CLINICAL CASE - TEST YOURSELF

MSK Imaging

Painful hip in an elderly man

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PART A

A 80-year-old male patient presented at the Emergency Department (ED) with pain of sudden onset on his left hip. No other symptoms were reported by the patient. The past medical history did not disclose any arthritic disorder. Physical examination confirmed the presence of severe pain and stiffness of the left hip joint and in addition showed limited range of motion. Plain anteroposterior film of the pelvis and hips was performed in the ED **(Fig. 1)**. The patient was admitted to the hospital and subsequently Computed Tomography (CT) **(Figs. 2, 3)** and Magnetic Resonance Imaging (MRI) **(Figs. 4, 5)**, were performed.

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***Fig. 1.** Plain radiograph of the pelvis.*

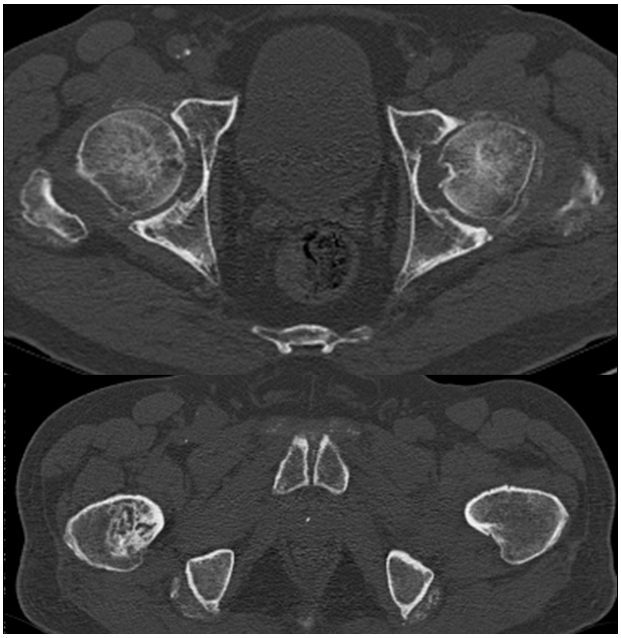

***Fig. 2.** Axial CT images of the pelvis.*

***Fig. 3.** CT coronal reconstruction images.*

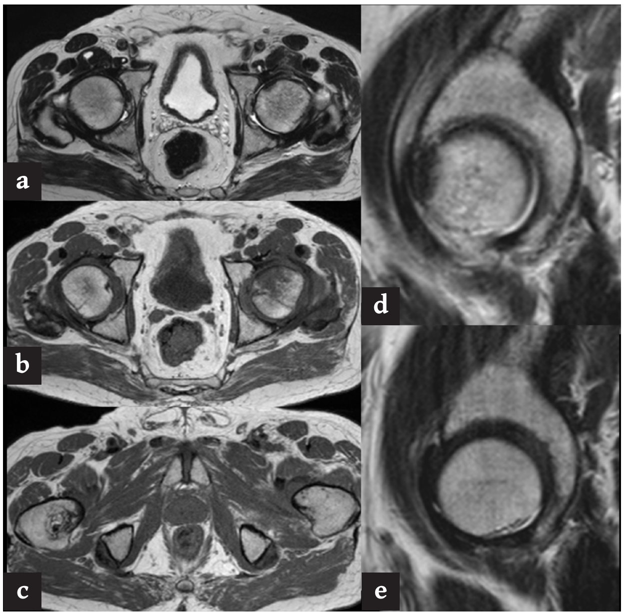

***Fig. 4.** Axial T2-w (**a**), T1-w (**b, c**) MR image of the right hip. Sagittal T2-w MR image of the left hip (**d**). Corresponding sagittal image on the right (**e**).*

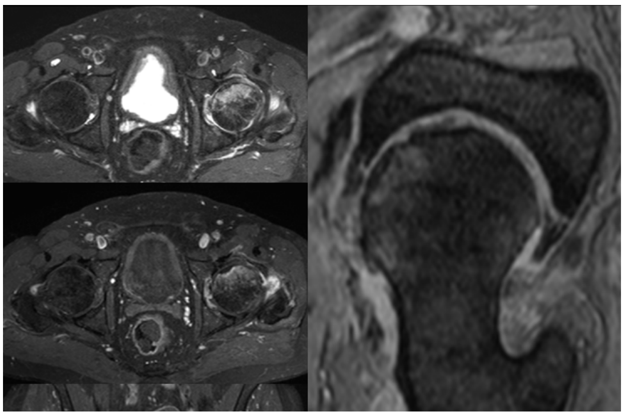

***Fig. 5.** Axial fat suppressed PD-w (upper left), axial fat suppressed contrast enhanced T1-w (middle left), coronal fat suppressed contrast enhanced T1-w (lower left) and oblique axial T2* (right) MR images.*

