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Case Report

Complex Chest Wall Reconstruction after Sarcoma Resection with Latissimus Dorsi Myocutaneous Flap- A Case Report and Literature Review

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Abstract: Approximately sixty percent of the neoplasms that reside in the anterior chest wall are classified as malignant. Chondrosarcoma and osteosarcoma are the principal kinds of sternal cancer that are found in the greatest number of patients. Reconstructive procedures for large abnormalities are rarely established, despite the fact that recommendations for resecting these tumors have been published. Full-thickness radical en bloc resection is the alternative treatment that has proven to be the most successful. The large chest wall defect is the most challenging feature of subsequent restoration. This defect is crucial for the preservation of the rigidity of the chest wall as well as the protection of the structures that lie beneath it. The therapy options have been reported using a variety of techniques and materials, but there have been no particular guidelines provided.

Keywords: Chest Wall Reconstruction, Latissimus Dorsi Myocutaneous Flap, Sarcoma.

INTRODUCTION

The latissimus dorsi (LD) muscle is one of the key flaps that plastic surgeons utilize for reconstruction of breasts and chest walls following cancer surgery. Aggressive oncological resections of the chest wall, frequently including skin, muscle, ribs, and pleura, result in intricate defects that expose critical tissues and impair breathing mechanics. The efficacy of reconstruction relies not solely on skin coverage but also on the restoration of dynamic function and the prevention of problems that may hinder adjuvant cancer therapies. Iginio Tansini first described its use in 1896 as a cutaneous flap to fix a problem that happened during breast cancer surgery. This flap is well-known because it has a reliable and stable pedicle, can be used in the same way over and over again, doesn't need microvascular anastomoses, and can take on different shapes and positions. Nevertheless, this method has a number of problems and limits. The drawbacks include donor site seroma and dehiscence, as well as the fact that the recurrent need for implant placement is sometimes not enough. The latissimus dorsi myocutaneous flap is distinguished among reconstructive procedures for its continuously advantageous benefit-risk ratio. Moreover, the emergence of pedicled abdominal-based flaps and free tissue transfer has reduced interest in this reconstructive option recently.

CASE REPORT

The patient, a 59-year-old male, had a 2-year history of left chest wall osteosarcoma and underwent local resection with a positive margin for oncological disease and regrowth. Thoracic surgeons then performed chest wall resection. A skin incision encircling the ulcerated lesion was made with a 1.5 cm clearance margin. Both pectoralis major muscles were partly dissected. Our department is currently conducting skin cover for chest wall reconstruction using a latissimus dorsi flap as a cover. A three-month follow-up by plastic and thoracic surgery demonstrated chest wall stability, a viable flap, and complete healing of the graft sites.

