

# Malignant Tumor of the Sternum Surgical Resection and Reconstruction in One Step: About A Case

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## Abstract:

Malignant primary tumors of the sternum are rare, and are difficult to treat due to the anatomical proximity to mediastinal vascular structures and the limited surgical margins that can be obtained. Wall reconstruction is the most difficult part of the treatment. Many techniques have been described, ranging from musculocutaneous flaps to increasingly sophisticated prostheses. The authors report a case of primary sternal tumor and the problems posed during parietal reconstruction.

The diagnostic means in the evaluation of sternal masses have evolved considerably with the advent and evolution of the scanner and their definitive diagnosis is made by anatomopathology, thanks to surgical biopsy.

We report a case of sternal tumor in a 37-year-old woman treated in our department and having benefited from a complete resection of the sternum removing the tumor with safety margins respected followed by reconstruction at the same operating time.

The objective of this article is to present the fundamental principles of surgical treatment of sternum tumors, namely complete resection, satisfactory from a carcinological point of view; Maintenance of respiratory function by wall repair restoring sufficient wall rigidity and coverage by good quality tissues.

**Keywords:** Chest wall tumors; Sternal tumor; Sternal resection; Reconstruction; Synthetic plate; Recidivism.

## INTRODUCTION:

Primary tumors of the sternum are rare, representing only 0.5 to 1.0% of all primary bone tumors (1-3). They are most often malignant, either primary or secondary. Their diagnosis and their frequency cannot be superimposed on the rest of the tumors of the chest wall. However, it appears that primary tumors of the chondrosarcoma type are the most frequent, and in metastatic type lesions (mammary, hepatic, thyroid, pulmonary). (4-5-6)

Sternal tumors are difficult to treat due to the anatomical proximity to mediastinal vascular structures and the limited surgical margins that can be obtained. Wall reconstruction after surgical resection is the

most difficult part of the treatment. Many techniques have been described, ranging from a simple musculocutaneous flap to reconstruction using increasingly sophisticated prostheses (7). However, the limited number of large-scale studies means that there is no well-established therapeutic modality to help decide the extension of resection and the method of wall reconstruction.

In this observation, we report a case of sternal tumor treated in our department having benefited from a complete resection of the sternum removing the tumor with safety margins respected followed by a reconstruction in the same operating time.

### **Materials and methods :**

We report the case of a 37-year-old woman who reported the appearance of a painful anterior thoracic arch that had been present for 5 months. The physical examination revealed a hard and immobile mass next to the body of the sternum (average 1/3) of hard consistency, fixed in relation to the deep plane, the skin next to it was healthy accompanied by weight loss. The remainder of the cardiopulmonary examination was unremarkable. There was no palpable peripheral lymphadenopathy, particularly in the laterocervical, supraclavicular and axillary areas.

A chest computed tomography (CT) scan was performed, revealing an intramedullary lytic blowing lesion of the body of the sternum with erosion of the cortex and rupture of the latter in places without invading the soft parts (Fig 1-2) and of which the anatomopathological examination of a fragment of a surgical biopsy of this mass revealed a malignant tumor such as low-grade Chondrosarcoma (figure 3).

### **Results:**

After a preoperative assessment, the surgical intervention took place in a single operating stage, and consisted of a sternectomy removing the tumor and the sternum in one piece, with a safety margin of 4 cm at the periphery, leaving the manubrium in place. sternal (figure 4). Followed by a parietal reconstruction using a polypropylene plate (figure 5), reinforced by muscular approximations.

The pathological study of the surgical specimen (figure 6) confirmed the diagnosis of chondrosarcoma. The postoperative outcome was very favorable and the patient left the hospital on the 6th postoperative day without respiratory distress. Reviewed one year later, we noted good healing with good adaptation of the plate to the chest wall and absence of recurrence.

### **DISCUSSION:**

Sternal tumors are rather rare; their differential diagnosis includes infectious lesions, of bacterial origin, and tumor-type lesions, most often malignant. They are either primary or metastatic. They are generally rare; the primary tumors are mainly chondrosarcomas; osteosarcomas, plasmacytomas, lymphomas, angiosarcomas, fibrosarcomas, Ewing sarcoma (4-9). Secondary malignant lesions of the sternum, the lesions most reported in the literature, are metastases of breast carcinoma, hepatocarcinoma, thyroid, gastric, rectal carcinoma; of lung carcinoma. (4.5 6) . Pulmonary bone metastases in the chest wall, mainly the ribs and thoracic vertebrae, are known and well described. On the other hand, metastatic lesions of pulmonary origin at the sternal level are exceptional. Benign sternal tumor lesions are even rarer, and include hemangioma, eosinophilic granuloma, neuroma (4-8).

