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En Bloc Resection and Reconstruccion of Sternal Manubrium For Expansile Chondrosarcoma: Innovative Surgical Management in A Young Adult

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Abstract

Background

Primary sternal bone tumors are exceedingly rare, with condrosarchomas being among the least common benign lesions. Their proximity to vital mediastinal structures complicates diagnosis and management.

Case Presentation

A 31-year-old woman presented with precordial pain and dysphagia. Imaging revealed an expansile lytic lesion with cortical scalloping of the sternal manubrium. Biopsy confirmed chondrosarcoma. En bloc resection of the manubrium was performed, followed by econstruction using a novel «mesh–cement sandwich» technique combining antibiotic-loaded PMMA bone cement with polypropylene mesh and braided polyester sutures. Postoperative recovery was uneventful, with early mobilization, minimal pain, and no complications. Follow-up imaging showed stable reconstruction without recurrence. The patient resumed daily activities pain-free.

Discussion

Chondrosarcomas in the sternum can mimic malignancy due to cortical scalloping. Complete resection with tailored reconstruction is essential for symptomatic relief and structural stability. The innovative «mesh–cement sandwich» provides an effective, affordable option, particularly in resource-limited settings.

Conclusion

Multidisciplinary surgical planning and the use of antibiotic-loaded cement with mesh enforcement allowed for successful management of a sternal chondrosarcoma, achieving excellent functional and cosmetic outcomes.

1. Introduction

Primary bone tumors of the sternum are exceedingly rare, representing less than 1% of all bone neoplasms, with chondrosarcomas among the least common lesions in this location. While chondrosarcomas typically arise in small tubular bones of the hands and feet, their occurrence in flat bones like the sternum poses unique diagnostic and therapeutic challenges due to proximity to vital mediastinal structures [1-4].

Cortical scalloping seen on imaging suggests aggressive local behavior even in benign tumors, raising concern for malignancy or potential structural compromise requiring surgical intervention. Optimal treatment involves complete excision with adequate margins to prevent recurrence, followed by sternal reconstruction to restore chest wall stability and protect underlying thoracic organs. Advances in biomaterials, such as antibiotic-loaded bone cement combined with synthetic meshes, have enabled effective and economical reconstruction of large sternal defects with excellent functional outcomes. This report describes a case of symptomatic sternal chondrosarcoma in a young woman, managed with en bloc resection and innovative reconstruction using an antibiotic-loaded bone cement "sandwich" technique, highlighting the importance of tailored multidisciplinary surgical planning [5-8].

2. Case Presentation

A 31-year-old woman was referred to the orthopedic oncology service by a radiologist who detected an incidental

sternal abnormality on a chest CT scan performed during evaluation of persistent precordial pain and dysphagia to solids, which she described as a "lump in the throat" sensation starting mid-2024 and worsening by January 2025. On examination, she reported moderate localized tenderness over the upper sternum but had no palpable mass, swelling, respiratory distress, or systemic signs such as fever or weight loss. Routine laboratory investigations, including inflammatory markers, were unremarkable. Initial imaging (Figure 1–3) revealed a well-demarcated expansile lytic lesion with internal cortical scalloping of the manubrium sterni, measuring approximately 4.2 × 3.5 cm, raising suspicion for a cartilage-based tumor. Subsequent MRI with contrast (Figure 4-6) demonstrated heterogeneous enhancement without soft tissue invasion, but with progressive cortical thinning. Given the risk of structural compromise and possibility of misdiagnosed low-grade chondrosarcoma, an open bone biopsy was performed on February 17, 2025, confirming histological features consistent with low-grade chondrosarcoma. (Figure 7-8) Considering the imaging findings of internal cortical scalloping and the patient's symptoms, a decision was made for surgical resection. En bloc manubrial resection was planned with reconstruction using a "sandwich" technique: antibiotic-loaded polymethylmethacrylate (PMMA) bone cement combined with 5mm braided polyester (Ethibond) sutures and polypropylene mesh to achieve stability and coverage. Through a midline sternotomy incision, the manubrium was excised en bloc, ensuring clear margins (Figure 9-11). Reconstruction was performed as planned: a layer of polypropylene mesh was placed anteriorly, followed by the antibiotic bone cement molded into the defect, and reinforced with Ethibond sutures to secure the construct, completing the "mesh–cement sandwich." Postoperative recovery was uneventful. The patient was extubated on the same day, required minimal analgesia, and experienced no respiratory compromise. Early mobilization was achieved within 48 hours, and postoperative CT on June 10, 2025, confirmed a stable reconstruction with no evidence of residual lesion or complications. At latest follow-up, the patient was pain-free and fully resumed daily activities.

