STERNUM TUMOR SURGICAL TREATMENT METHOD: A CLINICAL CASE

Zh.U. PYSSANOVA

1 «Kazakh Institute of Oncology and Radiology» JSC, Almaty, the Republic of Kazakhstan

ABSTRACT

Relevance: Sarcomas are relatively rare tumors. They make up 1% of all malignant neoplasms in adults, of which about 10-15% appear in the chest wall. Unlike primary tumors, metastatic bone tumors occur 2-4 times more often, while the sternum is affected in 9% of all metastatic bone lesions. A review of the literature and analysis of patients with chest wall tumors showed that surgical treatment might be the best option for primary and secondary chest wall tumors.

Chondrosarcoma is the most common primary chest bone sarcoma and originates from the anterior segment of the ribs, less often from the sternum, scapula, or clavicle.

The study aimed to present the outcome of a sternum sarcoma surgical treatment with a simultaneous reconstruction of an extensive postoperative defect at the Kazakh Institute of Oncology and Radiology (Almaty, Kazakhstan).

Methods: The article reviews the literature on the treatment of chest wall tumors and describes a clinical case of a patient with chondrosarcoma of the sternum. After subtotal resection of the sternum 2-3 cm away from the tumor margins, the patient underwent reconstructive plastic surgery. Synthetic material was used to stabilize the chest wall, prevent paradoxical breathing, and replace the defect.

Results: No recurrence of the primary process was registered after radical removal of the sternum tumor with the simultaneous reconstruction of the defect with synthetic material. Given the prevalence of the tumor, intraoperative suturing of the subclavian vein was performed, which led to vein thrombosis in the postoperative period.

Conclusions: Early recognition and radical removal with adequate margins are essential to successful sternum tumor treatment. Complete excision with broadly negative microscopic margins at the first operation is paramount since local recurrence increases the risk of systemic metastasis and death. Thus, standard guidelines are required to ensure the proper treatment of chest wall sarcomas.

Keywords: sternum tumor, reconstructive plastic surgery, sarcoma, chondrosarcoma.

Introduction: Sarcomas are rare malignant tumors of mesenchymal origin [1]. They make up 1% of all malignant neoplasms in adults, of which about 10-15% appear in the chest wall [2]. Unlike primary tumors, metastatic bone tumors occur 2-4 times more often, while the sternum is affected in 9% of cases of all metastatic bone lesions. Almost 1/3 of sternum tumors are cancer metastases from different organs [3]. The primary treatment method includes radical surgical resection by stepping back from the tumor's edges by at least 3 cm; according to some literature sources, excision with a margin of at least 4 cm is required. It is followed by reconstruction of the chest wall defect. A review of the literature and analysis of the treatment results of patients with chest wall tumors showed that surgical treatment might be the best method for primary and some secondary chest wall tumors [5, 6].

Chondrosarcoma is the most common primary chest bone sarcoma and originates from the anterior segment of the ribs, less often from the sternum, scapula, or clavicle [7]. The primary treatment method for sternum and ribs is the surgical method of chondrosarcoma. Average five-year survival is 45-60%, with 90% in highly differentiated chondrosarcomas and 29% in high grade sarcomas. Recurrence after surgical treatment of chondrosarcoma with sternum or rib damage can reach 50%. Predictors for their current development are a high degree of tumor malignancy and sufficient radicality of surgical intervention. The leading cause of death in patients with chondrosarcoma is lung metastases. According to the Mayo Clinic, 13.7% of patients have metastatic lung damage. The risk of lung metastasis was 5-6 times higher in patients who had already suffered a local disease recurrence. The effectiveness of chemotherapy is low. Sarcomas are also insensitive to radio emissions [8, 9]. This article presents a clinical case of a patient with sternum chondrosarcoma. The informed consent of the patient has been obtained for that study.

The study aimed to present the outcome of a sternum sarcoma surgical treatment with a simultaneous reconstruction of an extensive postoperative defect at the Kazakh Institute of Oncology and Radiology (KazIOR, Almaty, Kazakhstan).

Materials and Methods: The article reviews the literature on the treatment of chest wall tumors and describes a clinical case of a patient with chondrosarcoma of the sternum. After subtotal resection of the sternum 2-3 cm away from the tumor margins, the patient underwent reconstructive plastic surgery. Synthetic material was used...
to stabilize the chest wall, prevent paradoxical breathing, and replace the defect.

**Patient information:** Patient A., male, 26 years old. According to the patient, he has been ill since December 2018, when a tumor-like formation first appeared in the presternum zone leftward with gradual growth over time.

Since January 2019, tumor formation has been observed over time. The patient visited a traumatologist at the residence and was referred to the Kyzylorda Regional Oncological Dispensary.

*Cervical region CT scanning, March 2019:* the picture of osteolytic lesions of presternum-in the thickness of soft tissues of the anterior chest wall in the projection of presternum and sternal end of clavicle leftward – the tumor-like sense immobile formation was detected, emanating from the bone, size 10.0x12.0 cm (Figure 1).

