Advances in Medicine and Engineering Interdisciplinary Research, 2026, Volume 4, Issue 1
DOI: 10.32629/ameir.v4i1.4931
ISSN Online: 2972-3825
ISSN Print: 2972-3833

Chondroblastoma of the costal wall: a rare neoplastic phenomenon. case report and literature review

Juan Carlos Araujo-Cuauro[1], Milagros Sánchez De Rosales[2]

1. Thoracic Surgery Unit, Dr. Adolfo Pons Hospital, Bolivarian Republic of Venezuela.
2. University of Zulia, Maracaibo, Bolivarian Republic of Venezuela.

Abstract: The chondroblastoma is a rare benign bone tumor that typically arises in the epiphysis. Few cases of rib chondroblastoma have been reported in the literature. Clinical case: We describe a case of a 46-year-old male patient with chondroblastoma located in the left anterior 7th rib. The high-resolution computed tomography demonstrated a tumor in the 7th costal rib, a well-defined oval lesion measuring 110 mm x 100 m x 59 mm in the transverse and the anteroposterior diameters, with an area of lytic bone destruction, with no evidence of tissue extension adjacent soft tissue. Although the costal chondroblastoma are very rare neoplasms, they should be included in the differential diagnosis when they are found with an aggressive costal mass and the histological confirmation should be performed. The biopsy was performed with a 14 G core needle of the tumor lesion. The pathological and immunohistochemical examination made the diagnosis of chondroblastoma. A systematic review of the literature was carried out which showed that the chondroblastoma can affect people of all ages, but it is more common in children and young adults. Despite the patient not having had surgery, the surgical resection is the treatment of choice. Conclusion: The costal chondroblastomas are very rare and appear to be aggressive on imaging findings; with soft tissue extension, thin sclerotic border and the bone destruction.

Key words: rib; chondroblastoma; bone tumor; biopsy; tomography

1 Introduction

The description and classification of chest wall lesions is based on the origin of the tumor and its tissue elements. They are categorized as malignant and benign bone tumors, and soft tissue tumors, which include adipocytic, vascular, myofibroblastic, and fibroblastic tumors, peripheral nerve sheath tumors, and skin lesions. Most benign primary tumors of the chest wall originate from bone or cartilage tissue and are a heterogeneous group of neoplasms.

They are rare tumors, with an incidence of < 2% of the population, and account for approximately 5% of all thoracic neoplasms. The most common benign tumors include osteochondromas, chondromas, fibrous dysplasia, and desmoid tumors. The most common malignant tumors include soft tissue sarcomas, chondrosarcomas, and the Ewing sarcoma family of tumors. Approximately 50% to 80% of chest wall tumors are malignant, with approximately 55% of these malignant tumors originating in bone and cartilage and 45% from soft tissue [1].

Cartilage-forming tumors are the most common primary tumors. They are characterized by their exceptional behavior and unpredictable growth, as they may appear benign but have a poor prognosis. They are also very difficult to diagnose.

They are classified as solitary or multiple. The latter include osteochondromatosis and enchondromatosis. There are four varieties of solitary tumors: a. Osteochondroma, which is the most frequent. b. Chondroma, which is also common. c. Chondroblastoma, which is rarer and can also be referred to by other names (benign chondroblastoma, epiphyseal chondroblastoma, among others). d. The fourth tumor appears in 70% of the literature as chondromyxoid fibroma and in 30% as fibromyxoid chondroma, but they correspond to the same entity [2].

Chondroblastoma, also known as Codman's tumor, is a rare bone neoplasm that accounts for less than 2% of all primary skeletal tumors. It is an uncommon benign bone tumor that represents 1%–2% of all primary bone tumors, with gradual progression and partially low aggressiveness, capable of local recurrence and metastasis. It particularly affects the epiphyseal regions of long bones, however, there are other less common locations where it may be present in 10% to 20% of all cases, including: bones of the hand and foot, vertebrae, flat bones such as the rib cage, pelvis, and scapula. This involvement is more common in older patients.

