinoma, B) Modified V-Y latissimus dorsi flap after flap inset, C) Tail end of the flap was grafted with a split skin graft due to large defect with tension, D) Failed graft uptake due to shearing and pressure at the site.

**Case 2:** A patient with metastatic breast cancer unresponsive to chemotherapy underwent tumor excision,

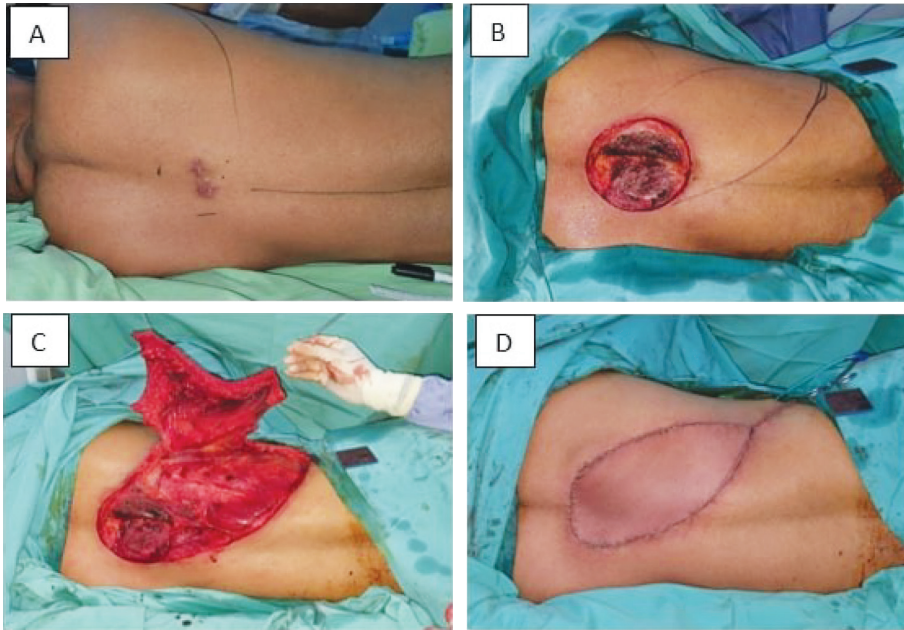
axillary clearance, and flap raise/inset—an uneventful perioperative period (**Figure 2**).



**Figure 2** A) Fungating left breast invasive carcinoma at presentation, B) Modified V-Y latissimus dorsi flap was raised with skin island oriented horizontally in triangular shape, C) Anterior chest wall recipient site after closure, D) Primary closure of donor site

**Cases 3-4:** Patients with back sarcomas underwent wide excision, and the flap was orientated obliquely and

vertically, respectively. Minor tip necrosis in one patient was managed conservatively (Figures 3-4).



