Case Report

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# Secondary Chondrosarcoma of the Clavicle: A Case Report

Radiology Section

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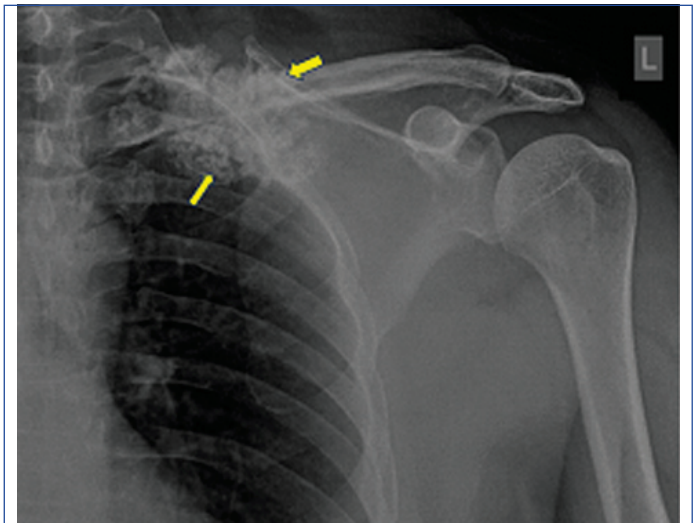
## ABSTRACT

Chondrosarcomas are uncommon cartilaginous tumours and are the third most common tumours arising from the bone. These tumours are low to high grade malignant chondroid tumours. Most of these lesions arise de novo and are considered primary chondrosarcomas. Tumours that develop from the cartilaginous cap of existing benign tumours like enchondroma or osteochondroma are known as secondary chondrosarcomas. Herein, the authors presented a case of a 41-year-old man who presented with a history of pain and swelling in his left clavicle for a duration of six months. Upon examination, clinicians felt a hard mass in the left clavicle region, prompting them to explore radiological insights. A radiograph revealed a lobulated sclerotic region overlying the medial aspect of the left clavicle. Computed Tomography (CT) further revealed an exophytic lesion arising from the clavicle. Magnetic Resonance Imaging (MRI) further characterised the lesion and raised suspicion of a complex malignant lesion of chondroid origin. Histopathological analysis confirmed it to be a chondrosarcoma of the clavicle. Subsequently, the patient underwent tumour excision with partial claviculectomy. Secondary chondrosarcomas are low to high grade malignant chondrogenic bone tumours that arise in pre-existing benign tumours. They may develop in osteochondromas, enchondromas, fibrous dysplasia, Paget's disease, irradiated bone, and synovial chondromatosis. Although sarcomatous transformation is common in osteochondromas, secondary chondrosarcomas of the clavicle are extremely rare.

