

Giant Back Defect Secondary to Sarcoma: From Rotational Flaps to Definitive Microvascular ALT Reconstruction

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ABSTRACT

Introduction: Soft tissue sarcomas of the back present unique reconstructive challenges, particularly when they reach massive dimensions requiring extensive excision. Large posterior trunk defects often exceed the limits of primary closure and local flap coverage, demanding advanced reconstructive strategies. While rotational flaps may offer a practical and versatile initial coverage option, their reach and reliability can be compromised in extensive defects or after multiple surgeries. Microvascular free tissue transfer, particularly the anterolateral thigh (ALT) flap, offers a versatile and durable solution with ample tissue volume, long pedicle length, and reliable vascularity. We present the case of a giant back defect following sarcoma resection, initially managed with rotational flaps, ultimately requiring definitive reconstruction with a free ALT flap.

Case Series: We present the case of a 46-year-old patient with a history of wide resection of a back sarcoma, initially managed with rib reconstruction using the ERASMUS system, and local flap coverage presented with tissue dehiscence and pleural exposure at the T4 level, measuring 12 × 5 cm. We the perforators from the descending branch of the lateral circumflex femoral artery of the latissimus dorsi muscle. Microvascular arterial and venous anastomoses were performed under an operating microscope using 8-0 and 9-0 nylon sutures without complications, achieving adequate blood flow. The postoperative course was uneventful, with good evolution and adequate, durable coverage of the defect.

Discussion: Although multiple reconstructive strategies exist for large posterior trunk defects, the anterolateral thigh (ALT) free flap remains a highly versatile and reliable option. Its generous skin paddle, long vascular pedicle, and robust blood supply allow for effective coverage of extensive three-dimensional defects, even in previously operated or compromised fields. In this case, after the failure of local rotational flaps, the ALT flap provided durable, tension-free coverage and restored structural integrity over a critical thoracic area with pleural exposure, underscoring its value as a definitive solution in challenging back reconstructions.

Conclusion: This case highlights the effectiveness of the ALT free flap as a reconstructive option for extensive posterior trunk defects, particularly in patients with prior oncologic surgery and failed local flaps. Its versatility, reliability, and ability to provide durable coverage make it an invaluable tool for achieving both functional protection and structural restoration in challenging back reconstructions.

KEYWORDS: Soft Tissue Sarcoma, Sarcoma, Soft Tissue, Trunk

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INTRODUCTION

Trunk and chest wall sarcomas are rare malignant tumors, accounting for less than 5% of all thoracic neoplasms (1). They may arise as primary tumors originating from the chest wall or as metastatic lesions spreading from other sites. Primary chest wall sarcomas often require wide resections with tumor-free margins to achieve adequate local control (2). Such procedures can result in large, full-thickness defects involving multiple ribs, the sternum, and adjacent soft tissues. The management of these tumors therefore represents a significant challenge, as extensive resections may compromise the structural and functional integrity of the thoracic wall, potentially leading to severe respiratory complications (3).

Reconstruction of chest wall defects is essential to restore respiratory function, protect vital organs, and achieve acceptable aesthetic outcomes (2,3). Nevertheless, the management of extensive thoracic wall defects remains a complex challenge that often requires a multidisciplinary approach (4). Within the reconstructive ladder, local and regional flaps such as Keystone, propeller, and latissimus dorsi flaps play an important role in the management of small

to moderate defects. These techniques offer advantages including relative technical simplicity, lower donor-site morbidity, and shorter operative times. However, their applicability is limited in cases of giant or recurrent defects, where the extent of tissue loss surpasses the capacity of local or regional options. In such scenarios, more advanced reconstructive strategies are required to achieve durable and reliable outcomes (5).

