

Solitary osteochondroma of the rib: the first documented case report from Sudan

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Abstract

Background

Solitary osteochondroma of the thoracic cage is a rare developmental anomaly, accounting for less than 2% of primary rib tumors. While typically benign and indolent, these lesions can expand endophytically or cause local complications. In adults, primary malignant chest wall tumors are far more prevalent, and costal osteochondromas can occasionally exhibit aggressive radiological features that mimic a sarcoma, presenting a significant diagnostic and therapeutic dilemma.

Case presentation:

A 28-year-old male presented with a hard, immobile, non-tender mass measuring 6 times 6cm} on the anterolateral aspect of the right chest wall at the level of the 6th and 7th ribs. The lesion was first noticed at age 13, at which time the patient underwent localized skin cauterization by a traditional healer with no therapeutic effect. The mass enlarged progressively over 15 years but was ignored due to the absence of severe symptoms. A chest computed tomography (CT) scan revealed an aggressive-appearing, destructive bony lesion arising from the anterior segment of the right sixth rib, measuring 6.5 times 6.0 times 7.1cm, characterized by a large ill-defined soft tissue component and heterogeneous contrast enhancement. Due to high suspicion of malignancy, a wide elliptical incision was performed. Intraoperatively, the mass was found firmly adherent to the sixth and seventh ribs and directly invading the right parietal pleura. An *en bloc* partial resection of both ribs and the involved pleura was executed. The resulting full-thickness thoracic wall defect was reconstructed using a tailored synthetic prosthetic mesh. Histopathological evaluation definitively confirmed a benign osteochondroma with a mature hyaline cartilage cap and no cellular atypia or malignant transformation. The patient had an uneventful postoperative recovery and demonstrated a stable, rigid chest wall with complete symptom resolution at his 45-day follow-up.

Conclusions

Costal osteochondroma can radiologically and Intraoperatively mimic primary malignant chest wall neoplasms. Traditional healing practices can drastically delay formal medical presentation, leading to extensive local growth and contiguous tissue invasion. Thoracic surgeons should anticipate the necessity of radical *en bloc* resections and prosthetic mesh reconstructions to achieve clear margins and preserve thoracic mechanics.

Background

Recognized as the most frequently encountered benign bone lesion, osteochondroma is traditionally characterized as a developmental anomaly of the growth plate rather than a true neoplasm. It represents

a significant clinical volume, constituting 20% to 50% of all benign bone tumors and 10% to 15% of all reported bone neoplasms [1]. Although osteochondromas primarily demonstrate a predilection for the long bones of the appendicular skeleton—specifically the distal femur, proximal tibia, and proximal humerus—they can infrequently involve the skull base, vertebral column, and pelvis. Among these atypical sites, a costal location represents an exceedingly rare presentation [2, 3]. Histologically defined by a benign hyaline cartilage cap overlying mature lamellar bone, costal osteochondromas require specialized diagnostic consideration due to their complex anatomical location within the thoracic cage. Costal osteochondromas account for a mere 1% to 2% of all osteochondroma cases [4]. Furthermore, these lesions demonstrate a strong male predilection, with occurrences typically manifesting within the first two decades of life prior to skeletal maturity or puberty [4, 5]. While usually slow-growing and benign, costal osteochondromas can occasionally exhibit highly aggressive radiological and clinical features in adulthood, closely mimicking primary chest wall sarcomas. We present the first documented case of a giant solitary rib osteochondroma from Sudan that masqueraded as a malignant chest wall neoplasm, significantly complicated and delayed by traditional cauterization.

Case presentation

A 28-year-old male presented with a slowly enlarging, painless mass on the right anterior chest wall. The patient first noticed a bean-sized nodule at age 13, for which he underwent localized skin cauterization by a traditional healer with no therapeutic effect. The mass grew prominently by age 20 but was ignored until age 28 due to the absence of debilitating symptoms. Physical examination revealed a hard, immobile, non-tender mass measuring 6 times 6cm on the anterolateral aspect of the right thoracic cage. The overlying skin was intact, without ulceration. (Fig. 1).

A chest computed tomography (CT) scan demonstrated an aggressive-appearing, destructive bony lesion arising from the anterior segment of the right sixth rib, measuring 6.5 times 6.0 times 7.1 cm. The mass featured a large, ill-defined soft tissue component causing significant outward bulging of the chest wall contour, alongside heterogeneous contrast enhancement and central hypodense areas (Fig. 2).

These features raised strong clinical suspicion for a primary malignant chest wall neoplasm, such as a chondrosarcoma. A preliminary incisional biopsy of a small tissue fragment was performed under local anesthesia. Histopathology confirmed a benign osteochondroma, allowing the team to safely proceed with the definitive en bloc resection.