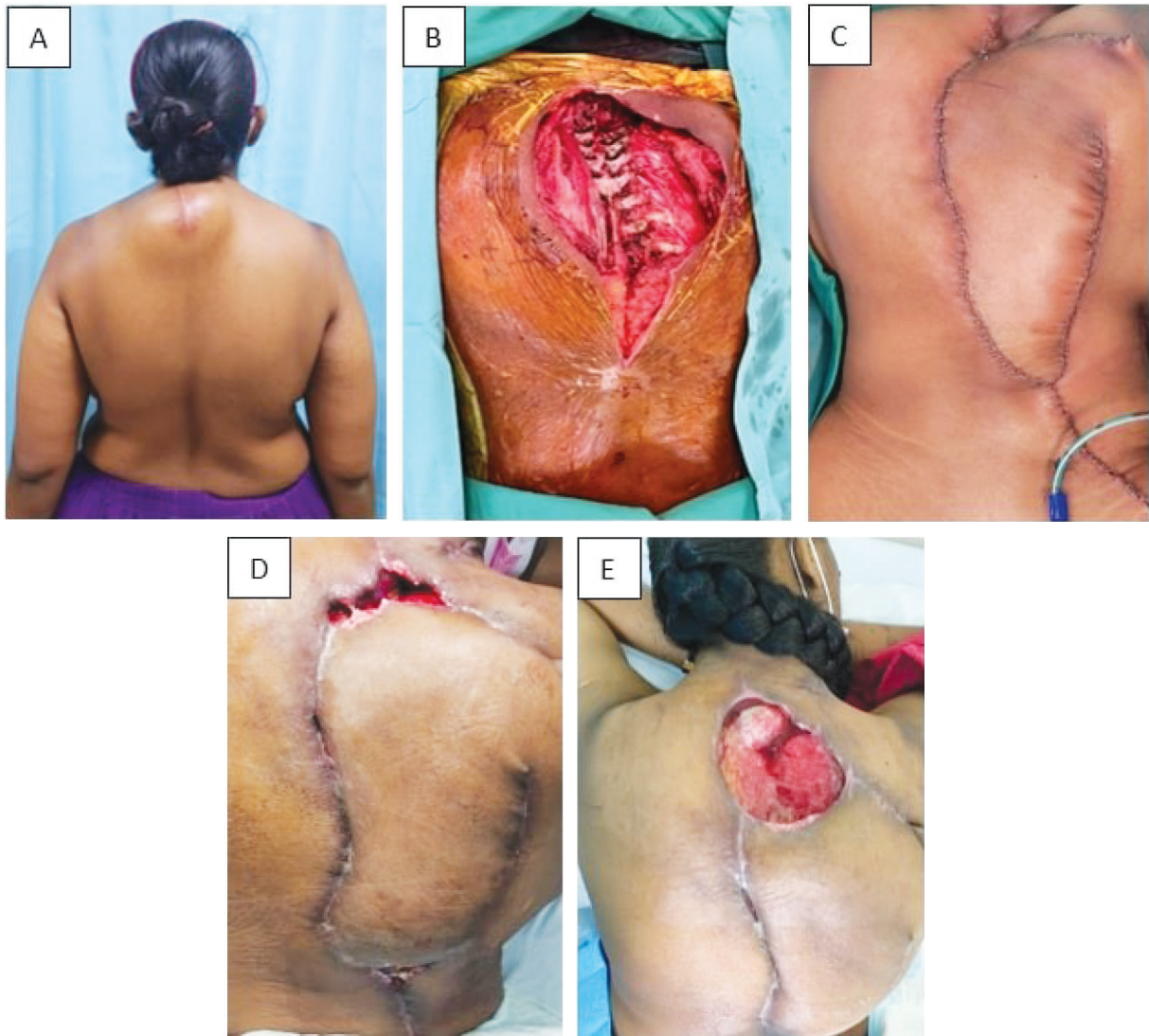
**Figure 3** A) Third patient with upper back DFSP at the midline, B) wound bed post tumor resection exposing the fascia, C) Flap was raised and inset, D) Closure



**Figure 4** A) Fourth patient with ulcerated fungating upper back DFSP, B) Intraoperatively, 15x15cm defect, C) Tail end necrosis which was observed till well-demarcated, D) Secondary healing of distal end with dressing

**Case 5:** The patient with extensive back sarcoma underwent tumor excision, laminectomy, and vertical flap raise. Prone/lateral nursing prevented flap pressure.

Wound dehiscence at the leading edge due to tension failed to close despite intervention complicated with recurrence despite margin-free excision (Figure 5).



**Figure 5** A) Upper back sarcoma, B) Post wide excision with exposed spine, C) After flap inset, D) Wound dehiscence at leading edge and tail end of flap, E) Tumour recurrence

### RESULTS

Three patients had good outcomes, adjuvant therapy was not delayed after complete healing, and no significant infections/flap losses occurred. One elderly patient developed multiple systemic complications and finally succumbed due to disease progression. One patient had a wound breakdown at the leading edge and distal tip with eventual recurrence at the tumor bed. Overall, patients

were satisfied with outcomes, flap appearance, and donor site. The patients were followed up after surgery until after suture removal on day 14 or until satisfactory wound healing and were sent for oncological management by the primary team. The patient's background, operative summary, histopathology, and outcomes are summarized in Table 1.

**Table 1** Summary of patients, operation, histopathology, and outcomes

No.	Age (Years)	Comorbidities	Functional status (ECOG)	Tumour location	Diagnosis	Operation	Duration of surgery, skin-to-skin (minutes)	Estimated blood loss (ml)	Defect size (cm)	Wound bed	Histopathology	Outcomes
1	74	Hypertension Dyslipidaemia Chronic Kidney Disease Rheumatoid arthritis with pulmonary fibrosis History of cerebrovascular accident Post-neoadjuvant chemotherapy, right mastectomy and axillary clearance	2	Anterior	Recurrent bleeding mastectomy fungating metastatic right breast carcinoma	Toilet mastectomy	345	1,200	15 x 20	Muscle	Invasive breast carcinoma	1) Failed uptake of split skin graft at donor site due to the ill condition of patient and graft shearing and pressure on supine position - dressing, allograft application 2) Wound dehiscence at the leading edge - dressing, debridement and secondary suturing 3) Death due to the progression of the disease
2	48	Post neoadjuvant chemotherapy	1	Anterior	Metastatic left carcinoma	Toilet mastectomy and axillary clearance	85	150	14 x 14	Muscle	Invasive breast carcinoma	Would well healed
3	37	Hypertension Dyslipidaemia	1	Posterior	Upper back sarcoma	Wide local excision	115	100	9 x 9	Fascia	Dermatofibrosarcoma Protuberans (DFSP)	Would well healed
4	49	Diabetes mellitus Dyslipidaemia	1	Posterior	Upper back sarcoma	Wide local excision	275	120	15 x 15	Muscle	Dermatofibrosarcoma Protuberans (DFSP)	Tail end necrosis - dressing, secondary healing
5	41	No known medical illness	1	Posterior	Upper back sarcoma	Wide local excision and laminectomy	570	500	20 x 30	Bone	High-grade Malignant Peripheral Nerve Sheath Tumour (MPNST)	1) Tail end necrosis 2) Recurrent wound dehiscence at the leading edge - dressing, negative pressure wound therapy, secondary suturing 3) Recurrent wound dehiscence at the tumour site

