

En-bloc Chest-Wall Resection and Ipsilateral Latissimus Dorsi Flap for Well-Differentiated Leiomyosarcoma with Pleural Extension: A Case Report and Literature Review

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Abstract: *Introduction: Leiomyosarcoma (LMS) is an uncommon subtype of soft tissue sarcoma (STS) that originates in smooth muscle. Its management is complex and requires a multidisciplinary approach, with complete surgical resection as the mainstay of treatment. Case presentation: We present the case of a 23-year-old man with a well-differentiated leiomyosarcoma of the left chest wall with pleural invasion. The patient reported a 6-month history of progressive pain and a palpable mass. Imaging studies revealed a 9.2 x 13.1 cm mass with pectoralis muscle invasion and intrathoracic extension. En-bloc thoracic resection followed by polypropylene mesh reconstruction and ipsilateral latissimus dorsi pedicle flap was performed. Discussion: treatment of choice for localized LMS is en-bloc surgical resection with negative margins. Reconstruction of large chest wall defects is challenging. The latissimus dorsi flap is a versatile option for covering such defects. Conclusions: En-bloc resection with wide margins followed by adequate reconstruction is an effective treatment for extensive chest wall leiomyosarcomas, offering good local control and functional outcome. Management in specialized centers is essential.*

Keywords: leiomyosarcoma, thoracic resection, latissimus dorsi flap, sarcoma, flap

1. Introduction

Soft tissue sarcomas (STS) are rare malignancies derived from mesenchymal tissue and account for less than 1% of all malignancies in adults [1]. Leiomyosarcoma (LMS) is one of the most common subtypes of STS, originating from smooth muscle cells or their precursors, and therefore can develop in almost any part of the body, although it most commonly occurs in the retroperitoneum, extremities, or uterus [2].

Diagnosis of STS can be difficult because of the often-nonspecific clinical presentation, such as a painless mass that grows gradually. Warning features suggestive of malignancy and requiring urgent investigation include size more than 5 cm, rapid growth, deep localization, new-onset pain, or recurrence of a previously excised mass [1].

Treatment of localized STS is based on a multidisciplinary approach, and en-bloc surgical resection with microscopically negative (R0) margins is the gold standard [3, 4]. In cases of large tumors or those invading vital structures, such as the chest wall, resection may be extensive and require complex reconstructive techniques to restore structural integrity and function as well as to provide adequate soft tissue coverage [3, 5]. The latissimus dorsi flap is a versatile and reliable reconstructive tool for these scenarios [5].

Herein, we describe the case of a young patient with a well-differentiated left chest wall leiomyosarcoma with pleural

invasion. The purpose of this report is to detail the complex surgical management, including en-bloc resection and single-stage reconstruction with an ipsilateral latissimus dorsi flap, thereby highlighting a successful approach for extensive thoracic defects.

This case is significant as it adds to the limited body of evidence supporting this reconstructive technique for massive chest wall defects in young adults, demonstrating excellent oncological and functional outcomes.

2. Case Presentation

A 23-year-old man from Sonora, Mexico, with no personal or family history of cancer and a 1-year history of smoking (smoking rate 0.35) and weekly alcohol consumption to intoxication for the past 2 years, presented with a 6-month evolutionary history characterized by progressive pain in the left hemithorax and a progressively growing mass in the same region. This symptomatology culminated in severe and disabling pain accompanied by paresthesia in the left upper extremity and limited mobility in the left shoulder. The patient also reported a weight loss of 4 kg in the past month. On physical examination, a painless, indurated, nonmobile mass was palpated in the left subclavicular region attached to the deep planes.

As part of the diagnostic evaluation, an initial contrast-enhanced thoracoabdominal CT scan was performed on March 13, 2024. This study revealed an 8 x 12 cm mass with

heterogeneous content (30-70 Hounsfield Units), in direct contact with the parietal pleura, protruding into the left thoracic cavity, displacing the first rib medially into the

thoracic cavity and in relation to the vascular structures of the subclavicular space. **Figure 1.** The patient was subsequently referred to surgical oncology for evaluation.