CASE REPORT

Case

We present the case of a 46-year-old male, with no history of chronic degenerative diseases, allergies, prior transfusions, or fractures, presented with a progressively enlarging mass in the left dorsal region. He had undergone two previous soft tissue resections in January 2024 and April 2024 for a lesion in the same area, with histopathological diagnosis of pleomorphic myxoid liposarcoma. Approximately five months after the second procedure, the patient developed a recurrent mass with rapid growth, reaching an approximate size of 30 × 20 cm (figure 1). He was referred to the surgical oncology clinic for evaluation and surgical planning.



Figure 1. Patient's back showing the tumor prior to wide excision surgery.

First Surgery – December 2024

Patient with pleomorphic myxoid liposarcoma of the left dorsal region. Surgical exploration revealed a persistent infra-scapular soft tissue sarcoma despite two prior resections, presenting as a large, fungating, and bleeding tumor measuring approximately 30 × 30 cm. En bloc resection was performed, extending to the pleural cavity, with removal of the 7th to 12th ribs (Figure 2). Thoracic wall reconstruction was carried out using the STRATOS-1 (Strasbourg Thoracic Osteosynthesis System) rib fixation system with

polypropylene mesh, placing three titanium bars reconstructing the 7th, 8th, and 9th ribs, with the 11th and 12th ribs left floating (Figure 3). Coverage of the thoracodorsal defect was achieved using four local flaps—two keystone flaps, one rotation flap, and one propeller-type flap. Local flaps were selected given that the patient presented in hemodynamic shock, which precluded the possibility of performing microsurgical options. Figure 4 shows a sketch illustrating the surgical design of the four flaps (Figure 4).

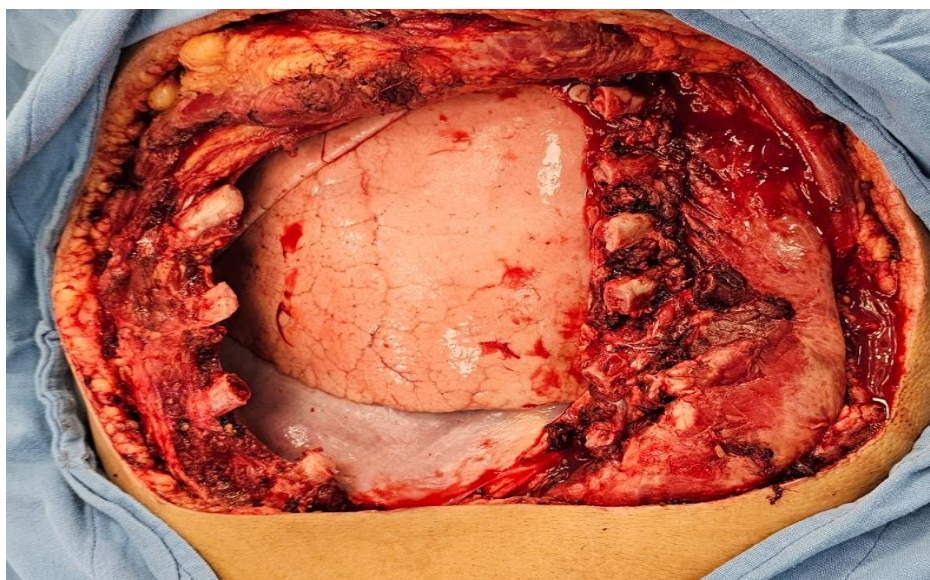


Figure 2. Defect at the thoracic cage level resulting from the en bloc resection, with exposure of the pleura and the left lung.

