Osteochondroma of the proximal humerus with frictional bursitis and secondary synovial osteochondromatosis

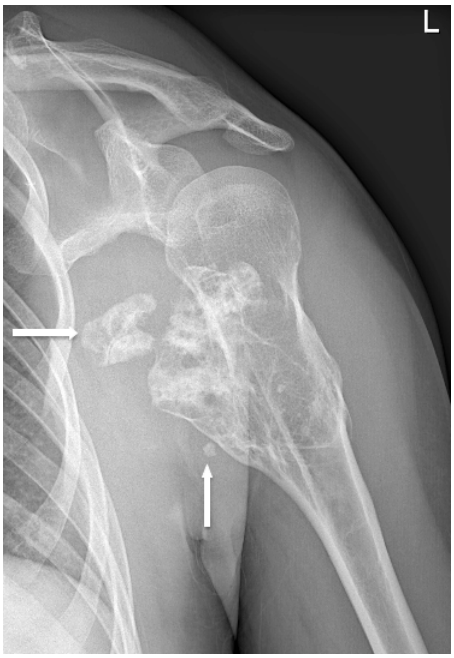

Fig. 1a

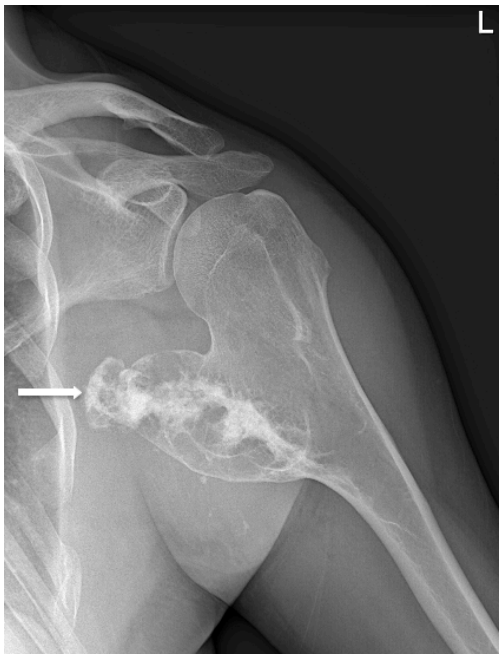

Fig 1b

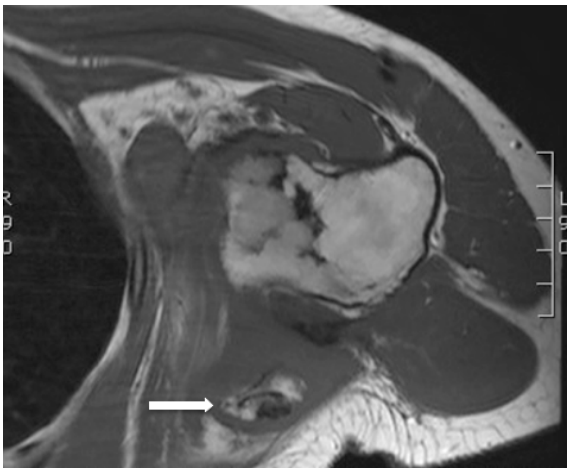

Fig. 2a

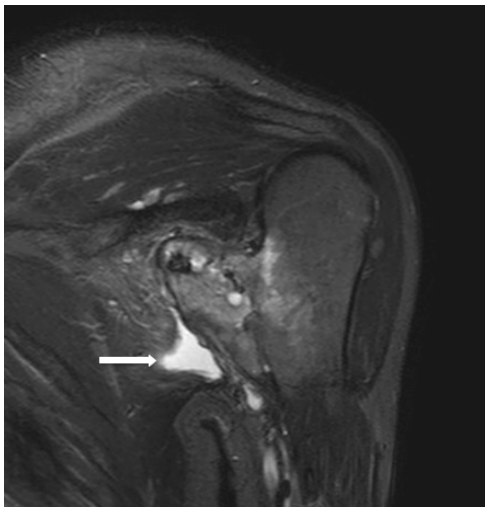

Fig. 2b

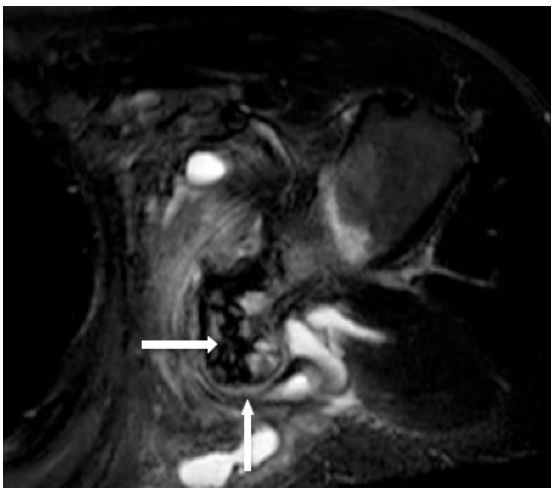

Fig. 2c

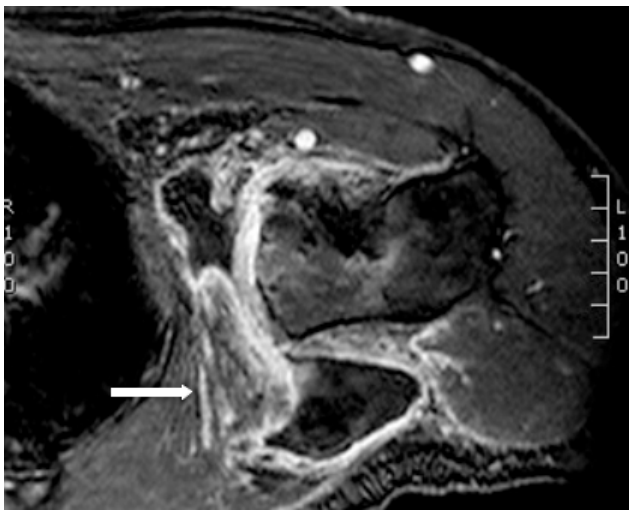

Fig. 2d

Clinical History:
A 33-year-old man presenting with pain and discomfort of the left shoulder. The patient is known with exostoses of the knee and pelvis in the context of Multiple Hereditary Exostoses (MHE). One lesion has previously been resected because of high risk for malignant transformation. There was no recent history of trauma.
Conventional imaging of the left shoulder showed a well defined bony lesion protruding from the proximal humeral metaphysis to diaphysis including accessory bone fragments located in the axillary soft tissues (Fig. 1).
Further assessment of the lesion was done by MRI (Fig. 2)

Imaging Findings:

Figure 1: Conventional radiography of the left shoulder
Fig. 1a: AP view in neutral position:
A bony lesion protruding from the medial side of the proximal humeral metaphysis to diaphysis. The lesion shows a pattern of rings and arcs to confluent calcifications. There is an accessory bone fragment (horizontal arrow) projecting over the axillary soft tissues associated with a surrounding soft tissue component. A smaller isolated loose fragment is located close to the inferomedial border of the primary lesion (vertical arrow).