Chondrosarcoma is the most common primary malignant bone tumor found in the sternum. It develops at the expense of the chondro-costal junction (60%), the sternum (20%) or the rib neck (20%). Slow growing, chondrosarcoma usually affects subjects aged 30 to 60, silent for a long time then painful,

Masab et al. (11) and Rad et al. (12) reported an age varying between 36 and 57 years in their respective series. This tumor affects men much more than women. The imaging is suggestive: Standard radiography and CT scan: show bone lysis, calcifications specific to arcuate or popcorn cartilaginous tumors, periosteal appositions.

The diagnostic means in the evaluation of sternal masses have evolved considerably with the advent and evolution of CT. However, the first evaluation examination remains the lateral x-ray of the sternum. For tumors of bone origin, bone window CT is the reference examination to explore the local extension of these tumors (13).

The definitive diagnosis of sternal masses is made by pathology, and surgical biopsy also remains the reference (13).

In our case, the demonstration of a sternal mass in a 37-year-old patient, with notion of weight loss, should point towards an oncological origin. The evolution of the signs dates back to 05 months with the appearance of a small pre-sternal mass with progressive increase in volume. This evolution is similar in the series of Masab et al and Rad et al. (12) who reported a period of 3 months and 6 months. As for pain, it constitutes a sign of poor prognosis, often reflecting periostalgic damage (13-14).

When surgery is curative, the resection should be a wide, radical en bloc excision of the tumor with adequate margins. The extent of resection should not be limited by size. A wide resection with a margin of 2 to 5 cm for skin and a margin of 4 to 5 cm for bony structures is acceptable (14). Inadequate tumor resection is associated with a high incidence of recurrence (69% versus 6% in adequately treated patients) (15).

The primary goals of all chest wall reconstructions are to restore chest wall rigidity, preserve ventilatory mechanics, protect intrathoracic organs, cover soft tissues, minimize deformities. (16-17)

The parietal reconstruction in our patient was carried out with the installation of a plate followed by muscle and skin coverage. This method has been used by authors such as Koto et al. (18), with very good results. We observed no change in postoperative lung function, which proves the effectiveness of our procedure for chest wall reconstruction.

Artificial materials may be prone to infection and induce factors not observed with autologous tissues (19). Musculocutaneous flaps should be widely used to overcome these problems. (20)

## CONCLUSION:

Chondrosarcoma of the sternum is rare. The therapeutic success of these tumors depends on the grade, the quality of resection, the possibilities of reconstruction and lung function.

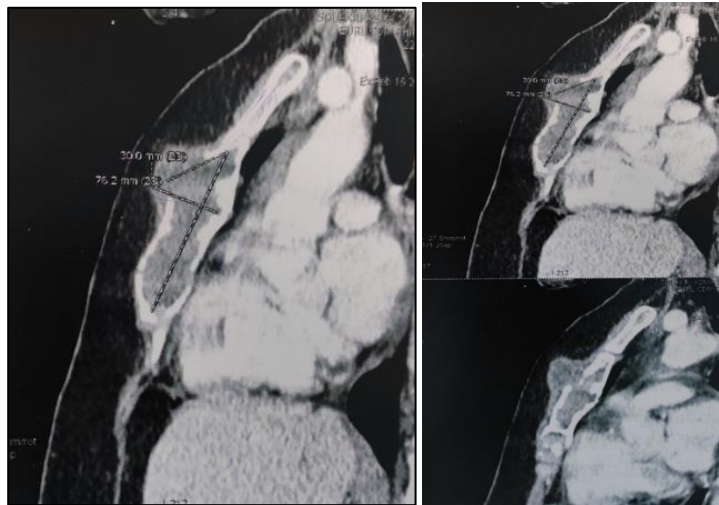
This surgery being considered as the therapeutic act par excellence, a complete preoperative assessment must be carried out in order to know the risk situations linked to the topography of the tumor, its extension and its vascularization.

This observation highlights that a resection of the chest wall, followed by reconstruction with a plate and musculocutaneous coverage can be performed in a single surgical stage, safely and effectively, on a patient with a sternum tumor. This procedure may be useful for reconstructing large chest wall defects.