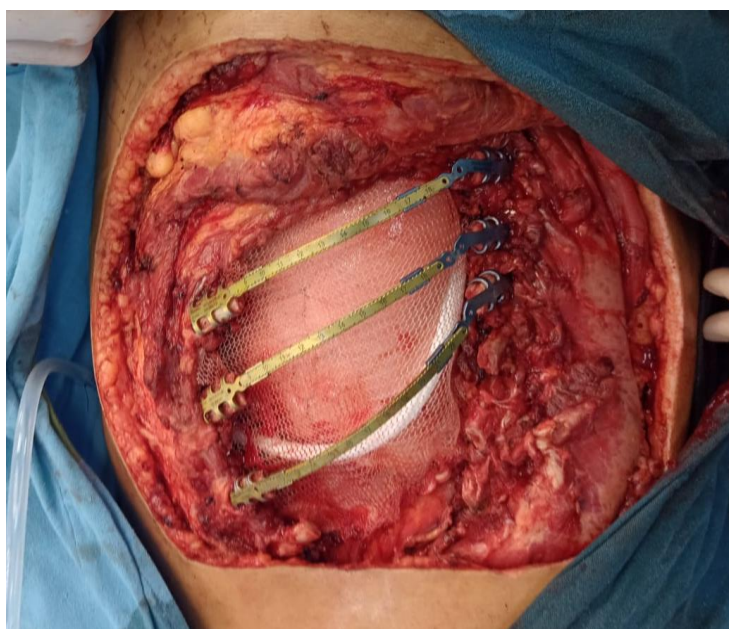


Figure 3. Thoracic wall reconstruction with STRATOS-1 rib fixation system

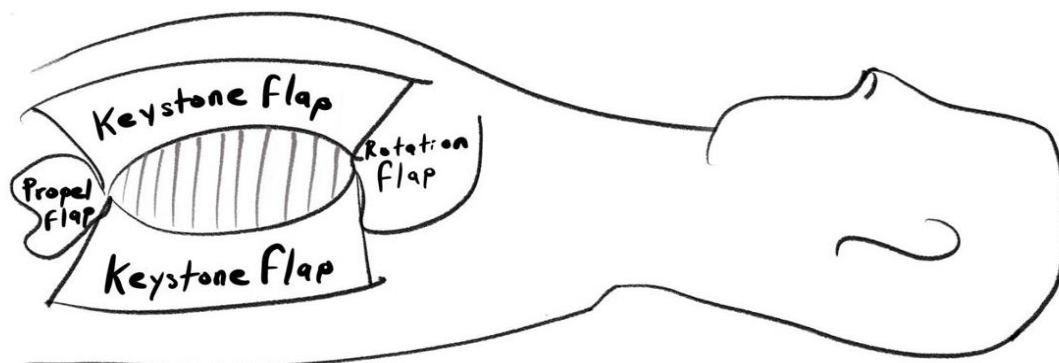


Figure 4. Sketch-style drawing illustrating the flap design in the patient.

The immediate postoperative course required admission to the intensive care unit for 20 days. On transfer to the general

ward, the patient was awake, oriented, and hemodynamically stable, with clean and well-approximated flap wounds,

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without active bleeding or infection, and with preserved cardiopulmonary function. He was discharged home on December 22, 2024, in good condition.

Second Surgery – January 2025

The patient was re-admitted in January 2025 due to partial flap dehiscence with exposure of the pleura at the T4 level, measuring approximately 12×5 cm (Figure 5). Under general anesthesia, an anterolateral thigh (ALT) free flap was harvested from the right thigh. Perforators from the

descending branch of the lateral circumflex femoral artery were carefully identified up to their origin. The flap was then anastomosed to the thoracodorsal vascular pedicle, with viable arterial and venous stumps of approximately 2 mm in diameter. Microvascular arterial and venous anastomoses were performed under operative microscopy using 8-0 and 9-0 nylon sutures, with immediate restoration of blood flow (figure 6). The patient tolerated the procedure well and had an uneventful immediate postoperative recovery.



Figure 5. The patient presented with partial flap dehiscence and exposure of the pleura at the T4 level.