Figure 1b: AP view in exorotation:
There is cortical and medullar continuity from the proximal humerus to the primary lesion. Superposition of the isolated bone fragment and the superomedial border of the primary lesion (arrow).
Small focal hyperdensities are located inferior to the lesion associated by a surrounding soft tissue mass.

Figure 2: MRI of the left shoulder
Fig 2a: axial T1:
Bony lesion protruding from the medial side of the proximal humeral metaphysis to diaphysis with continuous cortical margins surrounded by a low intensity soft tissue component and an isolated bone fragment (arrow) located in this soft tissue component.
Fig. 2b Coronal STIR:
A hyperintense cystic fluid collection (arrow) surrounds the metaphyseal lesion and contains the isolated bone fragment posterior to the humerus (not shown).
Fig. 2c: Axial STIR:
The posterobasal facet of the lesion is peripherally surrounded by a hyperintense rim (vertical arrow) representing the residual hyaline cartilage rim surrounded by a hypo-intense perichondrium, the carilage rim has a maximal thickness of 4 mm.
Central hypointensities represent calcific chondroid mineralisation of hyaline cartilage, low in intensity on all MR pulse sequences (horizontal arrow)
Fig. 2d: axial T1 TSE + Gd:
Contrast enhancement of the thin lined wall of the cystic mass and surrounding soft tissues anterolateral of the cranial segment of the latissimus dorsi muscle (arrow).