**Keywords:** Bone tumours, Cartilaginous cap, Cartilaginous tumours, Osteochondroma

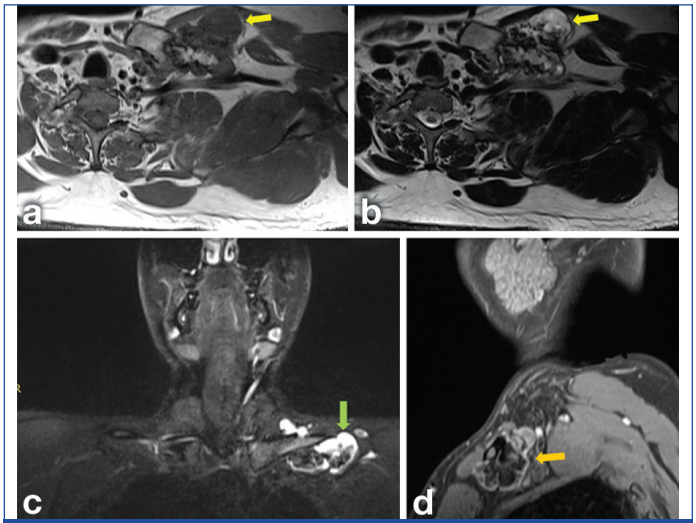
## CASE REPORT

A 41-year-old male presented with pain and swelling in the left clavicular region, which had an insidious onset and gradually progressed over the past six months. The pain was a dull, aching type and worsened with strenuous activities. There was no history of fever or trauma. Physical examination revealed a fixed hard mass measuring 7×3 cm in the left clavicular region. The Range of Motion (ROM) of the left shoulder was restricted. There were no signs of inflammation, such as a local rise in temperature, and no dilated veins were observed during examination. The swelling did not move with deglutition. The patient was advised to undergo a radiograph for further evaluation. An anteroposterior radiograph of the left clavicle revealed a lobulated sclerotic lesion with irregular margins overlying the medial clavicle. The matrix of the lesion appeared inhomogeneous with multiple areas of lucency, and the cortical margins of the underlying clavicle were indistinct [Table/Fig-1].




**[Table/Fig-1]:** X-ray left shoulder Anteroposterior- upright view showing and expansile mixed sclerotic and lytic lesion overlying the medial end of the clavicle with ring and are type of calcifications. (L-Lesion).

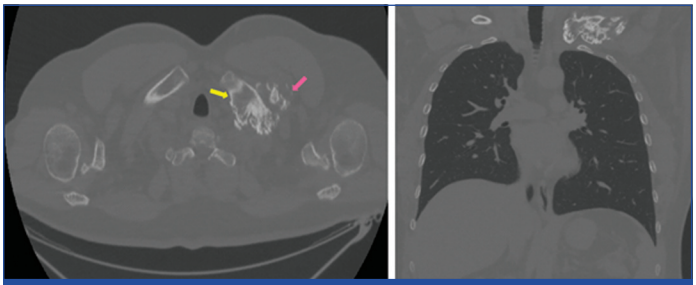
Subsequently, the patient underwent MRI and CT for further characterisation of the lesion. The MRI showed a large inhomogeneous, irregularly marginated mass arising from the medial third of the clavicle, measuring approximately 6.0×6.3×4.7 cm. The mass appeared hypointense on T1-weighted Images (T1WI) and had intermediate signal intensity on T2-weighted Images (T2WI). The overlying cartilage was thick, inhomogeneous, and hyperintense on T2-weighted images, with non uniform thickness. Cortical and medullary continuity between the lesion and the underlying clavicle was observed. Adjacent muscles and neurovascular structures were displaced, with maintained fat planes [Table/Fig-2].




**[Table/Fig-2]:** a) T1WI and b) T2WI shows a, irregularly marginated mass arising fron the medial third of the clavicle appearing hypointense on T1WI and heterogeneously hyperintense on T2WI with an overlying thick cartilage (yellow arrow). The lesion also shows coticomedullary continuity. c) Coronal STIR images show the lesion with a cartilage cap (green arrow). d) Post-contrast images shows heterogenous enhancement of the lesion (orange arrow) (L-Lesion).
T1WI: T1-weighted images; T2WI: T2-weighted images; STIR: Short tau inversion recovery

A corroborative plain CT study revealed an irregular, sessile, exophytic sclerotic lesion measuring 6×6.3×4.9 cm, arising from the medial third

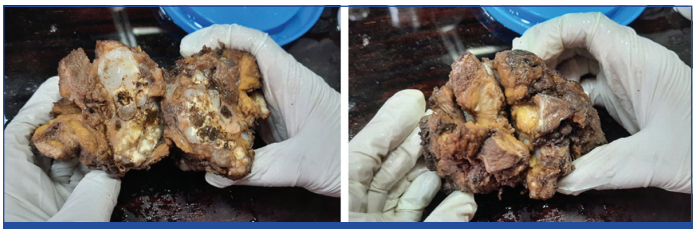
of the clavicle. The lesion showed cortical and medullary continuity with the clavicle, but it exhibited inhomogeneous mineralisation, surface irregularities, and an associated soft tissue component with calcifications. Areas of cortical thickening and erosions were noted in the underlying clavicle [Table/Fig-3]. Considering the expansile lytic lesion in the medial third of the left clavicle with cortical destruction and increased cartilage cap thickness (2.3 cm), the possibility of osteochondroma with secondary chondrosarcoma was considered.