Under general anesthesia, a wide elliptical incision was performed to excise the mass, the overlying skin, and the traditional cauterization scar. Intraoperatively, the endophytic tumor was found firmly adherent to both the right sixth and seventh ribs, directly invading the underlying parietal pleura. An en bloc partial resection of both ribs and the involved pleura was meticulously executed. The resulting full-thickness thoracic wall defect was reconstructed using a tailored synthetic prosthetic mesh anchored with non-absorbable sutures, and thoracostomy tube was placed. (Fig. 3)

Gross pathological examination showed a lobulated mass with a grayish-white, glistening, translucent cartilaginous cut surface. Microscopic evaluation confirmed a benign osteochondroma, demonstrating mature hyaline cartilage lobules organized into a defined cap covered by a fibrous perichondrium. Active endochondral ossification forming mature trabecular bone was continuous with the underlying host tissue. Chondrocytes were cytologically bland with no cellular atypia, binucleation, or mitotic activity, confirming the absolute absence of malignant transformation.

Postoperatively, the patient was extubated and monitored overnight in the Intensive Care Unit, stepped down to the High Dependency Unit on postoperative day (POD) 1, and transferred to the general ward on POD 2. Following chest X-ray confirmation of complete lung expansion, the thoracostomy tubes were removed sequentially. The patient had an uneventful recovery and was discharged home. At his 45-day follow-up, he was in excellent condition with full resolution of preoperative symptoms and a stable, rigid chest wall.

Discussion

Osteochondroma, also known as an exostosis, represents a benign cartilaginous growth that can present either as a solitary, isolated bone tumor or as part of a systemic syndrome known as hereditary multiple exostoses (HME) (6, 7). Anatomically, costal osteochondromas are classified based on their direction of growth into either intrathoracic (endophytic) or extrathoracic (exophytic) types—a distinction that directly determines their clinical presentation and complication risk (8). The clinical course of a costal osteochondroma is largely benign and indolent, with most cases presenting asymptotically due to its rarity. Nonetheless, when the lesion expands significantly or invades surrounding anatomical spaces, it can induce debilitating pain, structural deformities, functional restrictions, or ischemic circulatory deficits driven by direct vascular compression (7).

Inward endophytic growth can cause severe pulmonary complications in the form of pneumothorax, hemoptysis, and hemothorax (8, 9). These extra-pulmonary complications can result in the erosion of the visceral pleura, mechanical injury to the diaphragm, reactive pericardial thickening, and direct compression of the left ventricle of the heart, leading to progressive dyspnea (8, 10, 11).

Furthermore, neurological complications of costal osteochondromas include spinal cord compression and myelopathy, which occur when inward growth invades the spinal canal to cause lower-limb weakness (5, 12, 13). Additionally, the tumor can cause radiculopathy by encroaching on the intervertebral foramen and pinching exiting nerve roots to trigger radiating chest or back pain (5, 12, 13). Upper rib tumors can lead to thoracic outlet syndrome by compressing the brachial plexus, resulting in upper limb weakness and hand muscle wasting, while superficial growth along the lower rib borders can cause intercostal neuralgia by irritating adjacent intercostal nerves to produce localized, chronic neuropathic pain (5, 12).

The most severe complication of osteochondroma is malignant transformation into a secondary peripheral chondrosarcoma, which usually originates within the cartilage cap (5). This cancerous

degeneration occurs in roughly 1% of solitary lesions but rises to approximately 10% in HME cases (5). Asymptomatic costal osteochondromas generally require only conservative, serial observation, as they pose little immediate threat after skeletal maturity (5). However, if the tumor becomes symptomatic—causing severe pain, nerve impingement, or spinal cord compression—complete surgical excision of the mass and its cartilage cap is the definitive treatment to prevent local recurrence (5, 12). When inward growth invades the spinal canal or thoracic outlet, urgent surgical decompression via a costotransversectomy or laminectomy is mandatory to avert permanent neurological deficits (12). Ultimately, total surgical resection yields an excellent prognosis, typically resulting in the complete resolution of all cardiopulmonary and neurological symptoms (12, 14).

Conclusions

Solitary costal osteochondroma is a rare but critical differential diagnosis for expanding chest wall masses in adults. This case demonstrates that benign costal exostoses can present with highly aggressive clinical and radiological features—including bony destruction, soft tissue extension, and direct parietal pleura invasion—that closely mimic primary malignant chest wall malignancies like chondrosarcoma. Furthermore, traditional healing practices can significantly delay formal medical evaluation, allowing these lesions to achieve substantial dimensions and involve multiple adjacent anatomical structures. Thoracic surgeons must maintain a high index of suspicion and be prepared to execute radical en bloc structural resections combined with rigid synthetic mesh reconstructions. This approach ensures definitive histopathological clearance while successfully preserving thoracic mechanics and preventing long-term respiratory morbidity.

Abbreviations

CT	
Computed tomography	
cm	
Centimeters	
HME	
Hereditary multiple exostoses	
POD	
Postoperative day	

Declarations

Informed consent

A Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Competing interests

The authors declare that they have no competing interests.