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Radiographic and MR imaging findings are characteristic for an osteochondroma of the proximal humerus.
The presence of a similar lesions located at the pelvis and left knee supports the diagnosis of Multiple Hereditary Exostoses (MHE).
Development of a cystic mass surrounding the osteochondroma with bone fragments located in this well marcated cystic lesion is pathognomonic for a frictional bursa formation also known as 'exostosis bursata' with secondary synovial osteochondromatosis.

Comment:
An osteochondroma is defined as a cartilage-capped bony lesion arising on the external surface of a bone and containing a marrow cavity that is continuous with the primary bone. Osteochondromas are the most common benign bone tumors (30%) or bone tumors in general (10-15%). The majority of lesions are solitary, non hereditary (85%) but lesions can also by multifocal in the context of Hereditary Multiple exostoses (HME), a disorder inherited in an autosomal dominant manner.
Pathophysiologic an osteochondroma results from the separation of an epiphyseal growth plate cartilage fragment with persistent growth of the cartilage fragment and secondary enchondral ossification (maturation). Osteochondromas usually show a growth pattern similar to a normal physeal plate until skeletal maturity.
Imaging characteristics of an individual osteochondroma in HME is identical to solitary lesions.
An osteochondroma has the typical radiographic appearance of a lesion consisting of cortical and medullary bone continuous with the underlying parental bone.
The lesion is usually located at the metaphysis of a long bone, most frequently in the distal femur but any bone developing from preformed cartilage may be involved.
The hyaline cartilage is difficult to assess on conventional radiography but may be suggested by the identification of rings and arcs or flocculent calcifications as the result of chondroid mineralisation.
CT allows optimal evaluation of the pathognomonic cortical and trabecular continuity of the lesion and parental bone and is considered accurate in assessing thickness of the hyaline cartilage cap (lower in Hounsfield Units compared to muscle tissue as the result of the high water content).
Thickness of the hyaline cartilage cap is the most important imaging finding considering the risk of malignant transformation to a chondrosarcoma. Cartilage cap tickness of > 1,5 cm in a skeletal mature patient should be viewed with great suspicion. Other signs of malignant transformation include growth of a previously unchanged osteochondroma in a skeletal mature patient, irregular lesion surface, focal interior radiolucencies, erosion or destruction of adjecent bone and surrounding soft tissue mass formation containing irregular calcifications.
Ultrasound also enables accurate evaluation of the hyaline cartilage cap thickness, especially for superficial lesions.
MRI may also demonstrate cortical and medullary continuity and is the best imaging modality for evaluating the cartilage cap and its surrounding soft tissues.
The high water content of the cartilage cap in nonmineralized portions gives an intermediate to low signal on T1-weighted sequences and a high signal on T2-weighted sequences. Mineralised portions in the cartilage cap remain low in signal on all MR pulse sequences. The low signal intensity at the periphery represents the perichondrium.

Osteochondromas usually are asymptomatic but may show complications varying from cosmetic deformity, fracture, vascular or neurogenic compression, bursa formation and malignant transformation.
Anatomically an inconsistent bursa is located in the axilla in between the inferior angle of the scapula and the superior fibers of the latissimus dorsi muscle, more posterosuperiorly a bursa is located between the serratus anterior and the subscapularis muscle. Bursa neoformation between an osteochondroma and the perilesional soft tissues has been described as “exostosis bursata”, a result of mechanical impingement upon the adjacent muscles and tendons. Bursae are lined by synovium and may become symptomatic due to inflammation, infection or haemorrhage. Clinically bursa formation may present as a painful growing perilesional mass, simulating malignant transformation.
In rare cases chondral or fibrin fragments may be dislocated from the osteochondroma into the bursa resulting in chondrometaplasia in the synovial lining and secondary formation of multiple chondroid bodies as in primary synovial osteochondromatosis.
Secondary synovial osteochondromatosis is a more common finding in which several osteochondral bodies of different shapes and sizes are seen in a synovial fluid collection.

In this patient a bursa formed around the osteochondroma of the proximal medial left humerus as a case of 'exostosis bursata'.
Secondary to friction, osteochondral fragements of different shape and size became separated from the primary osteochondral lesion and migrated into the bursa resulting in a secondary form of synovial osteochondromatosis.
The patient was succesfully treated with bursectomy and resection of the osteochondroma with relief of his complaints.

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