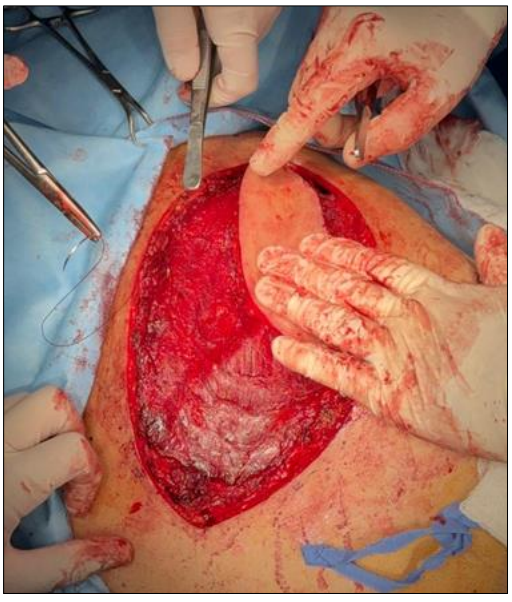
Latissimus Dorsi Flap Reconstruction

The latissimus dorsi (LD) muscle is one of the key flaps that plastic surgeons utilize for reconstruction following cancer surgery; other common clinical issues include reconstruction on chest wall, upper limb, shoulder, and back. Musculocutaneous flaps perfused by big vessels can address deficiencies by increasing blood flow, filling cavities, and covering wounds. The thoracodorsal artery, a large-diameter vessel of uniform length and reliable trajectory, largely supplies it. This extensive vascularization provides exceptional reliability and a low necrosis rate for the flap, even in individuals with a history of radiotherapy, where neighboring tissue quality is diminished. The vascular pedicle is reliable, a microsurgical anastomosis is not usually required, and there is minimal long-term functional loss associated with use of the LD muscle. Also, because of its wide arc of rotation, it is widely used for covering deficiencies in the anterolateral, lateral, and posterior parts of the chest, as well as the scapula, and not just for chest reconstruction. It is particularly beneficial for abnormalities extending into the axilla or shoulder and also provides a considerable amount of soft tissue (skin, subcutaneous fat, and muscle) perfect for obliterating dead-space cavities, safeguarding intrathoracic viscera, and restoring a desirable chest contour. Anatomical research indicates that the latissimus dorsi muscle is V-shaped and supplied by branches of the thoracodorsal artery, the 10th and 11th intercostal arteries, and the 1st and 2nd lumbar arteries; this allows for various flap designs. The LD musculocutaneous flap has advantages and disadvantages; the technical aspects of raising, elevating, and harvesting the LD flap are straightforward, reproducible, and relatively fast, and surgical time is reduced as a result, which is an important consideration for cancer patients. Following the harvesting of the latissimus dorsi muscle, the most significant functional result is a mild impairment in the adduction and medial rotation. Synergistic muscles, on the other hand, compensate for this limitation in the majority of patients, ensuring that it does not significantly interfere with activities. It is usually always able to perform primary closure of the donor site, which subsequently results in a linear scar on the dorsal region that is well tolerated.

1. Osteosarcoma-like left hemithorax costal mass

2. Left Chest Wall Defect Following Oncological Resection Team (18 cm* 20 cm)

3. Raising, elevating, and harvesting the Latissimus Dorsi flap



4. Latissimus Dorsi flap for anterior chest cover

5. Frontal perspective post-coverage

6. Post-surgical follow-up 14 days later

DISCUSSION

Reconstructing chest wall deformities caused by large oncologic resections is still one of the hardest things to do in reconstructive surgery. These defects often affect different layers of the body, from the skin and subcutaneous tissue to the bones, the parietal pleura, and even the pericardium. The reconstructive surgeon must not only make sure that the area is covered but also restore a functional, dynamic compartment that protects the thoracic viscera. This project will only be successful if it is carefully planned, the people working on it have a deep understanding of thoracic biomechanics, and everyone works together as part of a multidisciplinary team of oncologists, thoracic surgeons, and radiation therapists, all with the same goal of the patient's full recovery. The primary objective of our intervention is to transform a contaminated, exposed, or unstable defect into a closed, stable, and well-vascularized environment. Choosing a reconstructive procedure is not arbitrary; it is governed by a hierarchy of established principles, where the concept of "like-with-like reconstruction" (employing analogous tissues) must be evaluated in conjunction with donor-site morbidity and the patient's systemic conditions. The reconstructive algorithm is usually divided into groups based on the size, location, and depth of the defect, as well as the patient's history of radiation and general health. For partial-thickness or minor full-thickness abnormalities that do not compromise skeletal stability, local and regional flaps, such as the pectoralis major myocutaneous flap or the latissimus dorsi flap in its partial-rotation configuration, provide sophisticated, low-morbidity alternatives. However, it is for significant defects—those requiring extensive volumetric coverage and frequently the restoration of bone integrity—

that reconstructive options become increasingly important, and the pedicled latissimus dorsi flap demonstrates its considerable value.