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Author Contribution

Authors' contributions A.A.M. and S.E.E. conceived the study, designed the paper, managed the literature search, and drafted the main manuscript text. M.E.A. drafted the case presentation section and collected the clinical patient data. B.M.E. prepared figures 1–3, assisted in the study design, and critically reviewed the discussion section. All authors read and approved the final manuscript.

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Availability of data and materials

The data supporting the findings of this case report are included within the article text.

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Figures



Figure 1

Demonstrating a large, hard, immobile mass on the right anterior chest wall prior to surgical intervention.

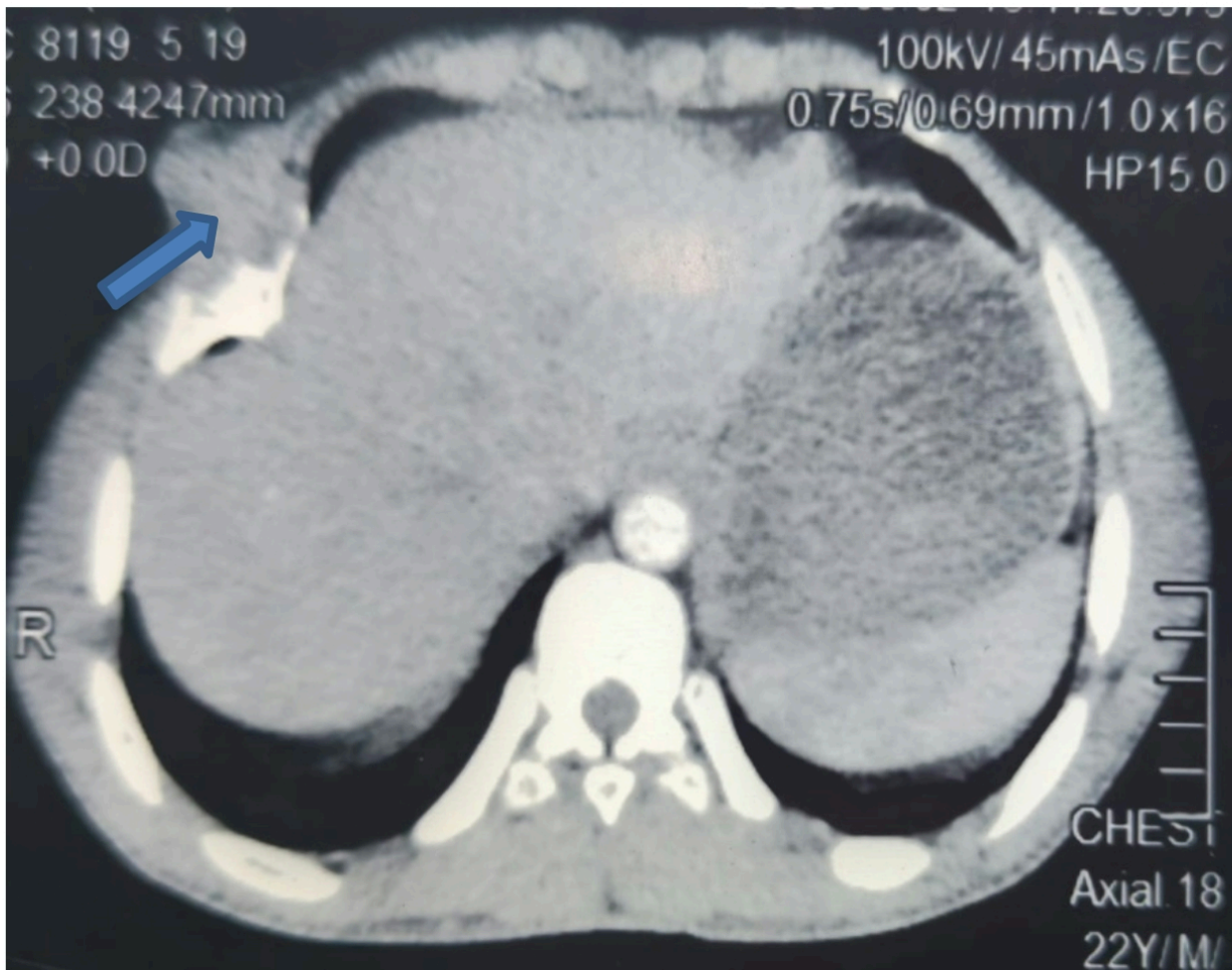


Figure 2

Computed tomography (CT) findings. Axial chest CT scan demonstrating a large, aggressive-appearing, destructive bony tumor arising from the anterior segment of the right sixth rib, featuring a significant soft tissue component causing prominent outward bulging of the thoracic wall contour.



Figure 3

Chest wall reconstruction. Post-resection field demonstrating the stabilization of the full-thickness thoracic defect. A tailored synthetic prosthetic mesh has been meticulously anchored to the surrounding margins with non-absorbable sutures to restore thoracic wall rigidity and preserve respiratory mechanics.