3. Discussion

Chondrosarcomas are malignant cartilaginous tumors commonly found in the metaphyseal regions of long bones but rarely in the axial skeleton or flat bones like the sternum. When present in the sternum, they often pose diagnostic dilemmas because cortical destruction or scalloping may mimic malignant processes such as high-grade chondrosarcoma. Cortical scalloping on imaging indicates chronic pressure erosion but does not necessarily signify malignant transformation. Biopsy remains crucial in differentiating benign from malignant cartilage tumors, yet biopsy sampling errors can occur due to tumor heterogeneity; thus, clinical, radiological, and pathological correlation is essential. In symptomatic cases or when imaging suggests aggressive features, complete surgical excision is recommended to relieve symptoms, prevent potential fracture or invasion, and definitively exclude malignancy. Traditional sternal reconstruction approaches have included autografts, allografts, or titanium plates, but these options can be costly, technically complex, or unavailable in resource-limited settings. The innovative "mesh–cement sandwich" technique, combining PMMA bone cement with synthetic mesh, offers a cost-effective alternative, providing immediate structural stability and infection control when antibiotic-loaded cement is used Additionally, synthetic meshes facilitate soft tissue integration and reduce risk of seroma or wound dehiscence. Our patient's successful outcome, with restoration of chest wall stability and excellent functional recovery, underscores the effectiveness of this technique, especially in cases where advanced reconstruction systems or customized implants are not feasible. Early rehabilitation and minimal postoperative pain further highlight its benefits in young patients who require rapid return to active life [6-12].

4. Conclusion

This case demonstrates the importance of considering chondrosarcoma in the differential diagnosis of sternal lytic lesions, recognizing that cortical scalloping may occur even in benign tumors. En bloc resection with innovative reconstruction using a PMMA mesh–cement "sandwich" provided excellent chest wall stability and cosmetic results in this young patient. Multidisciplinary planning, meticulous surgical technique, and tailored reconstruction strategies are key to successful outcomes in rare primary sternal tumors.

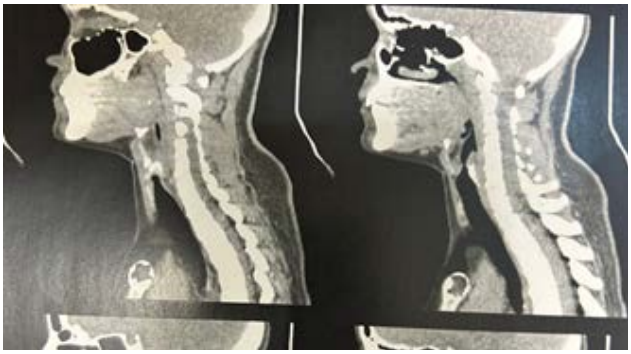
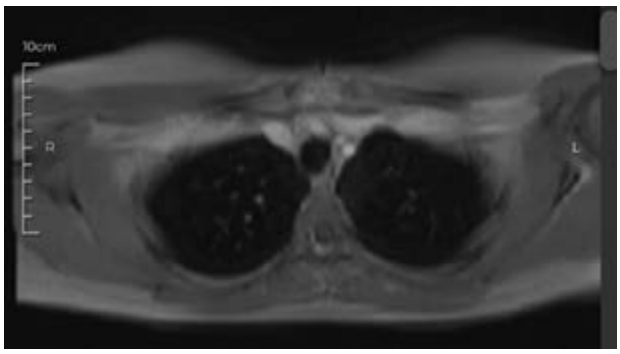


Figure 1

Figure 2

Citation: Franco, A. T. (2025). En Bloc Resection and Reconstruccion of Sternal Manubrium for Expansile Chondrosarcoma: Innovative Surgical Management in A Young Adult. *CME J Clin Case Rep, 2*(3), 1-5.