## DISCUSSION

There are many ways for chest wall defect coverage using a pedicle or free flap. Common flaps traditionally used include pedicle transverse rectus abdominis myocutaneous (TRAM) flap, pedicle latissimus dorsi (LD) myocutaneous flap, and free anterolateral thigh (ALT) flap. These flaps are beneficial as they provide versatility, resilience, and durability for tissue coverage and can withstand chemo and radiotherapy post-operatively. However, the donor site morbidity is significant if a large flap design is required; the inability for primary closure and wound breakdown due to tension, weakness of abdominal wall, hernia, and distal end necrosis in TRAM flap due to limited vascularity and pedicle length. Bostwick et al observed that the latissimus dorsi flaps with skin islands more than 12 cm in width required skin grafts for closure for donor sites in thin patients with very little skin elasticity of the back, whereas in obese patients, it is possible to close the donor site using a conventional elliptical design.

The role of reconstructive surgery in large chest wall tumors has reached a greater height due to the improvement of flap design by varying the shape of the skin island. Since the introduction of the modified V-Y LD flap in the 1990s by Micali and Carramaschi,<sup>4</sup> it has enabled surgeons to embark on more challenging, previously “unresectable” tumors to achieve a negative histological margin and cosmetically acceptable wound coverage.<sup>5</sup>

The triangular design of the modified V-Y LD myocutaneous flap is innovative as it can cover a larger defect than the conventional LD flap while being manipulated in different orientations to fit into the defect, the ability to close the donor site primarily without skin graft, and in delayed reconstructions with previous radiotherapy, the skin territory is far away from the irradiated fields.<sup>6,7</sup>

In this case series, all 5 patients had aggressive malignancies. The choice for this flap selection was made based on patient and surgeon’s factors. The patient’s factors include age, comorbidities, and functional status. Subjecting some of these patients to long hours of surgery had a free tissue transfer and microsurgery been performed would have been detrimental due to prolonged exposure to anesthesia, bleeding, hypothermia, cardiorespiratory compromise, and long intensive care unit stay. As for the surgeon’s factor, our center has a single surgeon with limited microsurgical expertise and intensive care facilities. Thus, reconstruction with a pedicle flap is preferred.

Based on our encounters, the main difficulty was wound dehiscence at the leading edge of maximum tension. This is mainly attributed to the excision of extensor muscles of the back, causing the patient to be in persistent trunk flexion, which could have been prevented with a suitable brace that was not prepared in advance due to financial and logistic issues. Repeated efforts to downsize the wound with NPWT and secondary suturing proved to be futile and was further aggravated with rapid tumor recurrence.

Another challenge was nursing patients in proper positioning. It was especially hard for the post-operative patients to continue lying in prone or lateral positions due to the discomfort; elderly patients are especially at risk. The patients were also advised against arm abduction as stretching and direct pressure on the flap can cause flap/tip necrosis.

Other complications like hematoma, seroma, and infections should be monitored and managed promptly.<sup>8</sup> In all of our 5 patients, we did not encounter these problems. Patients must be counseled regarding expected outcomes. Careful preoperative planning and postoperative nursing can help optimize outcomes.

## CONCLUSION

The modified V-Y LD flap provides reliable, low-risk coverage of significant defects for patients, avoiding microsurgical procedures with more predictable outcomes. Careful postoperative positioning and pressure avoidance are critical to prevent wound dehiscence, morbidity, and faster recovery.

## PATIENT CONSENT

The patient's consent has been obtained before this report. The consent form states that the patient consented to disclose her images and other clinical information in the report. The patient also understands that the message will not include her name and initials. Due efforts will be ensured to conceal their identity, but anonymity cannot be guaranteed.

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Nil

## CONFLICTS OF INTEREST

None

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