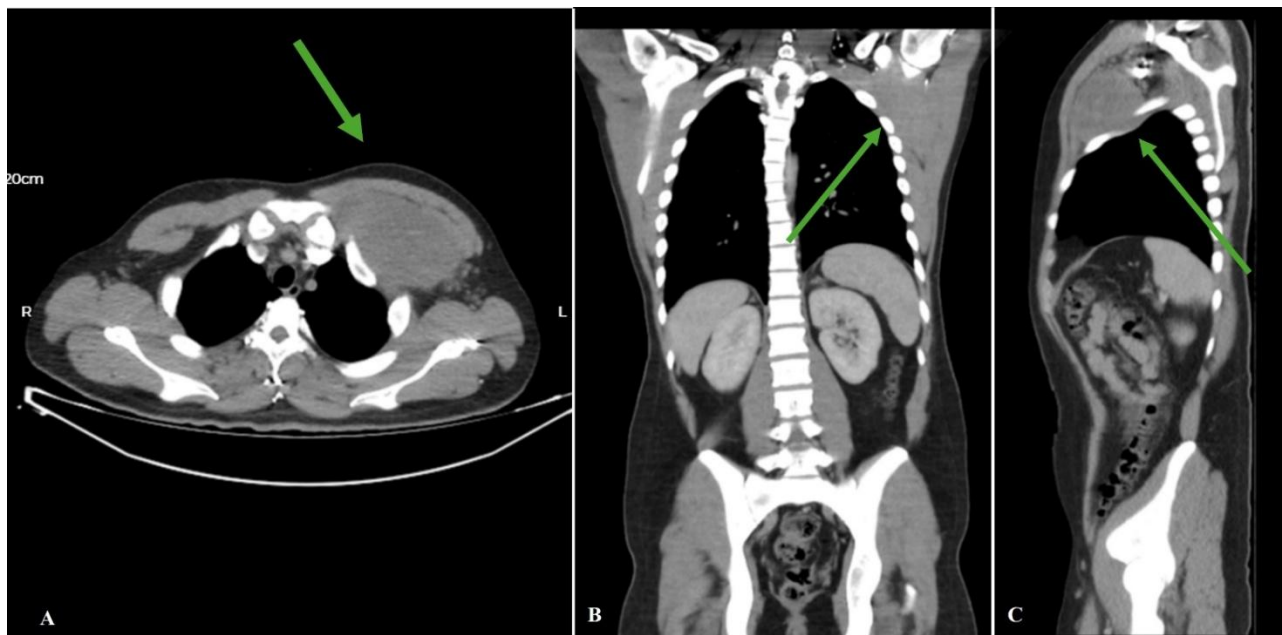


Figure 1: Initial contrast-enhanced thoracoabdominal computed tomography (CT). A: Transverse view. B: Coronal view. C: Sagittal view. Revealed an 8 x 12 cm mass with heterogeneous content, highlighted with a green arrow.

On July 17, 2024, because of increased swelling and pain reported by the patient, a contrast-enhanced thoracoabdominal CT scan was ordered. The results showed an ovoid tumor measuring 9.15 x 12.1 cm with invasion in the deep plane of the pectoralis major and minor muscles. The tumor had well-defined borders and heterogeneous density, without significant enhancement in the arterial or venous phase. The lesion displaced the first through third ribs medially with

predominance on the first rib, identifying intrathoracic structures through the first two intercostal spaces. In addition, there was involvement of the lateral portion of the second rib with cortical loss and irregularity. No pleural effusions or distant metastases were observed. The radiological impression was that of a probable soft tissue tumor with intrathoracic extension, suggestive of a probable sarcoma. **Figure 2.**