Figure 3



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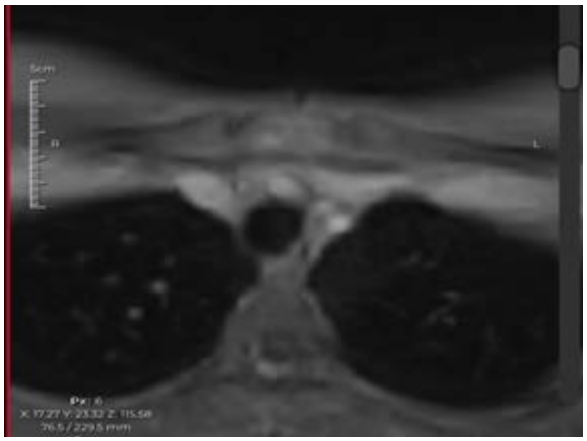


Figure 5

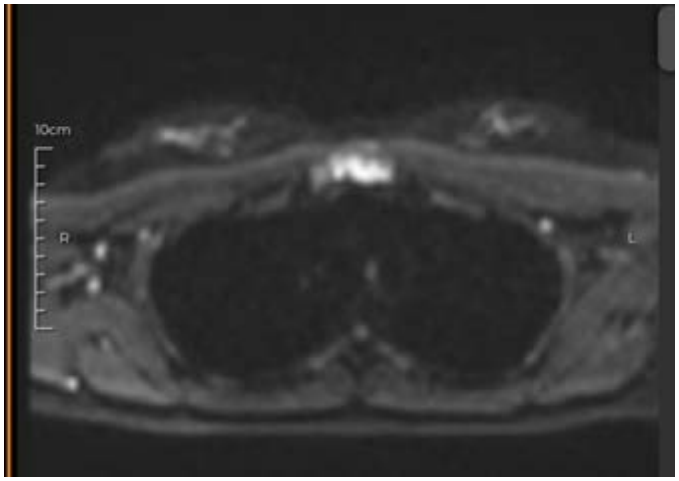
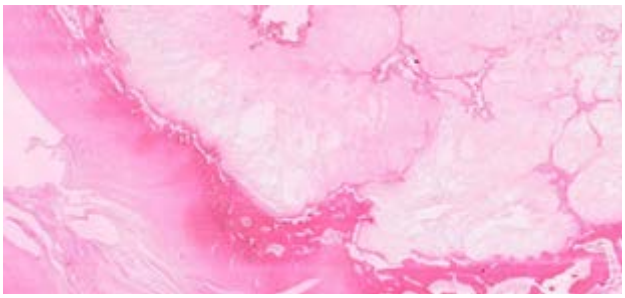


Figure 6

Citation: Franco, A. T. (2025). En Bloc Resection and Reconstruccion of Sternal Manubrium for Expansile Chondrosarcoma: Innovative Surgical Management in A Young Adult. *CME J Clin Case Rep, 2*(3), 1-5.



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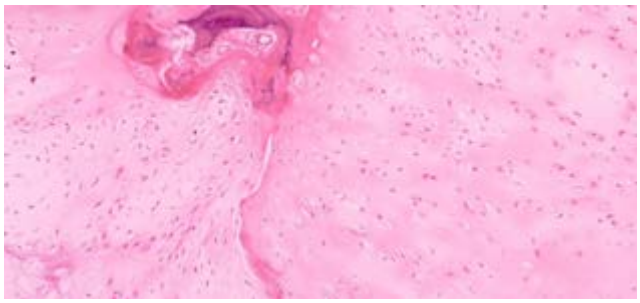

Figure 8

Figure 9

Figure 10

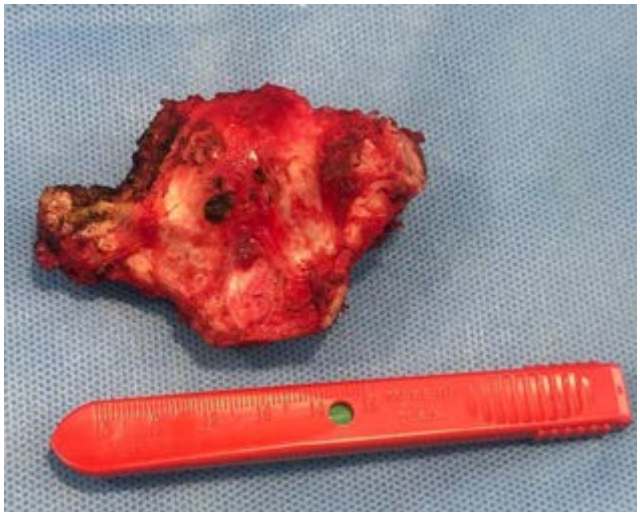

Figure 11

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