



## Radical resection of giant chondrosarcoma of the anterior chest wall

### Radikalna resekcija gigantskog hondrosarkoma na prednjem zidu grudnog koša

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#### Abstract

**Background.** Chondrosarcomas represent approximately 30% of primary malignant bone tumors, the most frequent of which is on anterior thoracic wall. **Case report.** We presented a case of 50-year-old man suffering from a slow-growing, painless giant chondrosarcoma of the anterior chest wall. A wide resection was performed to excise the tumor including attached skin, right breast, ribs, sternum, soft tissues and parietal pleura. Mediastinum was not affected by the tumor. After resecting a 26 × 20 × 22 cm segment, the chest wall defect was reconstructed with a Marlex mesh and extensive *latissimus dorsi* myocutaneous flap pedicled on the right thoracodorsal vessels. Histopathology diagnosis was chondrosarcoma G 2–3. The mechanics of ventilation was not altered and respiratory function was normal from the immediate postoperative period. Three years after the operation postoperative results showed no local recurrence and excellent functional and aesthetic results were evident. Respiratory function remained unaltered. **Conclusion.** According to the results it can be concluded that the use of Marlex mesh and myocutaneous flap is good method for stabilization of the chest wall and enough to avoid paradoxical respiratory movements in managing giant chondrosarcoma of the anterior chest wall.

#### Key words:

chondrosarcoma; thoracic surgical procedures;  
reconstructive surgical procedures; treatment outcome.

#### Apstrakt

**Uvod.** Hondrosarkomi čine oko 30% primarnih malignih tumora kosti i najčešće su lokalizovani na prednjem torakosnom zidu. **Prikaz bolesnika.** U radu je prikazan bolesnik, 50-godišnji muškarac, sa spororastućim bezbolnim gigantskim hondrosarkomom prednjeg zida grudnog koša. Urađena je široka resekcija radi ekscizije tumora uključujući okolnu kožu, desnu stranu grudi, rebra, sternum, meko tkivo i parijetalnu pleuru. Mediastinum nije bio zahvaćen tumorom. Posle resekcije segmenta veličine 26 × 20 × 22 cm, urađena je rekonstrukcija defekta grudnog koša pomoću Marlex mreže i ekstenzivnim miokutanom režnjem *m. latissimus dorsi* peteljkom povezanim za krvne sudove torakodorsalno desno. Patohistološki potvrđena je dijagnoza hondrosarkoma G 2–3 stadijuma. Mehanika ventilacije nije bila promenjena, pa je respiratorna funkcija bila normalna od samog početka postoperativnog perioda. Tri godine posle operacije nalazi nisu ukazali lokalno na recidiv bolesti, a funkcionalni i estetski rezultati bili su očigledni. Respiratorna funkcija ostala je nepromenjena. **Zaključak.** Primena Marlex mreže i miokutanog režnja predstavlja dobru metodu stabilizacije grudnog koša i sprečavanja pojave paradoksnog respiratornog pomeranja kod zbrinjavanja gigantskih hondrosarkoma prednjeg zida grudnog koša.

#### Ključne reči:

hondrosarkom; hirurgija, torakalna, procedure;  
hirurgija, rekonstruktivna, procedure; lečenje, ishod.

#### Introduction

Primary chest wall tumors are uncommon and constitute 0.2–2% of all tumors<sup>1</sup>. Chondrosarcoma is the most common neoplasm of the anterior chest wall, arising from cartilaginous and bony structures and represent 20–30% of the primary tumors of the thoracic wall, being 80% from the ribs and 20% of the sternum<sup>2–4</sup>. Mostly it arises from the costochondral or the chondrosternal junc-

tion. This tumor occurs more often at the age of the third and fourth decade of life, being relatively uncommon in people younger than 20 years, the males being more affected<sup>5</sup>.

The treatment of large chest wall tumors was limited for many years until 1898 when Parham described the first thoracic resection of chest neoplasm<sup>6</sup>. Chest wall surgery improved when measures were taken to reconstruct the defect remained after the tumor had been removed.

The patient presented with consistent slow-growing mass painful for several months. It could grow into the pleural cavity or through the muscles into the subcutaneous tissues. Chondrosarcomas are lobulated neoplasias that may grow to massive proportion and, consequently, may extend internally to the pleural space, or externally, invading muscle, adipose tissue and skin of the thoracic wall.

Microscopically, the findings vary from normal cartilage to obvious malignant modifications. The differentiation between chondroma and chondrosarcoma can be extremely difficult<sup>5</sup>. Palpable mass in thorax is the main symptom in approximately 80% of the patients with thoracic wall tumor. Of these, 60% present associated pain<sup>2</sup>. Respiratory failure and hemothorax are rare, and are present only in very large tumors<sup>7</sup>.