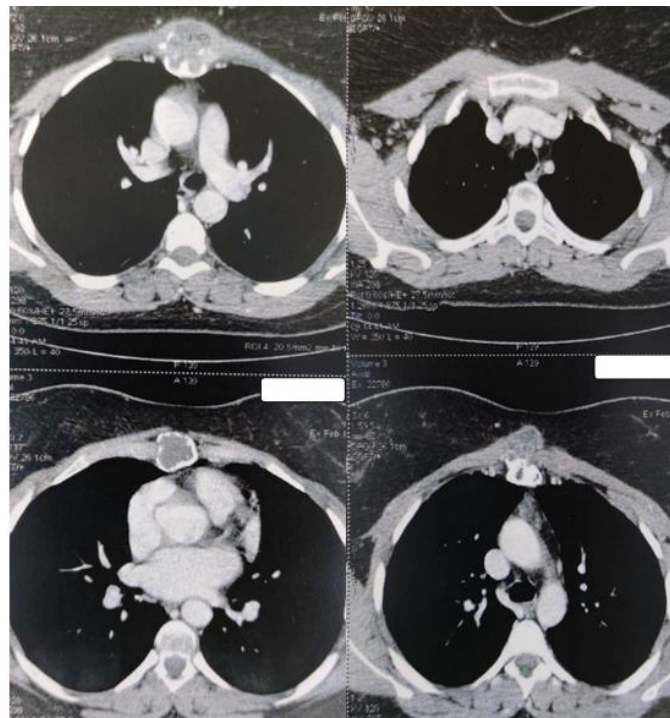
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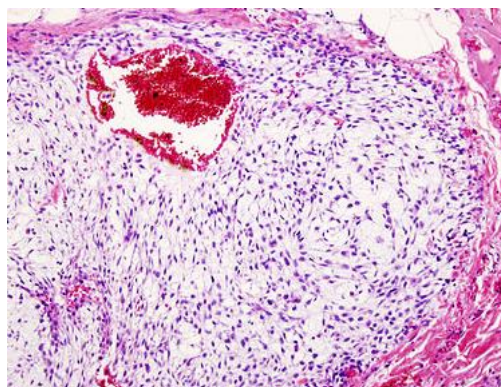
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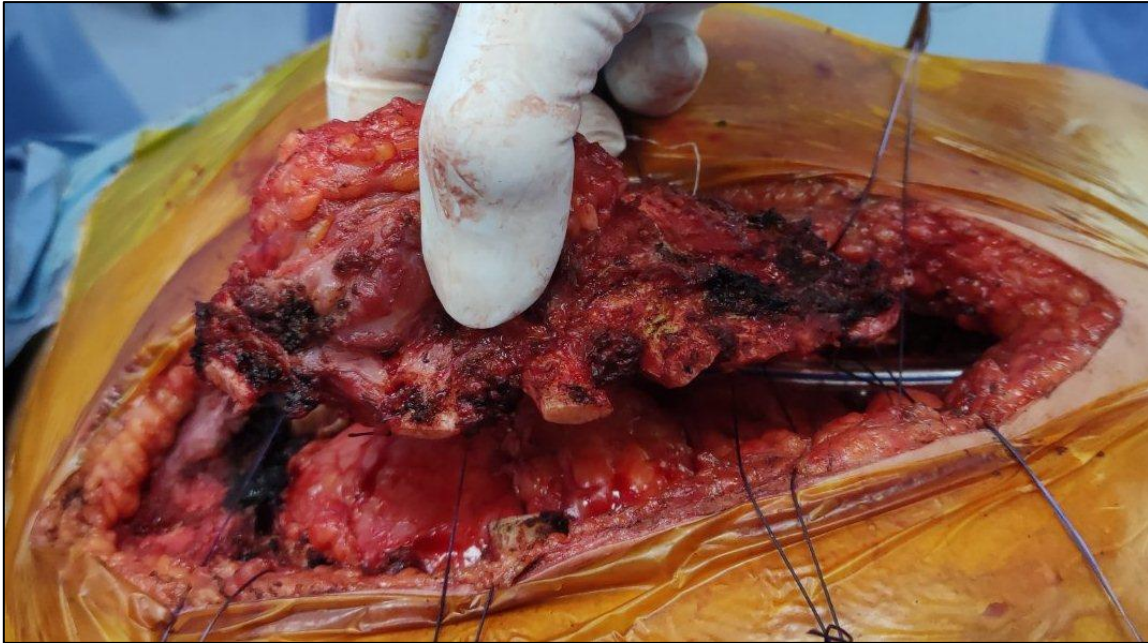
**Fig 1: Sternal mass lateral view., shows a lytic bone mass of the body of the sternum.**