In May 2019, the patient was admitted to the Centre of bone, soft tissue, and melanoma tumors of KazIOR.

**Clinical data:** Complaints at admission – the tumor-like formation in the region of presternum.

![Figure 1](image)

**Diagnostics:**

*Ultrasound examination, May 2019:* no focal changes have been detected in their retroperitoneal space, neck area, and supra clavicular areas of both sides. Formations of soft tissues of the chest wall in the projection of the upper third of sternum, spread to subclavian a reason both sides-BI.

*Spirography, May 2019:* the lung’s vital capacity was within the provisional norm, a disorder of lung ventilation ability, obstructive type, mildly apparent.

*Chest CT scanning, May 2019:* During the review of the bone structures, the pathological bone structural alteration of the presternum was determined in the form of uneven swelling, foci of lytic destruction, and osteosclerosis, with areas of damage to the cortical layer integrity. The length of the process was 6.2 cm. In the destruction zone: the soft tissue component, 8.9x8.5x7.7 cm, with uneven, fairly precise contours, non-homogeneous structure due to reduced density zones, with a slightly apparent perifocal infiltration of the adjacent muscular layer of the chest wall. The distal end of the sternocleidomastoid muscle leftward was lost in the formation layer. The adjacent parts of the coastal pleura were intact. The formation was closely adjacent to the aortic arch, without apparent invasion signs – no changes were determined in other bone structure zones. No focal, infiltrative changes of the lungs and pleura parenchyma have been detected. The pulmonary pattern can be traced in all fields; its structure was preserved. No signs of peribronchial and perivascular infiltration have been revealed. The pulmonary field transparency was unevenly reduced. The permeability of the trachea, main and lobar bronchi was preserved. The sinuses were free. The mediastinal lymph node, so fall groups were not enlarged. The mediastinum organs were centralized and differentiated. The cardiac chambers were not enlarged. **Conclusion:** CT-image of a destructive process of the presternum, specific to sarcomas.

The patient was diagnosed with “presternum chondrosarcoma St III (T3N0M0)” based on clinical data, anamnesis, and tumor localization.

The **Interdisciplinary Group (IDG) decision:** Taking into account the anamnesis, the clinical course of the disease, local status (status local is), and data of instrumental studies, the IDG recommended a therapeutic and diagnostic operation for the patient. After the radical operation and histological examination, the PET-CT scanning was recommended with follow-up IDG re-discussion to determine further treatment tactics.

**Treatment:** In May 2019, the patient underwent surgery in the volume of the “Removal of the tumor with destruction and soft tissue component: a – soft tissue component, b – presternum with destruction”
with resection of presternum and sternum body at the third middle level, suturing of the subclavian vein, thoracoplasty, cavity drainage” (Protocol No.182) (Figure 2).

Figure 2 - Patient A., 26 years old, surgery to remove the tumor with resection of presternum at the level of the middle third, 2-3 cm away from the tumor margins: a - defect 10.0x12.0 cm; b – plastic surgery of the chest wall defect with a prolene mesh

The postoperative period proceeded without complications. The patient underwent antibiotic therapy, and daily dressings were applied. The patient was discharged home on the seventh day after surgery.

Postoperative cytological conclusion, May 2019, found rounded, spindle-shaped cells in smears, with dystrophy among erythrocytes, oxyphilic substance, and individual cells with some atypia.

Postoperative histological examination, May 2019: the mesenchymal chondrosarcoma of the sternum 9240/3.

Pleural ultrasound, June 2019: Free fluid in the pleural cavity leftward (62 mm).

On Day 15 after surgery, the upper limb leftward swelling and local pain were noted. The patient underwent a Doppler ultrasonography of the upper extremity vessels.

Ultrasound of the lower extremities arteries and veins, June 2019: thrombosis of the left superior jugular vein (SJV), subclavian vein, and the medial vein of the shoulder.

The patient was counseled by an angiosurgeon who prescribed conservative treatment. The thrombus in the left SJV completely disappeared within a month.

The IDG recommended the patient four courses of adjuvant polychemotherapy (Table 1).

The 1st APCT course in June 2019 included vincristine 2 mg, doxorubicin 100 mg, and cyclophosphamide 1000 mg;

The 2nd APCT course in July 2019 included vincristine 2 mg, doxorubicin 100 mg, and cyclophosphamide 1000 mg;

The 3rd APCT course in August 2019 included vincristine 2 mg No. 1, epirubicin 60 mg No.1, and cyclophosphamide 1000 mg No.1;

The 4th APCT course in September 2019 included cyclophosphamide 1000.0 mg No.1, vincristine 2 mg No.1, and doxorubicin 110 mg No.1.

Chest CT scanning in September 2019 showed no signs of recurrence or metastasis; the infiltration zone was visible in the postoperative zone.

Later the patient was followed up by the local oncologist.