Imaging exams may be useful for indicating pathology. However, the definitive diagnostics requires a correlation between histology and radiology. Computerized tomography (CT) and magnetic resonance (MR) are good exams to characterize the tumor and its extension. Computerized tomography is superior to MR demonstrating calcifications, whereas MR is the choice to evaluate the tumor extension and its relationships with adjacent structures<sup>7-11</sup>. Thoracic wall chondrosarcomas typically grow slowly and relapse locally. If not treated, late metastasis will occur.

Complete control of the primary tumor is the main determinant of survival. The purpose of the first surgery must be a wide resection, enough to prevent local recurrence. This means obtaining a wide margins at the time of initial resection (4 cm margin at each side)<sup>12,13</sup>.

This conduct results in cure for most patients, resulting in a 10-year survival in 97%<sup>2,14-16</sup>. Some authors propose a wide resection to be done in any cases of thoracic wall tumors since the preoperative histology is difficult<sup>17</sup>.

If after the surgical treatment which is the treatment of choice a relapse occurs there is an indication of applying radio- and chemotherapy.

### Case report

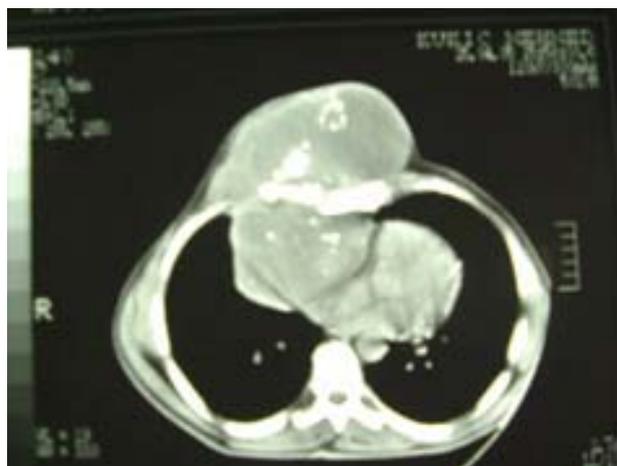
A case of 50-year-old man is presented with a slow-growing, painless giant chondrosarcoma of the anterior chest wall (Figure 1). He was hospitalized in the Clinic for Thoracic Surgery of Military Medical Academy exhibiting a large mass protruding from the anterior thoracic wall. He reported that the lesion had appeared four years before, without local pain or bleeding. He denied losing weight and complained only of occasional and mild dyspnea. The patient denied smoking and alcoholism. His previous pathological history was normal.

Physical examination was normal, except for the mass of thoracic wall. The lesion was firm, attached to the ribs, sternum and involving the right breast. Right parietal pleura, right 3rd, 4th, 5th and 6th ribs, sternum, left 3rd, 4th and 5th ribs, underlying muscle, subcutaneous tissues and the right breast were also affected by the tumor. The borders were distinct and the skin covering it was red with pathologic vessels.

Thorax computerized tomography was then performed, revealing a large expansive solid insufflating lesion, extending from approximately 26×22 cm, with density of soft parts, discrete contrast impregnation in the initial phase and area with calcification (Figure 1). The lesion invaded the anterior thoracic wall and the anterior mediastinum, displacing mediastinal structures to the left (Figure 2). Preoperative lung function was normal (FEV1 = 3,71 l and FVC = 4,54 l).



**Fig. 1 – The view and dimensions of the chest wall giant tumor**

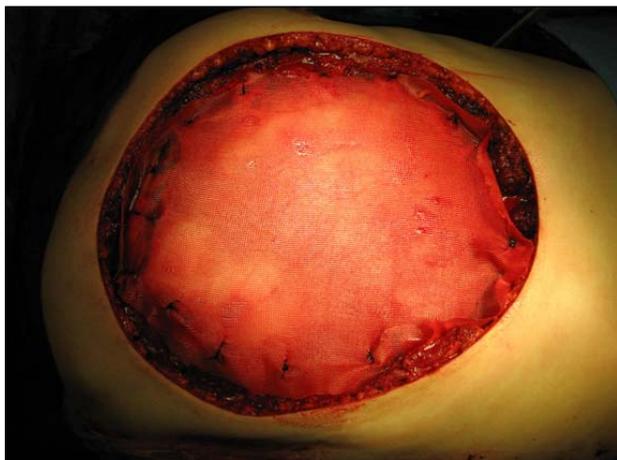


**Fig. 2 – CT scan of the thorax at the level of the giant tumor**

Tumor biopsy was not performed before the operation because the tumor was presented with typical signs of chondrosarcoma (history, slow growth, large size, localization and calcification on CT scan).