**[Table/Fig-3]:** Axial and coronal CT sections show a medial third lesion involving the left clavicle with corticomedullary continuity (yellow arrow) and associated soft tissue component (pink arrow) and in homogeneous mineralisation. (L-Lesion).

The other key differentials that the authors considered were other aggressive lesions, such as paraosteal osteosarcoma and synovial sarcoma. Subsequently, a percutaneous ultrasound-guided biopsy of the left clavicular lesion was performed under local anaesthesia. Histopathological examination showed the presence of bony tissue comprising chondrocytes in lobules with increased cellularity, enlarged hyperchromatic nuclei, and multinucleated chondrocytes. These findings confirmed that the lesion was a secondary chondrosarcoma of the medial end of the left clavicle.

Following this, the patient underwent left clavicle tumour excision with partial claviculectomy [Table/Fig-4]. The postoperative period was uneventful. After the surgery, the patient was managed conservatively with intravenous antibiotics, analgesics, and proton pump inhibitors. The advice at discharge was to revisit the hospital after two weeks for suture removal, along with taking tablet chymoral forte and maintaining the left arm pouch for three weeks.

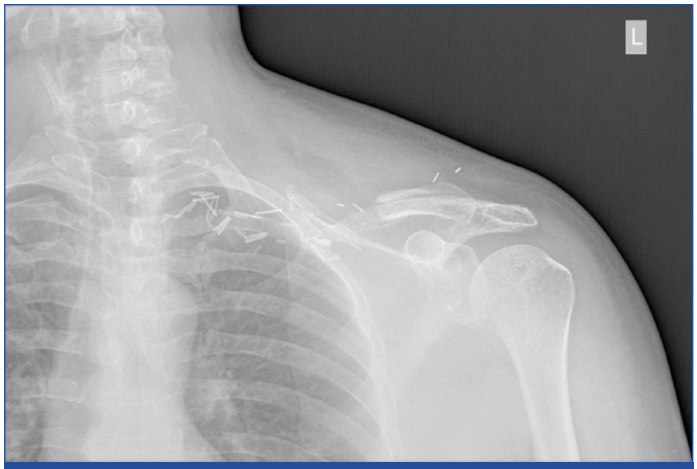


**[Table/Fig-4]:** Postoperative images of the left clavicular chondrosarcoma.

Postsurgery, the patient was asked to follow-up after four weeks to check for any recurrence and suture removal. The patient was advised to have an X-ray of the left shoulder, which showed a few surgical staples in the region of the medial left clavicle without any residual lesion [Table/Fig-5]. Following this, the patient was advised to follow-up after six months, but the patient never came for further follow-ups.

## DISCUSSION

Osteochondromas are lesions that arise from the surface of bones and have continuity with the normal cortex and marrow. They are considered the most common type of benign bone tumour. These lesions are typically located in the metaphysis of long bones, with a higher incidence in the lower extremities near the knee, particularly in the distal femur and proximal tibia. However, osteochondromas are rare in the clavicle and spinal bones [1]. Chondrosarcomas are the third most common primary bone tumour in patients older than 25 years and produce a cartilaginous matrix. They arise de novo and constitute 20%-30% of primary bone tumours [2]. There are various types of primary chondrosarcomas, including conventional




**[Table/Fig-5]:** Left shoulder X-ray upright view shows no obvious residual/recurrent lesion. Surgical staples noted in the region of the medial third of clavicle.

intramedullary, clear cell, juxtacortical, myxoid, mesenchymal, extraskeletal, and dedifferentiated. Conventional intramedullary chondrosarcoma is the most common type and predominantly affects the long bones or pelvis [2]. Secondary chondrosarcomas are rare and typically arise from pre-existing osteochondromas or enchondromas [3].