The latissimus dorsi flap can be used to rebuild the middle and upper chest wall. Its vascular-nervous pedicle is big enough and stable, so it's safe to use even in areas that have already been exposed to radiation. Radiotherapy is an important part of the multimodal approach to treating thoracic cancer. However, it can hurt the environment of the recipient because it damages tissues, causing things like obliterative microangiopathy and fibrosis. From a biological standpoint, it is essential to obtain a well-vascularized axial flap from a location outside the radiation zone. The latissimus dorsi flap not only covers the defect, but it also improves the ischemia environment, which speeds up healing and raises the oxygen levels in the tissue. These two things are very important for helping bone grafts or prosthetic meshes stick together and lowering the risk of infection. Another thing that makes it unique is how versatile it is. It can help with problems in the breast, axillary apex, sternal area, and posterior midline because it can move around. Another possible use is a myocutaneous flap, which uses the patient's own muscles to fill in gaps and gives a high-quality skin paddle for primary cutaneous coverage. The ability to provide a cutaneous component is important because too much stress on the sutures makes it more likely that the prostheses underneath will become exposed. It is crucial to scrutinize the flap's attachment to the prosthetic materials meticulously. To make the chest wall stiff again and stop paradoxical flail chest, it is often necessary to do skeletal reconstruction with polypropylene, extended polytetrafluoroethylene (ePTFE), or composite meshes. If these materials are not kept away from the outside world and the body's internal organs, they can get infected or extruded.

The latissimus dorsi flap is an important biological barrier that keeps the prosthesis from coming into contact with the outside world. This perfused "cushion" helps the osteomuscular repair and makes sure it lasts a long time. It may not be safe to use it on patients whose other upper limb doesn't work well because they could experience severe pain if they can't adduct and rotate their arm. So, it's important to know what it can't do. The thoracodorsal pedicle may also be hard to get to if the person has had axillary surgery before, like a big lymphadenectomy. If the problem is with the front or lower chest wall and the latissimus dorsi isn't enough, we'll have to use more complicated treatments.

The next step in the reconstructive pyramid is microvascular free flaps. The contralateral latissimus dorsi free flap, the deep inferior epigastric artery perforator (DIEP) flap, or the free rectus abdominis muscle (TRAM) flap offer unmatched design flexibility and volume. But they are linked to a higher chance of microvascular failure, which is a very bad thing in this case, as well as a longer surgery time and more problems at the donor site. On the other hand, regional projections, such as the pedicled omentum, which comes from the right gastroepiploic artery, are still very important. It is the best choice for sealing bronchopleural fistulas or treating infections that have already happened because it is flexible and has a lot of new blood vessels, which act as a granulation bed for skin grafts.

In our experience, as well as in the literature, we have consistently found that the best results come from doing reconstruction quickly, no matter what method is used. Delaying reconstruction is linked to a higher risk of fibrosis, contracture, infection, and functional deformity. So, it is not only a good idea but also required to work with the oncologic surgery team to plan ahead of time. This teamwork helps us guess how big the defect is, pick the best tissue, and move smoothly from the resection phase to the reconstruction phase. This cuts down on the amount of time the patient needs to be under anesthesia.

In conclusion, reconstructing the chest wall in cancer patients is a field that is still developing and needs a complex, individualized approach. The pedicled latissimus dorsi flap remains the principal approach for most mid- and upper chest wall defects, as it provides well-vascularized tissue in a single surgical intervention and is both dependable and adaptable. The reconstructive surgeon must be skilled in a variety of techniques, such as complex microsurgical procedures and local flaps, in order to find the best solution for each individual clinical situation. The ultimate goal is more than just closing a cut; it is to help the patient regain their trust in their body, breathing, and internal organs, which will help them face their cancer recovery with the most emotional and physical stability possible. To enhance the standard of care for this complex patient demographic, forthcoming research must focus on the optimization of prosthetic materials, the mitigation of donor-site morbidity, and the advancement of preoperative planning methodologies via 3D imaging.

CONCLUSION

The pedicled latissimus dorsi flap is an essential component of reconstructive procedures for oncologic chest wall abnormalities. The fact that it is vascularly reliable, has versatile designs, has the capacity to restore function, and has a good safety profile makes it a choice that should be considered first. Using it in a methodical and planned manner makes it possible to accomplish the basic objectives of reconstructive surgery, which are the protection of important organs, the restoration of function, the prevention of problems, and the enhancement of body contour. This, in turn, makes it easier for the cancer patient to make a full recovery.

Conflicts of Interests

The authors have disclosed no conflicts of interest. The patient has signed the informed permission form, approving the usage and dissemination of confidential information and photos for scientific and non-profit reasons. The submitted paper was reviewed and approved by all authors.

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