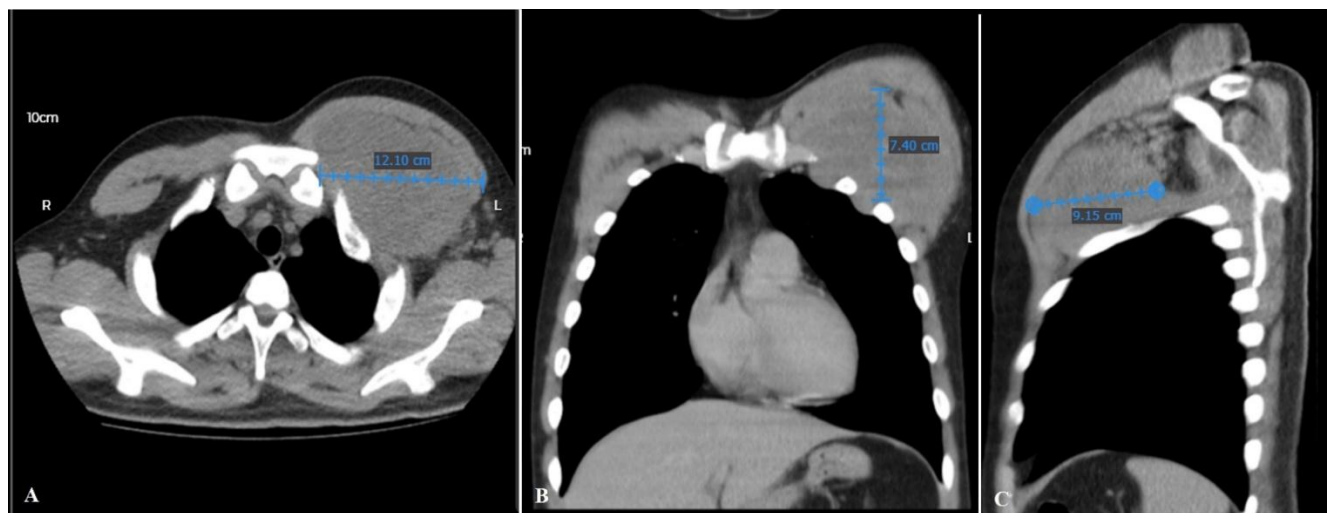


Figure 2: Contrast-enhanced thoracoabdominal CT scan. A: Transverse view. B: Coronal view. C: Sagittal view. It showed an ovoid tumor measuring 9.15 x 12.1 cm with invasion in the deep plane of the pectoralis major and minor muscles. The measurements are shown with the blue line in cm.

Considering the extent of the tumor and rib invasion, therapeutic intervention consisting of en-bloc resection with immediate chest wall reconstruction was planned. On September 24, 2024, en-bloc resection of the pectoralis major and minor muscles, the first through third ribs, and a segment of the clavicle was performed. A surgical specimen measuring

19 x 17 x 11 cm was obtained, including a 12 x 3 cm skin spindle. **Figure 3.**



Figure 3: Thorax after resection of the thoracic sarcoma, resection of the pectoralis major and minor muscles, the first through third ribs.

Macroscopically, the mass was described as grayish-white, measuring 12 x 8 cm; it invaded and displaced the muscles, extending through the chest wall to the parietal pleura overlying it. The closest surgical margin was found to be 3 cm. Two endopleural probes were placed to close the defect. Chest wall reconstruction was performed with a polypropylene mesh, which was covered with a pedicled myocutaneous flap of the ipsilateral latissimus dorsi muscle. Finally, a closed wound suction system was placed.

The histopathological report concluded that it was a well-differentiated 12 x 8 cm leiomyosarcoma with 5% necrosis and mitotic activity of 1 to 3 mitoses per 50 high-power fields. The tumor invaded the costal bones, but surgical margins were reported as uninvolved. No major postoperative adverse events were reported.