The World Health Organization (WHO) defines it as a "relatively unusual benign tumor, characterized by highly cellular and relatively undifferentiated tissue consisting of rounded or polygonal cells similar to chondroblasts with clear borders, and isolated or grouped osteoclast-type multinucleated giant cells [3].

Chondroblastoma is a rare cartilaginous neoplasm, accounting for only 0.5% to 1% of primary bone tumors undergoing biopsy and 9% of all benign bone tumors. It is more common in males of any age. It occurs in the vast majority of cases in males (2 to 3:1) and is usually identified between the ages of 10 and 20. It is a neoplasm typical of young individuals, rarely observed in early childhood or after the age of 30. It is usually a localized, benign mass with well-defined edges that responds favorably to surgical treatment. However, in 10% of patients, the tumor recurs, and in 3.3% of cases, it is malignant and aggressive, leading to metastasis [4].

The significant clinical manifestations of chondroblastoma are not specific to this lesion. Pain and swelling are the main symptoms in 80%–90% of cases and may be mechanical, inflammatory, or mixed in nature. The onset of symptoms, as in this patient, is insidious, with pain first appearing in the affected region in the evening, gradually increasing over the course of months and is accompanied by inflammation. Physical examination confirms the increase in volume of the area in the form of a mass located in the anterior wall at the level of the left hemithorax [5].

From the perspective of radiologic imaging studies, it manifests as an osteolytic, eccentric, epiphyseal lesion, very similar to a giant cell tumor. What differentiates them is the presence and existence of cartilage, which usually has a sclerotic periphery. The absence of this can increase uncertainty, especially if it is located in an uncommon site, such as the costal cartilage. This is why location and age are very significant for diagnosis; a giant cell tumor should not be considered before the age of twenty. A simple X-ray may show a rounded or oval, well-defined area of osteolysis that may extend to the adjacent joint.

Computed tomography (CT) is useful in demonstrating tissue density, subtle calcifications, the extent of epiphyseal involvement, and often, more importantly, the location of the lesion in relation to the articular and epiphyseal cartilage [6,7].

This bone neoplasm is difficult to differentiate from other neoplasms of cartilaginous origin, which can lead to misdiagnosis and the use of inappropriate therapeutic procedures or methods, given its similarity to several types of malignant tumors, especially the aggressive form of chondroblastoma. In histology, the main diagnostic difficulties may arise with chondromyxoid fibroma or chondroblastoma-like osteosarcoma and with some giant cell tumors. In adults, the differential diagnosis of chondroblastoma is proposed and/or suggested mainly with clear cell chondrosarcoma, which has a much more serious prognosis. On imaging studies such as plain radiography, computed tomography, and even magnetic

resonance imaging, the appearance of both lesions may be similar; it will only be possible to distinguish them by histological and immunohistochemical analysis [8,9,10,11].

The traditional treatment for this type of lesion will always be surgical, which generally consists of curettage (bone curettage) followed by bone grafting and accompanied by cryotherapy to prevent tumor recurrence. Like most benign bone tumors, chondroblastoma progresses slowly, with gradual local growth. However, there have been reports of more aggressive chondroblastomas with rapid and destructive local evolution that could produce lung metastases, but this concept of aggressive chondroblastoma is still debated in current publications [12,13,14].

The objective of this research is to describe the clinical presentation and radiological characteristics of a rare case of costal chondroblastoma. This study reports a case affecting the anterior 7th rib. A 46-year-old man presented with chest pain in the left hemithorax and numbness. CT revealed tumor infiltration of the seventh rib.

2 Clinical Case

A 46-year-old male patient with no relevant previous medical, traumatic, or personal pathological history, whose reason for consultation is an increase in volume in the left hemithorax, a solid mass visible in the upper third of the left hemithorax. He reports that the current illness began eight months ago, with a progressive increase in volume, accompanied by mild to moderate pain without irradiation. For this reason, he consulted a physician who requested imaging studies: chest radiography and chest CT. The overlying skin was normal with no sensory deficit.

