

# Anterior Chest Wall Resection and Reconstruction Due to Recurrent Chondrosarcoma: a Case Report

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## Abstract

Chest wall chondrosarcoma is a rare malignant tumor with aggressive biological behavior. The only available treatment for primary or recurrent chondrosarcoma consists of radical surgical resection because of its well-known chemo- and radioresistance. Repeated resection for recurrent chondrosarcoma is challenging because of the altered anatomy, scarring, harvested muscles, and close proximity to vital thoracic organs. We present an uncommon case of recurrent chest wall chondrosarcoma resected in the Department of Thoracic Surgery, which we reconstructed with Symbotex mesh and reinforced by omentoplasty. In addition, we created a brief review of the prevalence, diagnostics, surgical treatment, reconstructive options, and prognosis for this condition.

## Keywords

chest wall resection and reconstruction, omentoplasty, recurrent chondrosarcoma, surgical treatment, Symbotex mesh

## INTRODUCTION

Chest wall chondrosarcoma is a rare aggressive malignancy with a high recurrence rate, especially when treated non-radically. We present an uncommon case of recurrent chest wall chondrosarcoma resected in the Department of Thoracic Surgery, which we reconstructed with Symbotex mesh and reinforced by omentoplasty. In addition, we created a brief review of the prevalence, diagnostics, surgical treatment, reconstructive options and prognosis for this condition.

## CASE REPORT

A 51-year-old female patient presented to our Department with complaints of anterior chest wall swelling in the region of a previous scar (**Fig. 1**). She had a medical history for fourth

left rib partial resection with close margins of about 2 cm due to chondrosarcoma 3 years ago. The patient's laboratory work-up was unremarkable, except for mild leukocytosis (WBC 11.43 g/l). Chest x-ray revealed a left paracardial lung opacity. The PET/CT scan revealed a parasternal lesion at the level of the fourth left rib, which was presented with heterogeneous metabolic activity (SUV max 1.9) (**Fig. 2**). A conclusion was made for a neoplastic process of the anterior chest wall and absence of lymphatic or hematogenous dissemination. At the multiboard collegium, this was supposed to be a recurrent chondrosarcoma of the previously resected rib and it was decided to proceed directly to anterior chest wall resection.

The surgery started with an arcuate incision over the sternum, descending inferiorly to the left mammary gland, as the previous scar was excised. The left mammary gland was mobilized, revealing a moderately dense tumor towards the left sternal border in the location of the previously resected rib.



**Figure 1.** Preoperative view of the patient showing a mass in the region of previous surgery.



**Figure 2.** Preoperative CT scan (axial section), showing a recurrent chest wall chondrosarcoma.

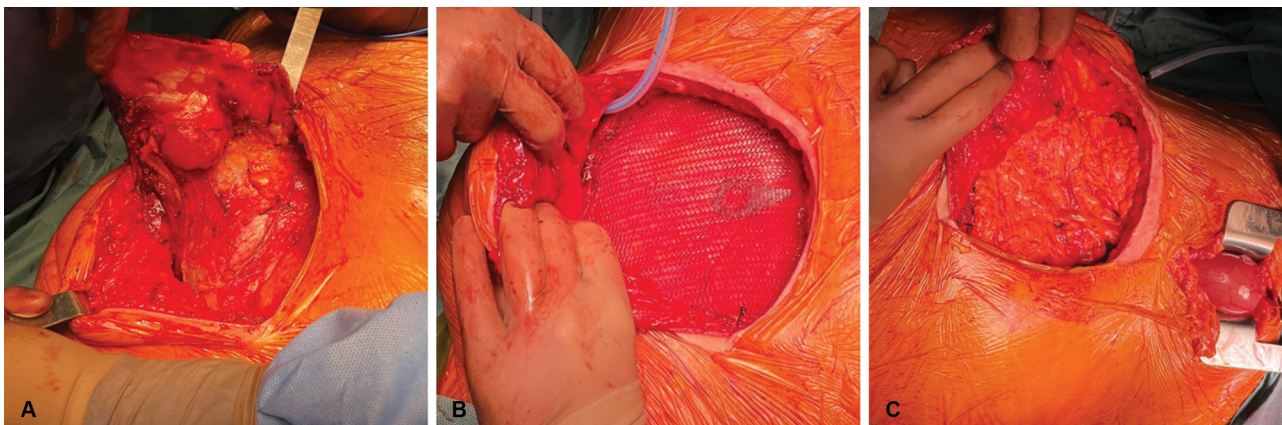
We performed left thoracic wall partial resection with gross dimensions of 10×12 cm (**Fig. 3A**). The distal half of the sternum, parts of the left rectus abdominis, serratus anterior, and pectoralis major muscles, together with one rib each above and below the tumor, also the adjacent intercostal muscles and nerve-vascular bundles were all resected en-block. Ventrally, the tumor lied in the intimate proximity to the pericardium and lung lingula, as consequently small parts of them were also excised. The previously positioned polypropylene mesh in the first surgery was removed. The remaining chest wall defect was reconstructed with Symbotex mesh (**Figs 3B, 3C**). Thereafter, we performed an upper midline laparotomy and a flap from greater omentum was mobilized under the feeding vessel right gastroepiploic artery and fixed upon the mesh as omentoplasty. The wound was closed in layers. Postoperative course was uneventful and the patient was discharged on the eighth day after surgery.