3. Discussion

Leiomyosarcoma (LMS) of the chest wall is a rare and aggressive entity. The treatment of choice for localized LMS, when technically feasible, is en-bloc surgical resection with histologically negative margins [3, 4]. A margin of at least 2 cm is considered ideal to minimize the risk of local recurrence [3]. In this case, an oncologically adequate margin of 3 cm was achieved.

Invasion of the parietal pleura and multiple rib arches, as in the present case, presents a significant surgical challenge, both for complete resection and subsequent chest wall reconstruction. Resection of more than 5 cm in diameter or more than 3-4 ribs generally requires some form of reconstruction to maintain chest wall stability, prevent paradoxical movements, and protect intrathoracic viscera [3]. In our patient, the resection involved three ribs and a clavicle segment, creating an extensive defect.

Various techniques have been described for reconstruction of chest wall defects, including the use of prosthetic materials

(such as polypropylene mesh, methylmethacrylate, or titanium rods) and autologous tissue flaps [3]. The polypropylene mesh, used here, provides immediate structural support, while the wide latissimus dorsi myocutaneous flap provides vascularized soft tissue coverage, which is essential for healing, obliteration of dead space, and protection of the mesh from infection or extrusion [5, 3]. Free flaps are also essential in post-sarcoma reconstruction, although a pedicled flap was used in this case [9].

The latissimus dorsi flap is a highly versatile and reliable reconstructive option for thoracic defects [5]. Its robust vascular pedicle (thoracodorsal vessels) and large surface area (up to 20 x 40 cm) allow it to cover extensive defects [5, 6]. It can be used as muscle, myofascial or myocutaneous pedicled or free flap [5, 6].

In this case, an ipsilateral pedicled flap was used, which simplifies the procedure as it does not require microvascular anastomoses. Preservation of the thoracodorsal nerve, if possible and if it does not compromise oncologic margins, can help maintain muscle tone and function, although the main function in this context is coverage and filling [7]. Morbidity at the donor site of the latissimus dorsi flap is usually low, although shoulder dysfunction has been reported; however, early physiotherapy and nerve preservation may mitigate this risk [7]. No early flap-related complications were reported in this patient.

The prognosis of LMS depends on factors such as histologic grade, tumor size, depth, site, and achievement of negative surgical margins. Well-differentiated LMS, as in this patient, tend to have a better prognosis than high-grade LMS, although considerable size and local invasion are negative factors. The presence of necrosis (5% in this case) and mitotic activity (1-3/50 HPF) are important parameters for grading. The local recurrence rate for STS of the extremities and trunk can be 20-25% at 10 years, with most occurring in the first 2 years [1], emphasizing the importance of careful follow-up with clinical and imaging examinations.

Referral of patients with suspected sarcoma to specialized centers with multidisciplinary teams (surgical oncologists, medical oncologists and radiation oncologists, radiologists, and pathologists with expertise in sarcomas) is critical to optimize diagnosis, staging, and treatment [4, 8].

The therapeutic approach for this patient was based on established oncologic principles for the treatment of locally advanced leiomyosarcomas. The primary goal was complete excision of the tumor with microscopically negative (R0) margins. Given the invasion of pectoral muscles, ribs, and proximity to the pleura, a large en-bloc resection encompassing all macroscopically involved structures and a margin of surrounding healthy tissue was required, in accordance with guidelines indicating R0 resection as the most important factor for local control [3]. A polypropylene mesh was used for chest wall reconstruction to restore structural integrity and prevent lung herniation [3]. Vascularized soft tissue coverage was performed using an ipsilateral latissimus dorsi pedicle flap, chosen for its versatility, vascular reliability, proximity, and suitability to cover the anterior and lateral thoracic defect, providing

sufficient volume and avoiding the complexity of microsurgery [5, 6]. Postoperative management included chest tube placement and the use of a closed wound drainage system. No neoadjuvant or adjuvant therapy was administered, a decision that may have been based on the degree of tumor differentiation, achievement of negative margins, and patient age [4, 8].