Physical examination revealed a prominent mass measuring approximately 13 cm x 11 cm x 9 cm, hard in consistency, not adherent to deep planes and without cutaneous inflammatory signs, located in the anterolateral costal wall of the upper third of the left hemithorax. The rest of the examination was normal. The results of the laboratory tests performed, including tumor markers (alpha-fetoprotein, CA 125, CA 199, and CEA), complete blood count, and erythrocyte sedimentation rate (ESR), were within normal limits.

Plain radiography showed a well-defined lytic defect measuring 70 mm in the left seventh rib. High- resolution CT showed an extensive osteolytic bone destruction area measuring 110 mm x 100 mm x 59 mm in transverse and anteroposterior diameters, with dcortical destruction. The margins were delineated with some ossifying matrix (Figure 1). There was no evidence of extension to adjacent soft tissue. A benign osteocartilaginous lesion, such as a chondroma, was highly suspected.

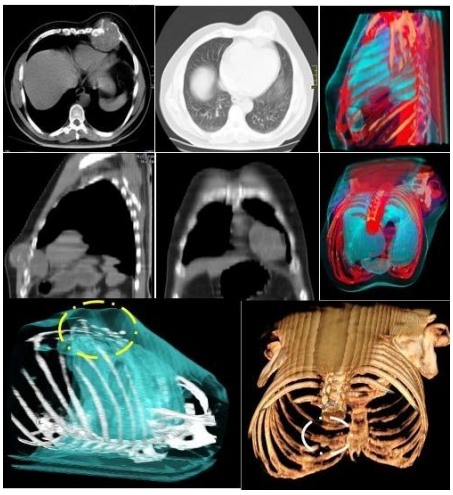

Figure l. Chest CT scan shows an oval lesion (circle) with osteolytic cortical bone destruction of the VII rib (110 mm x 100 mm x 59 mm in size). The margins were poorly defined with some ossifying matrix and no evidence of extension to the adjacent soft tissue. Axial, coronal, and sagittal sections. 3D reconstruction. CT scan.

Macroscopic examination: consisting of three [3] elongated tissue fragments measuring a total of 0.5 cm x 0.3 cm, grayish white in color. Biopsy sections reveal a lesion composed of round or polyhedral chondroblasts with oval nuclei, some hyperlobulated with grooves, with eosinophilic cytoplasm without mitotic figures, fusiform elements, and myxoid degeneration. Diagnosis: compatible with chondroblastoma of the chest wall (Figure 2).

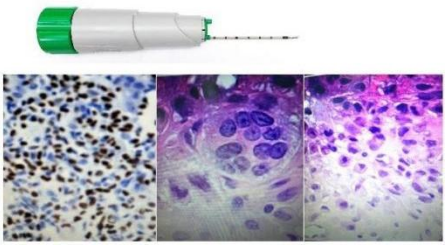

Figure 2. Disposable automatic biopsy device. (BARD-MONOPTY®). 14 gauge. Histological section shows a neoplasm, hamartoma vs. pulmonary lipoma; malignancy is not ruled out. Photomicrograph. Histological section shows a lesion composed of round or polyhedral chondroblasts with oval nuclei, some hyperlobulated with grooves, with eosinophilic cytoplasm without mitotic figures, fusiform elements, and myxoid degeneration.

In view of the histopathology results, resection of the lesion with reconstruction of thechest wall was suggested, but the patient refused surgical intervention and was lost to follow-up.

3 Discussion

Chondroblastoma is a rare benign neoplasm of the cartilage that originates in the appendicular skeleton in the vast majority of cases (80%). Chondroblastoma of the rib arches is an even rarer condition. Although costal chondroblastomas are very rare neoplasms, they should be included in the differential diagnosis when an osteolytic, infiltrative and aggressive rib mass is found, and histological confirmation is therefore necessary in such cases.

In most male patients between the ages of 10 and 25, chondroblastomas account for approximately 1% to 2% of all bone neoplasms at the time of diagnosis. In our case, the age at diagnosis was 46 years, a very rare age. Likewise, no risk factors or pathogenesis of chondroblastoma have been identified. Chondroblastoma usually affects a single bone, but it can affect two different anatomical parts. It is usually a well-circumscribed, round or oval lesion on plain radiography. CT may show matrix mineralization, cortical erosion, and soft tissue extension, as occurred in our case. Pain is the most common symptom, usually present for less than 1 year [15].