Tumours of the clavicle are rare, accounting for less than 0.5% of all tumours [4], and they are usually primary tumours. Osteochondromas of the clavicle are extremely rare, and their transformation into secondary chondrosarcomas is even rarer [3]. They typically present as an expansile mixed sclerotic lesion with ring and arc chondroid matrix (representing enchondral calcification) and a centrally lucent area with a narrow zone of transition and endosteal scalloping. Malignant transformation of primary bone pathology into chondrosarcoma is characterised by a sudden increase in size of the lesion and the development of pain, which may have been initially asymptomatic. A cartilage cap thickness of more than 2 cm is considered a suspicious malignant feature. Other features favouring malignant transformation include irregular calcifications, irregular margins, the presence of soft tissue components, and adjacent bone erosions [5,6]. A study conducted by Takenoshita S et al., in a 20-year-old male, showed irregular calcifications in the right clavicle on the x-ray. Subsequent CT and MRI revealed a lobulated neoplastic lesion in the right medial clavicle with corticomedullary continuity and a thick cartilage cap, similar to the findings in this case [6]. Following this, the patient underwent subtotal claviculectomy, and histopathological examination confirmed the lesion to be a chondrosarcoma.

Efremidou EI et al., in a case report on a 54-year-old man who presented to their hospital with swelling over the left shoulder, diagnosed him with juxtacortical chondrosarcoma of the clavicle [7]. X-rays showed an irregular soft tissue mass with areas of chondroid calcifications. Subsequent CT revealed an ovoid soft tissue mass arising from the distal part of the diaphysis of the left clavicle, with a coarse peripheral matrix and multiple central spotty calcifications. The cortex showed extrinsic thickening and erosion, with non mineralised areas. MRI of this patient revealed a hypointense mass on T1, heterogeneously hyperintense on T2, and showing heterogeneous postcontrast enhancement. These findings were similar to those of the index case. Histopathological examination confirmed the diagnosis of low-grade juxtacortical chondrosarcoma.

In a case report by Younus A and Kelly A, a 57-year-old male presented with a painless mass in the right clavicle. On examination, the mass measured approximately 15×10 cm and was firm and fixed to the underlying bone. MRI revealed a T2 hyperintense soft tissue mass that was replacing the clavicle, along with retropectoral lymphadenopathy. The investigators performed a CT angiogram to

exclude vascular involvement and a Technium bone scan to rule out metastases. A fine needle biopsy confirmed the diagnosis of chondrosarcoma of the clavicle [8]. Khaja A et al., in their report of a 37-year-old man with tenderness over the medial aspect of the clavicle for 10 years, described a bony lesion protruding from the underlying bone of the clavicle. Subsequent MRI showed a cauliflower-like mass measuring 2.2×2.2×2.5 cm with a stalk showing corticomedullary continuity, along with a 1 cm cartilage cap. The mass was excised. One year later, the patient presented again with a painful mass in the medial region of the clavicle. MRI showed a 4×4 cm lesion with ill-defined margins, calcifications, and an increased cartilage cap thickness, highly suggestive of malignant transformation. A CT-guided biopsy confirmed the malignant transformation, consistent with chondrosarcoma [9].

CT imaging helps in better delineation of the tumour matrix, while MRI helps determine cartilage cap thickness, tumour extent, bone marrow involvement, and invasion into soft tissue [2]. Surgery is considered the primary treatment choice, as radiotherapy and chemotherapy are generally ineffective except in the dedifferentiated type. Intralesional curettage followed by local adjuvant therapy using phenol, liquid nitrogen, and filling of the cavity with bone grafts can achieve satisfactory outcomes if used [2].

## CONCLUSION(S)

Clavicular bone tumours are rare, and primary chondrosarcoma is even rarer. Secondary chondrosarcoma of the clavicle is rarely reported in the literature. If a bone tumour is detected in the clavicle, regular follow-up is crucial to ensure early recognition of any malignant transformation, particularly in painless lesions. Early recognition enables appropriate surgical management and improves outcomes, reducing the recurrence rate.

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