4. Conclusion

En-bloc thoracic resection followed by reconstruction with polypropylene mesh and an ipsilateral pedicled latissimus dorsi myocutaneous flap represents an effective and safe therapeutic approach for the treatment of large, well-differentiated leiomyosarcomas with invasion of the chest wall and parietal pleura. This case illustrates the possibility of achieving adequate surgical margins and satisfactory functional reconstruction in a young patient. The authors acknowledge the limitations of a single case report and the relatively short-term follow-up; however, the presented outcome is promising. A multidisciplinary approach in a specialized center and long-term oncologic follow-up remain essential to detect recurrence early and confirm long-term success.

Acknowledgements

The authors express their gratitude to the Instituto Mexicano del Seguro Social (IMSS) for permitting access to facilities during this research. They would also like to extend a special thanks to Dr. Leonel Camacho Hernández M. D. for his valuable guidance and support throughout this project.

Conflicts of interest

The authors declare that they have no conflicts of interest.

Ethical statement

Written informed consent was obtained from the patient for the publication of this case report and any accompanying images.

References

- [1] Shakya S, Banneyake EL, Cholekho S, Singh J, Zhou X. Soft tissue sarcoma: clinical recognition and approach to the most solitary tumor. *Explor Musculoskeletal Dis.* 2024; 2:56-68. doi: 10.37349/emd.2024.00034.
- [2] Kerrison WGJ, Thway K, Jones RL, Huang PH. Biology and treatment of leiomyosarcomas. *Crit Rev Oncol Hematol.* 2023; 180: 103955. doi: 10.1016/j.critrevonc.2023.103955.
- [3] Sánchez-Matas C, Monge Blanco S, García Gómez F, López Villalobos JL, de la Cruz Lozano FJ, Blanco Orozco AI. Chest wall sarcoma with en bloc resection of 6 ribs and reconstruction with prosthetic material and musculocutaneous graft. *Rev Esp Patol Torac.* 2021;33(4):243-245.
- [4] Gamboa AC, Gronchi A, Cardona K. Soft tissue sarcoma in adults: an update on the current status of histiotype-specific management in the era of personalized medicine. *CA Cancer J Clin.* 2020 Apr;70(3):200-229. doi: 10.3322/caac.21605.
- [5] Vincent A, Hohman MH. Latissimus dorsi flap [Updated 2024 Apr 1]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK564377/> [Accessed Nov 15, 2024].
- [6] Abe Y, Nagasaka S, Yamashita Y, Minoda K, Yamasaki H, Bando M, Mima S, Hashimoto I. Functional outcomes of reconstructive flap surgery for soft tissue sarcoma: long-term outcomes of functional restoration by innervated muscle transplantation. *J Plast Reconstr Aesthet Surg.* 2024; 91:312-321. doi: 10.1016/j.bjps.2024.02.018
- [7] Chakrabarti S, Panuganti A, Gupta M, Ghosh A, Bhukar S, Choubey T, Mishra A, Sharma SS. Pedicled Latissimus Dorsi myocutaneous flap is an effective reconstructive option for extensive buccal tumor resection in resource-limited and salvage settings. *Indian J Surg Oncol.* 2020 Sep;11(3):462-468. doi: 10.1007/s13193-020-01123-5.
- [8] Von Mehren M, Kane JM III, Agulnik M, Bui MM, Carr-Ascher J, Choy E, et al. Soft Tissue Sarcoma, Version 2.2022, NCCN Clinical Practice Guidelines in Oncology. *J Natl Compr Canc Netw.* 2022 Jul;20(7):793-821. doi: 10.6004/jnccn.2022.0035.
- [9] Lucattelli E, Luseti IL, Cipriani F, Innocenti A, De Santis G, Innocenti M. Reconstruction of upper limb soft tissue defects after sarcoma resection with free flaps: a systematic review. *J Plast Reconstr Aesthet Surg.* 2021;74(4):755-767. doi: 10.1016/j.bjps.2021.01.001

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