Although costal chondroblastomas are very rare neoplasms, they should be included in the differential diagnosis when an aggressive rib mass is found, and histological confirmation should be performed. Chondroblastoma lesions affect approximately 75% of long bones; the most common symptom is pain, usually present for at least one year, and soft tissue edema may also be present in 20% of cases, appearing as a mass. In large chondroblastomas, it can extend to the metaphysis or cause cortical destruction with periosteal new bone formation [16,17].

Histological and immunohistochemical findings are characterized by the presence of chondroblasts and chondromyxoid stroma surrounding the neoplastic cell. The specific cells are uniform, round to polygonal with well-defined cytoplasmic borders and mainly clear cytoplasm. Occasionally, there is a nuclear groove or small nucleoli. Almost constantly, there are randomly distributed osteoclast-like giant cells. The variable amount of chondroid material deposition is associated with the chondroblasts. In the immunohistochemical pattern, neoplastic cells most frequently show reactivity for S-100 protein, vimentin, and cytokeratin [18,19].

Treatment generally consists of curettage of the lesion, with or without bone graft, and block resection is necessary in

few cases [19]. Chondroblastoma is a rare bone tumor that is locally benign but aggressive. However, rib chondroblastoma is particularly rare. Due to its rarity, there are no definitive or standard treatment guidelines. Although benign chondroblastoma is an uncommon tumor, it is important to be familiar with its clinical and radiological characteristics for early diagnosis and treatment.

This research article describes the case of a 46-year-old male patient who presented with chondroblastoma located in the 7th left anterior arch, which is an especially rare phenomenon. The existing literature was also reviewed and updated.

Chondroblastoma is a rare type of benign, non-cancerous tumor that produces cartilage and often appears at the ends of long bones. Few cases of rib chondroblastoma have been reported in the literature. It most commonly affects adolescent children and young men, which highlights the age of the patient in our case.

Chondroblastomas have distinctive radiological and histopathological characteristics, and despite their benign biological behavior, they can cause high morbidity for patients due to their location and exclusively surgical treatment.

Although it is generally considered a benign entity, chondroblastoma exhibits an intermediate type of behavior, given its ability to recur locally and, rarely, to metastasize.

Finally, we can conclude that costal chondroblastomas are very rare and appear to be aggressive in imaging findings, with soft tissue extension, thin sclerotic margins, and bone destruction.

Statement on ethical aspects. As it involved bioethical aspects, the research complied with ethical and bioethical principles, was carried out in accordance with ethical and moral considerations, and likewise under the framework of current regulations (requirements of Good Clinical Practices (GCP) and adherence to ethical and bioethical principles originating in the Declaration of Helsinki and the habeas data law). The implications and purpose of the research were explained to the patient. To carry out the research, the patient provided informed consent, which included all information about the risks and benefits, as well as anonymity. The patient had full autonomy to accept or reject the research. The case was approved by the bioethics committee.

Ethical responsibilities, protection of people and animals. The authors declare that no experiments were performed on humans or animals for this research. Data confidentiality. The authors declare that they have followed their workplace's protocols on the publication of patient data. Right to privacy. The authors declare that no patient data appear in this article. Conflict of interest. During the writing of this article, none of the authors had any connection with any activity that could involve conflicts of interest. Funding. No resources were received from any national or international entity, nor was there any connection with any activity that could involve conflicts of interest.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

[1] Herrera-Rodríguez M, Miranda-Chavarría J. Tumores cortados torácica. Acta med. costarricense [Internet]. Marzo de 2003;45(Suplemento1):33-34. Disponible en: URL: https://www.scielo.sa.cr/scielo.php?script=sci_arttext&pid=S0001600220030005000005&lng=en.

[2] Focaccia M, Gambarotti M, Hakim R, Paioli A, Cesari M, Spazzoli B, et al. Chondroblastoma's lung metastases treated with denosumab in pediatric patient. Cancer Res Treat. 2021;53(1):279-282.