Surgical resection was planned including skin, right breast, ribs, sternum and parietal pleura. A wide resection was performed to excise the tumor. En block resection of the affected ribs and half of the body of the sternum with surrounding soft tissues and right breast was done. Mediastinum was not affected by the tumor.

After resecting the affected segment the chest wall defect was 27×20×9cm (Figure 3).



**Fig. 3 – Intraoperative image showing the large defect after a wide *en bloc* resection and placed Marlex mesh.**

Chest wall was reconstructed with a Marlex mesh and extensive ipsilateral *latissimus dorsi myocutaneous* flap pedicled on the right thoracodorsal vessels. Marlex mesh was sutured to the ribs and remaining part of the body of the sternum with resorbable Vicryl sutures. The skin portion of the flap was elliptical and horizontal and the donor area was closed with split-skin graft of the right leg.

The patient was ventilated artificially for 24 hours, then he was weaned without difficulty, his respiration was normal but with a small movement of the flap, no dyspnoea was detected. The mechanics of ventilation was not altered and respiratory function was normal from the early postoperative period.

The definitive post-operative anatomopathologic result was chondrosarcoma, G1–2, while N2 disease was not found.

The postoperative course was uneventful and the wounds healed by primary intention (Figure 4). After six months the flap movements disappeared almost completely in normal breathing. One year after the surgery a CT scan showed the complete absence of recurrence and a neopleura formation was noticed under the flap.



**Fig. 4 – The image showing a patient seven days after the operation**

At the latest follow-up postoperative evaluation (twenty eight months), the patient was alive and was very satisfied with functional and aesthetic results. There were no signs of local recurrence or distant metastasis. Respiratory function remained unaltered. The patient stated that there were no differences in his quality of life or his lifestyle compared with the preoperative status.

### Discussion

Early attempts to reconstruct chest wall defects included the use of *fascia lata*, rib grafts<sup>18</sup>. As early as 1960, Graham and Usher introduced the use of prosthetic materials when they described using of Marlex mesh to repair defects of the chest wall<sup>19</sup>. Today, the success of thoracic tumor resection is due to advances in critical care and functional reconstructive surgery<sup>15,20</sup>.

To avoid local recurrence, it is critical for a wide *en bloc* resection of the tumor to be performed<sup>5,21–23</sup>. Management of large defects of the chest wall after resection has remained difficult and controversial<sup>24</sup>. Various methods of reconstruction have been described, including the use of steel bars and Marlex mesh<sup>24</sup>, the use of Marlex mesh with or without methylmethacrylate<sup>22,25–27</sup> and the use of acrylic resin and Gore-Tex patch<sup>28–30</sup>. The most used materials for chest wall reconstruction are Marlex mesh.

The use of a mesh allows a rigid chest wall reconstruction avoiding a floating respiratory mechanism. The primary objective is to obtain parietal stability and, therefore, minimizing functional limitations. Small defects of the chest wall (less than 4 cm in diameter) do not require reconstruction, but defects larger than this should be reconstructed. It is vary important that the lung function must be normal. Large defects should be reconstructed with appropriate tissues, but the respiratory mechanism should also be preserved and functional limitations minimized.

When primary wound closure has not been possible, various myocutaneous flaps, including pedicle omental flaps, have been used to close the defect<sup>22,26,27,29,31–35</sup>.

A free flap uses various muscles for coverage. Rotational myocutaneous flaps using *latissimus dorsi*, with or without alloplastic mesh, can initially be considered as a technique of choice since it does not only permit extensive soft tissue repair but also covers wide defects. Initial mild paradoxical respiratory movement disappeared two months after the surgery achieving rigid thoracic stability, the respiratory function remained unaltered.

Most surgeons use a one layer of Marlex mesh or, more recently, two layers of Marlex mesh with a filler of methylmethacrylate, thereby creating a rigid prosthesis<sup>22,24,25,27,36,37</sup>. A few authors used only myocutaneous flaps<sup>32–34,38</sup>.

On the basis of the absence of any complications intraoperatively, in the immediate postoperative period, or during the entire duration of follow-up, most surgeons be-

lieve that the operative procedure offers a viable alternative to the above-mentioned techniques<sup>36, 39-42</sup>. We recommend the use Marlex mesh to repair full-thickness defects of the anterior chest wall and rotational myocutaneous flaps using *latissimus dorsi* to cover these defects. These method can initially be considered as a technique of choice since it not only permits extensive soft tissue repair but also covers wide defects.

## Conclusion

A combination of prosthetic materials and rotational flaps, with the improvement in mechanical ventilation provide good functional and cosmetic results and short hospital stays. The use of Marlex mesh and *latissimus dorsi* myocutaneous flap is a good method for stabilization of the chest wall and enough to avoid paradoxical respiratory movements.

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