Macroscopically, the tumor was 80×70 mm, gelatinous, and with a formed cavity after the cut (**Fig. 4**). Microscopically, it was composed of basophil myxoid avascular matrix and rounded cells with small monoform nuclei and slight eosinophil cytoplasm. The tumor was well demarcated with well-formed fibrous capsule from which incomplete intraparenchymal septae were extended. There was no evidence of mitoses, necrosis, or adjacent organ infiltration. The final histopathological diagnosis was recurrent highly differentiated chondrosarcoma.

Six months later, at the follow-up examination, we found no evidence for recurrent disease from the physical examination or control CT scan (**Fig. 5**).

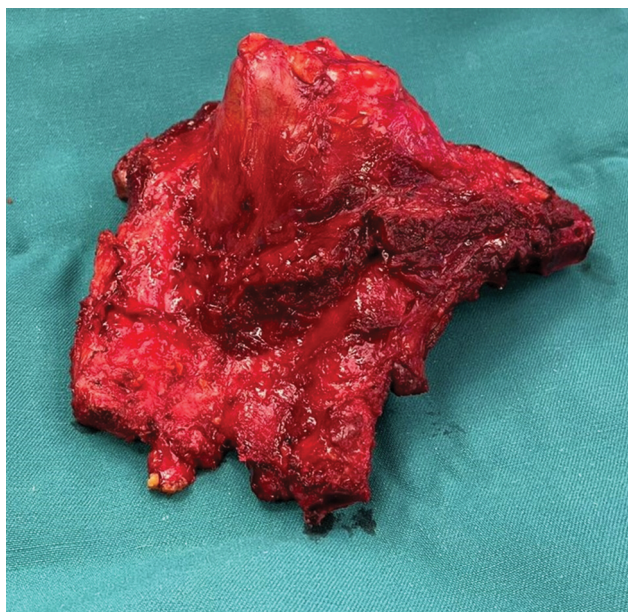
## DISCUSSION

We present an uncommon case of recurrent chest wall chondrosarcoma resected in the Department of Thoracic Surgery, which we reconstructed with Symbotex mesh and reinforced by omentoplasty. Chondrosarcoma represents 23% of all primary malignant chest wall tumors and the chest wall chondrosarcoma represents 15% of all chondro-



**Figure 3.** Intraoperative images: A. chest wall resection, B. reconstruction by means of a mesh, C. omentoplasty.





**Figure 4.** Postoperative specimen of a well-demarcated chondrosarcoma, resected en-block with the chest wall.



**Figure 5.** The patient six months after the second surgery.

sarcomas according to a retrospective study during a 40-year period performed in Memorial Sloan-Kettering Cancer Center.<sup>[1]</sup>

This tumor shows sex predilection - most patients are males and in their fifties. Usually, chondrosarcoma presents as an asymptomatic painless slow growing mass. The most common origin of chest wall chondrosarcoma is from the ribs as in the case we present.

Early diagnosis increases the chance of effective treatment and minimizes the need for extended resections and reconstructive procedures thereafter. Radiographically, the tumor may be seen as a lytic lesion with endosteal scal-

loping, cortical thinning or thickening, irregular margins and, in addition, the calcifications of the mass commonly have a ring and arcs configuration; however, they may be punctate as well.<sup>[2]</sup> On CT, chondrosarcoma presents like a rounded lobulated low attenuating mass. MRI shows low to intermediate signal on T1-weighted sequences and hyperintense signal on T2-weighted sequences. PET/CT is useful for higher-grade chondrosarcomas and their metastases and could have normal uptake values in low grade tumors like in our case, which was highly differentiated chondrosarcoma and SUV max was 1.9.

Histologically, the findings are typically distinctive multinodular architecture, high numbers of hyaline cartilage cells, and presence of chondromyxoid cartilage matrix. It is classified into low, intermediate, and high grade which is the most aggressive type.

Fine-needle aspiration cytology (FNAC) is recommended in cases of large masses, where a complex operation like chest wall resection is expected, or in a disseminated disease for histological diagnosis. According to a study at nonspecialty centers, only 26% of the sampled chondrosarcomas are correctly diagnosed by FNAC as malignant and, at sarcoma centers, 94% are correctly diagnosed by the same procedure.<sup>[3]</sup> In our patient, because of the history of previous partial rib resection for chondrosarcoma with too close surgical margins (only 2 cm) and PET/CT data for a tumor in the same place, we considered it unnecessary to perform FNAC.