Figure 6. Immediate postoperative result of the ALT free flap

DISCUSSION

Sarcomas of the back can lead to devastating tissue defects, and even after complete oncologic resection, patients often face significant functional and aesthetic challenges. The extent of tissue loss, combined with prior surgeries or adjuvant therapies, can complicate reconstructive efforts, making traditional local or regional flaps insufficient in many cases (6). Microvascular free flaps, such as the anterolateral thigh (ALT) flap, have emerged as a reliable and versatile option to restore both form and function in these complex scenarios (7).

In this case, the initial management involved reconstruction of the rib cage using the STRATOS system, combined with multiple local flaps for wound closure. Despite these efforts, the patient experienced wound dehiscence, necessitating a subsequent procedure. Definitive coverage and restoration of both form and function were ultimately achieved through a free anterolateral thigh (ALT) flap, underscoring the role of microvascular reconstruction as a reliable solution for complex defects following extensive sarcoma resection.

The STRATOS system is an important tool in thoracic wall reconstruction, particularly after extensive resections. It is frequently employed following radical surgical excision of malignant soft tissue tumors of the chest wall, providing essential structural stability and preserving normal respiratory mechanics (8,9). The system can be used after total or subtotal sternectomy and is often combined with musculocutaneous flaps to achieve comprehensive reconstruction (9). Its rigidity ensures that pulmonary function is maintained, while its versatility allows integration with other reconstructive techniques, such as free muscle flaps. Long-term follow-up has demonstrated durable chest wall stability, highlighting the system's reliability in complex thoracic reconstructions (9).

Local flaps are a good initial option in the reconstructive ladder for chest wall defects. Keystone flaps, based on fascial perforators, and propeller flaps, based on arteries such as the internal mammary or intercostal, offer versatility, excellent aesthetic results, and low donor-site morbidity (10–12). Their

surgical technique is simpler than that of free flaps, with shorter operative times—averaging 75 minutes for propeller flaps (11) and careful preoperative planning using CT angiography or Doppler ultrasound ensures selection of perforators within 3 cm of the defect (13). Rotation of 90° to 180° allows adequate coverage of complex defects (14). Clinical outcomes are favorable, with Keystone flaps showing a 98% success rate, high patient and surgeon satisfaction (9.47/10 and 9.51/10), and a low complication rate of 3.22% (12,15). These flaps provided effective temporary closure in this patient, although the extensive defect ultimately required definitive coverage with a free ALT flap.

The free anterolateral thigh (ALT) flap represents a versatile and effective option for the reconstruction of extensive and complex chest wall defects (16,17). Its composition can be tailored to the specific needs of the defect, as it may include skin, fascia, muscle such as the vastus lateralis, and even motor nerves, thereby allowing not only structural but also functional reconstruction (17,18). The flap can be harvested in large dimensions, with reports of sizes up to 27 × 18 cm, making it particularly suitable for massive thoracic defects (19). Clinical outcomes are highly favorable, with total flap loss rates ranging from only 3–5% (19). Additional advantages include the possibility of primary closure at the donor site, minimal donor-site morbidity, and the ability to perform immediate thinning of the flap when required (19,20). From a technical perspective, microvascular anastomosis is often performed to internal thoracic or thoracoacromial vessels (21), and in exceptionally complex cases, bilateral ALT flaps have been described (22). Taken together, these features highlight the ALT flap as a reliable, adaptable, and durable reconstructive solution, offering both functional stability and satisfactory aesthetic outcomes in the setting of chest wall reconstruction.

CONCLUSION

In summary, the reconstruction of extensive chest wall defects secondary to sarcoma remains a surgical challenge

that often requires a stepwise approach within the reconstructive ladder. While local flaps such as Keystone and propeller designs can provide effective initial coverage with low morbidity, definitive and durable reconstruction may demand microvascular solutions. The free anterolateral thigh (ALT) flap stands out as a reliable and versatile option, capable of addressing large, complex defects while ensuring both functional stability and satisfactory aesthetic results. This case illustrates the importance of combining regional and microsurgical strategies to achieve optimal outcomes in chest wall reconstruction following oncologic resection.

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