Chest CT scanning in June 2020 showed no signs of recurrence of the primary process but revealed metastasis in the lungs.

The patient received comprehensive treatment. The process stabilization was achieved, and the patient remained under follow-up observation.

Results: In the described clinical case, the primary treatment method for chest wall chondrosarcoma was surgical with the simultaneous reconstruction of the defect with synthetic material for restoring the chest wall frame. Good aesthetic and functional results have been obtained. No recurrence of the primary process was observed due to the radical removal of the sternum tumor. However, lung damage metastasis has been noted 13 months after surgery. In the postoperative period, the patient experienced a complication in the form of thrombosis of the left SJV, the subclavian vein, and the medial vein of the shoulder due to the volume of surgery, which included suturing the subclavian vein.
Table 1 – Timeline of the clinical case of sternum sarcoma surgical treatment

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tumor detection</td>
<td>December 2018</td>
</tr>
<tr>
<td>Tumor growth over time</td>
<td>January 2019</td>
</tr>
<tr>
<td>First visit to a doctor</td>
<td>March 2019</td>
</tr>
<tr>
<td>Surgical treatment</td>
<td>May 2019</td>
</tr>
<tr>
<td>Discharge after surgery</td>
<td>Day 7 after surgery</td>
</tr>
<tr>
<td>Postoperative complication</td>
<td>Day 15 after surgery</td>
</tr>
<tr>
<td>1st APHT course</td>
<td>June 2019</td>
</tr>
<tr>
<td>2nd APHT course</td>
<td>July 2019</td>
</tr>
<tr>
<td>3rd APHT course</td>
<td>August 2019</td>
</tr>
<tr>
<td>4th APHT course</td>
<td>September 2019</td>
</tr>
<tr>
<td>Lung damage mts</td>
<td>June 2020</td>
</tr>
</tbody>
</table>

Discussion: Chest tumors are rare and pose a clinical problem for surgeons. Incorrect and untimely diagnosis, non-radical resection, and ineffective chest wall re-construction of general defects lead to complications.

CT is a gold standard of X-ray examination for diagnosis and operative planning. However, given the presented case, it is desirable to conduct intravenous contrast computed tomography (IC CT) to determine the tumor’s prevalence and the involvement of blood vessels. The performance of radiation therapy and chemotherapy depends on the extent of the disease.

Conclusion: Early recognition and radical removal with adequate margins are essential to successful sternum tumor treatment. Complete excision with broadly negative adequate margins are essential to successful sternum tumor treatment.

References:
МЕТОД ХИРУРГИЧЕСКОГО ЛЕЧЕНИЯ ОПУХОЛИ ГРУДИНЫ: КЛИНИЧЕСКИЙ СЛУЧАЙ

Ж.У. Пысанова

1АО «Казахский научно-исследовательский институт онкологии и радиологии», Алматы, Республика Казахстан

АННОТАЦИЯ

Актуальность: Саркомы встречаются относительно редко. Они составляют 1% всех злокачественных новообразований у взрослых, из них около 10-15% появляются в грудной стенке. В отличие от первичных, метастатические опухоли костей встречаются в 2-4 раза чаще, при этом грудина поражается в 9% случаев от всех метастатических поражений костей. Обзор литературы и анализ пациентов с опухолями грудной стенки показали, что хирургическое лечение может быть лучшим методом выбора при первичных и некоторых вторичных опухолях грудной стенки.

Хондросаркома является самой распространенной (12%) первичной саркомой костной ткани грудной клетки и берет начало из переднего отрезка ребер, реже – из грудины, лопатки или ключицы.

Цель статьи – представить результаты хирургического лечения саркомы грудины с одновременной реконструкцией обширного послеоперационного дефекта в АО «Казахский научно-исследовательский институт онкологии и радиологии» (Алматы, Казахстан).

Методы: В статье представлен обзор литературы по лечению опухолей грудной стенки и описан клинический случай пациента с хондросаркомой грудины. После субтотальной резекции грудины, отступив от краев опухоли на 2-3 см, пациенту проведена реконструктивно-пластическая операция. Для стабилизации грудной стенки, предотвращения парадоксального дыхания и замещения дефекта использовали синтетический материал.

Результат: После радикального удаления опухоли грудины с одновременной реконструкцией дефекта синтетическим материалом отмечается отсутствие рецидива основного процесса. Учитывая распространенность опухоли, интраоперационно проведено ушивание подключичной вены, приведшее к тромбозу вены в послеоперационном периоде.

Заключение: Ключом к успешному лечению опухоли грудины является раннее распознавание и радикальное удаление опухоли с адекватными краями. Полное иссечение опухоли с широкого отграничительных микроскопических краями при первой операции имеет первостепенное значение, поскольку локальный рецидив предвещает системное метастазирование и возможный летальный исход.

Ключевые слова: опухоль грудины, реконструктивно-пластическая операция, саркома, хондросаркома.