The only available treatment for primary or recurrent chondrosarcoma is the radical surgical resection because of its well-known chemo- and radioresistance. Microscopically, negative margins and en-block resection with adjacent free margins of 4-6 cm are recommended. Margins smaller than 4 cm are related to a high percentage of recurrent diseases like in our case. A high incidence of intralesional margins (45.4%) and low incidence of marginal (18.2%) and wide (36.4%) margins were observed in one study and subsequently the authors observed a higher recurrence rate (4 from 7 patients) compared to other series.<sup>[4]</sup> Recurrences usually appear within 3 years after the excision, but late recurrence was reported to develop in 37% of cases.<sup>[5]</sup> In our patient, the tumor recurred three years after first surgery. According to one study of 76 patients resected for primary chondrosarcoma, 17% recurred, and of 26 patients resected for recurrent chondrosarcoma, 27% had a second local recurrence within 5 years, with a median time to re-recurrent disease of 17 months.<sup>[6]</sup>

Repeated resection for recurrent chondrosarcoma is challenging because of the altered anatomy, scarring, harvested muscles and close proximity to vital thoracic organs.

Reconstructive procedures are performed with the aim of restoring the stability and rigidity of the thoracic cage, eliminating the thoracic dead space, preserving pulmonary function, protecting the major intrathoracic organs, providing adequate soft tissue coverage, and optimizing the patient's cosmetic appearance.<sup>[7]</sup>

Combined resection and reconstruction in one stage

hide the risk for distant iatrogenic implantation of tumor cells at the donor site. Today, there is a wide range of options for prosthetic materials from autografts, allografts (cryopreserved sternal grafts), three-dimensional custom-made prosthesis, synthetic materials (polypropylene mesh, polytetrafluoroethylene prostheses, methylmethacrylate plates), titanium plates, cement spacers, etc. The ideal prosthetic material should be radiolucent, malleable, rigid, inert, light, biocompatible, and cheap but unfortunately, such material has not yet been created. There are some drawbacks with the use of different prosthetic materials like erosion appearance, migration, infection, periimplant fracture, screw loosening, foreign body rejection, high cost, etc.

The reconstructive opportunities using the patients own tissues include different types of flaps such as thoracoepigastric fasciocutaneous flap, pectoralis major, vertical rectus abdominis muscle (VRAM) flap, cranially pedicled transverse rectus abdominis myocutaneous (TRAM) flap, latissimus dorsi, omentum majus, free flap plasties, etc.<sup>[8]</sup>

In recent decades, synthetic nets have included essential features such as inertness, radiolucency, sufficient rigidity, and pliability.<sup>[8]</sup> In the presented case herein, the mesh was fixed to the adjacent ribs and was covered with a greater omentum flap to avoid direct mesh contact with subcutaneous tissue, to obliterate the dead space, to prevent from infections because of its anti-inflammatory capacity, and to create a better cosmetic effect.

In literature, a case was reported of extremely large recurrent chondrosarcoma originating from the first rib and invading the mediastinum and spine. The authors suggested that using intralesional surgery, a good prognosis in terms of survival can be expected in some instances.<sup>[9]</sup>

One paper underlined the grading is a significant predictor of survival, as 5-year survival rates for grades 1, 2, and 3 chest wall chondrosarcoma were 97, 57, and 39%, respectively.<sup>[10]</sup> One study showed a 10-year survival rate of 81% and 45% in primary and recurrent tumors, respectively, and emphasized the poor outcome in patients with local recurrence.<sup>[11]</sup> The independent predictors of overall survival and cancer-specific survival according to other study were age at diagnosis, tumor stage, tumor grade, surgery, and radiotherapy.<sup>[12]</sup>

Patients require physical examination and imaging chest x-ray every 3 to 6 months for the first 5 years.<sup>[13]</sup>

## CONCLUSIONS

Radical resection of chest wall chondrosarcoma is of paramount importance, as the inadequate surgical margins are a risk factor for local recurrence. The chest wall reconstruction is a safe and reliable procedure as it achieves stability regardless of the materials used. The herein presented case underlines the high recurrence rate in chest wall chondrosarcoma, when it is resected with close margins. Repeated resection was performed and chest wall reconstruction by means of Symbotex mesh and omentoplasty was accom-

plished. Repeated surgery is indicated in recurrent chest wall chondrosarcoma with high success rate and low morbidity and mortality rate in experienced hands.

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## Competing interests

The authors have declared that no competing interests exist.

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# Резекция и реконструкция передней грудной стенки по поводу рецидива хондросаркомы: клинический случай

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## Резюме

Хондросаркома грудной стенки – редкая злокачественная опухоль с агрессивным биологическим поведением. Единственный доступный метод лечения первичной или рецидивирующей хондросаркомы состоит в радикальной хирургической резекции из-за её хорошо известной химио- и радиорезистентности. Повторная резекция рецидивирующей хондросаркомы является сложной задачей из-за изменённой анатомии, рубцевания, изъятия мышц и непосредственной близости к жизненно важным органам грудной клетки. Мы представляем необычный случай рецидивирующей хондросаркомы грудной стенки, резецированной в отделении торакальной хирургии, которую мы реконструировали сеткой Symbotex и укрепили с помощью оментопластики. Кроме того, мы создали краткий обзор распространённости, диагностики, хирургического лечения, реконструктивных вариантов и прогноза состояния.

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## Ключевые слова

резекция и реконструкция грудной стенки, оментопластика, рецидив хондросаркомы, оперативное лечение, сетка Symbotex

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