**Figure 2: Sternal mass, axial section., shows a lytic bone mass.**



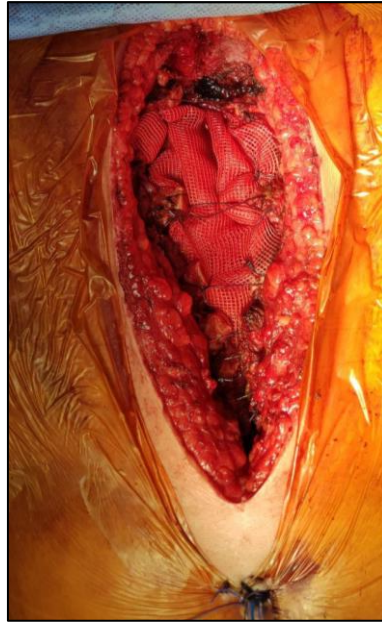
**Figure 3: Image of Chondrosarcoma of the rib cage.**



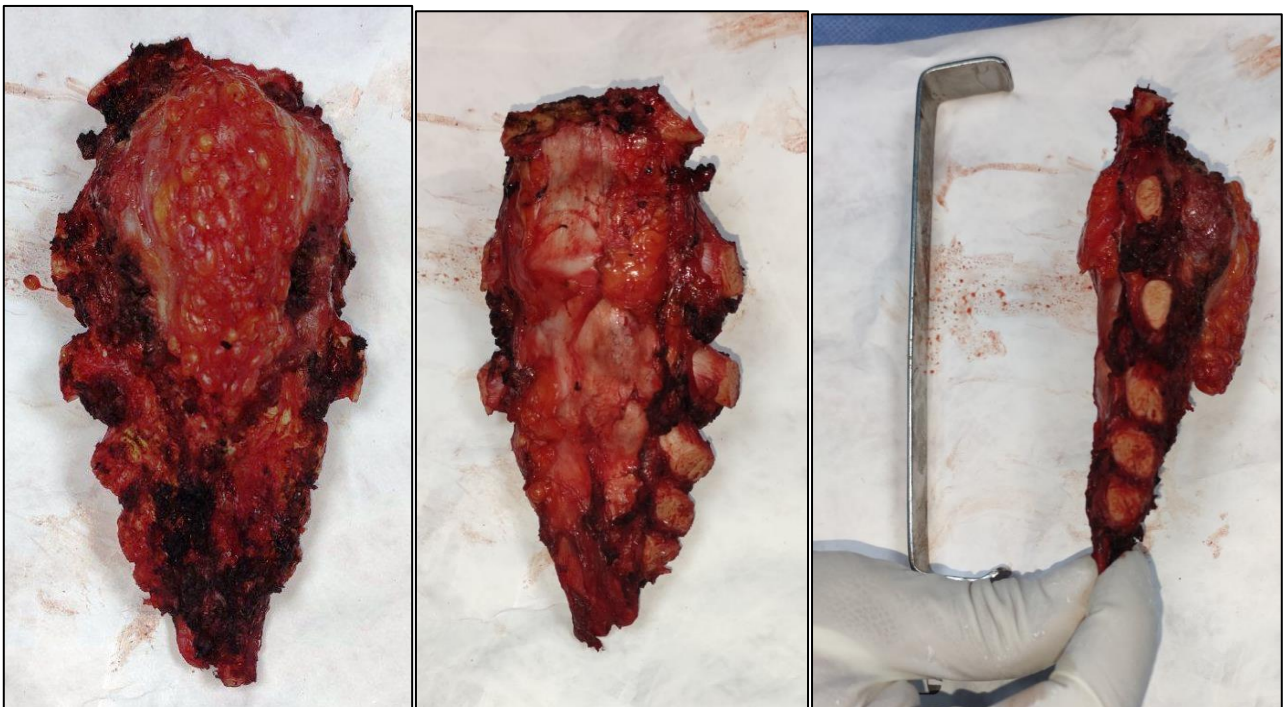
**Figure 4: Single-piece resection of the sternum removing the tumor. ( K..MESKOURI collection)**



**ig 5: Approximation of the chondro-sternal cartilage to reduce the defect. ( K..MESKOURI collection)**



**Fig 6: Reconstruction by placing the synthetic plate ( K..MESKOURI collection)**



**Fig 5: Operating piece (sternectomy removing the tumor) ( K..MESKOURI collection)**