[3] Hernández E, Barrios N, Rodas J, Claverie-Martínez G, Rodas-Pernillo O. Condroblastoma del hueso calcáneo: un caso inusual. Rev. méd. (Col. Méd. Cir. Guatem.). 2022;161(3):312-314. Disponible en: URL: https://www.revistamedicagt.org/index.php/RevMedGuatemala/article/view/517/888.

[4] Lang Y, Yu Q, Liu Y, Yang L. Chondroblastoma of the patella with pathological fracture in an adolescent: A case

report. World J Surg Oncol. 2019;17(1):218.

[5] Long L, Li Z, Tang Y. Chondroblastoma in the sphenoid sinus. Ear Nose Throat J. 2021;100(10_Suppl):1139S-1140.

[6] Rizo Fiallo Y, Tamayo Figueroa A, Morales A, Ismael A. Condroblastoma de tercio proximal de húmero derecho. Revista Cubana de Ortopedia y Traumatología. 2021;35(3):e263. Disponible en: URL: https:// revortopedia.sld.cu/index.php/revortopedia/article/view/263/294.

[7] Oyanedel QR, García BC, Villanueva AE, Otero J, Solar GA, Rojas CR, et al .Estudio radiológico simple en el diagnóstico de condroblastoma epifisiario benigno: correlación anatomo - radiológica. Rev. chil. radiol. [revista en la Internet]. 2007;13(4):185-190. Disponible en: URL: https://www.scielo.cl/scielo.php? script=sci_arttext&pid=S0717-93082007000400003.

[8] Ferreres-Claramunt Á, Lázaro L. Condroblastomas del carpo: caso clínico y revisión de la literatura. Disponible en: URL: https://www.thieme-connect.de/products/ejournals/pdf/10.1055/s-0038-1667321.pdf.

[9] Jundt G, Baumhoer D. Chondroblastoma. Pathologe. 2018;39(2):132-138.

[10] Hmada YA, Bernieh A, Morris RW, Lewin J, Allen T. Chondroblastoma-like osteosarcoma. Arch Pathol Lab Med. 2020;144:15-17.

[11] Rekhi B, Ghate S, Shah A, Ramadwar M, Gulia A. Immunohistochemical analysis of 36 cases of chondroblastomas: A single institutional experience. Ann Diagn Pathol. 2020; 44:151440.

[12] Xiong Y, Lang Y, Yu Z, Liu H, Fang X, Tu C, et al. The effects of surgical treatment with chondroblastoma in children and adolescents in open epiphyseal plate of long bones. World J Surg Oncol. 2018;16(1):14.

[13] Chen W, DiFrancesco LM. Chondroblastoma. An Update. Arch Pathol Lab Med. 2017; 141:867-871.

[14] Cortés RR, Lezama VP, Lugo B, Fuentes V. Condroblastoma benigno. Manejo quirúrgico con endoprótesis tumoral tibial no convencional RC-9. Arch Inv Mat Inf. 2019;10(2):43-49.

[15] Venkatasamy A, Chenard M, Massard G, Steib J, Bierry G. Chondroblastoma of the thoracic spine: A rare location: A case report with radiologic-pathologic correlation. Skeletal Radiol. 2017;46(3):367-372.

[16] Brandolini J, Bertolaccini L, Pardolesi A, Salvi M, Valli M, Solli P. Chondroblastoma of the rib in a 47-year-old man: A case report with a systematic review of literature. J Thorac Dis. 2017;9(10):E907-E11.

[17] Wu Y, Guan J, Kai Z, Huiguo C, Wu W, Zhang J. Rare chondroblastoma of the 6th left rib, video-assisted thoracoscopy resected: One case report and literature review. J Cardiothorac Surg. 2021;16(1):192.

[18] Wu CT, Chen ACY, Wang CJ, Wang CW, Fu CJ, Wong YC. Chondroblastoma of the triquetrum. Pediatr Neonatol. 2013;54(04):278-280.

[19] Clapper AT, DeYoung BR. Chondroblastoma of the femoral diaphysis: Report of a rare phenomenon and review of literature. Hum Pathol. 2007;38(5):803-806.