PART B

Diagnosis: Insufficiency fracture of the left femoral head, crystal deposition disease and fibroosseous lesion of the right femoral bone

The major differentials in elderly patients presenting with acute onset of hip pain include insufficiency or pathologic fracture, articular collapse complicating avascular necrosis (AVN), septic arthritis, inflammatory myositis and tendon degenerative tears [1].

Insufficiency fractures (IFs) represent a subtype of stress fracture that occurs when normal forces apply on a weakened bone [2]. They have a female predilection, typically older than 70 years. Predisposing factors include osteoporosis, renal disease and previous radiation. IFs are often located in the pelvic ring, the sacrum and the femoral neck [2]. The diagnosis of IFs is mostly based on radiological findings, since symptoms and clinical tests in these patients are not specific [2]. The progressive nature of IFs, that can eventually lead to bone collapse, makes early diagnosis crucial [3].

Plain radiographs may be unremarkable or show regional osteopaenia or focal subchondral sclerosis. In follow-up radiographs, a subchondral line representing the fracture may be observed, with or without flattening of the femoral head. CT can reveal the aforementioned signs earlier and with a higher sensitivity. Scintigraphy almost always shows increased uptake and can effectively localise the lesion in early stages as well as other affected areas but it is non-specific [2-4]. On MRI, a low signal intensity on T1- and T2-weighted (w) images, linear band, parallel or convex to the articular surface, is typically found [2, 3]. Bone marrow oedema (BME) is depicted distal to the subchondral line.

It is important to differentiate an IF from a severely collapsed femoral head in AVN, since the same subchondral fracture line may occur. AVN shows the typical “band like” sign on T1-w images but in advanced cases a “crescent” sign, with gas on plain films/CT and fluid on MR images, may be seen. BME appears as an associated finding in cases that articular collapse occurs, complicating a long standing AVN [5]. The diagnosis and staging of AVN is important because treatment for early disease includes joint preserving procedures whereas for advanced disease total hip replacement.

The prognosis of IFs remains unclear depending on the extent and location of the lesion, body weight and bone density. Conservative treatment with weight bearing protection in the affected limb can lead to significant clinical and radiological improvement in early detected IFs [4].

Our patient was osteoporotic with DEXA bone densitometry of the spine showing a T-score of -3.4. Complete resolution of symptoms was recorded 12 weeks following rest and weight-bearing protection. In addition, treatment for osteoporosis was initiated. Radiographs performed four and nine months after the initial diagnosis did not disclose any articular collapse in keeping with the clinical improvement. No further imaging follow-up was required and two years after the initial symptoms, the patient was well regarding the musculoskeletal system.

The initial imaging findings in our patient revealed joint space narrowing on the left hip joint, cloud-like calcifications in both hip joints, linear and stratified calcifications of the hamstrings and a lytic lesion with sclerotic rim on the right proximal femoral bone on plain radiographs **(Fig. 1)**. CT imaging showed chondrocalcinosis and synovial crystal deposition in both hips and in the pubic symphysis, as well as linear calcifications in the hamstrings and the adductor tendons. The lesion on the right femur demonstrated a mixed pattern with fat and sclerosis, without cortical disruption **(Figs. 2, 3)**. The final diagnosis of IF was based on MR imaging, which showed mild articular collapse on the anterior left femoral head along with additional low T1-w and T2-w subcortical sclerosis representing the compressed trabeculae, surrounding BME and anterior joint space narrowing **(Figs. 4, 5)**.

Extensive multifocal, rather symmetrical, joint and soft tissue calcifications were shown on imaging. Crystal deposition disease consists of deposition of calcium pyrophosphate (CPP) and basic calcium phosphate (BCP) in all joint structures, ligaments, tendons, muscles and soft tissues [6]. Care should be

Fig. 1. *Plain radiograph shows joint space narrowing on the left (black arrow), intraarticular calcifications in both hip joints (short arrows), calcification at the hamstrings (long arrows) and a sclerotic lesion in the intertrochanteric zone on the right proximal femoral bone (open arrows).*

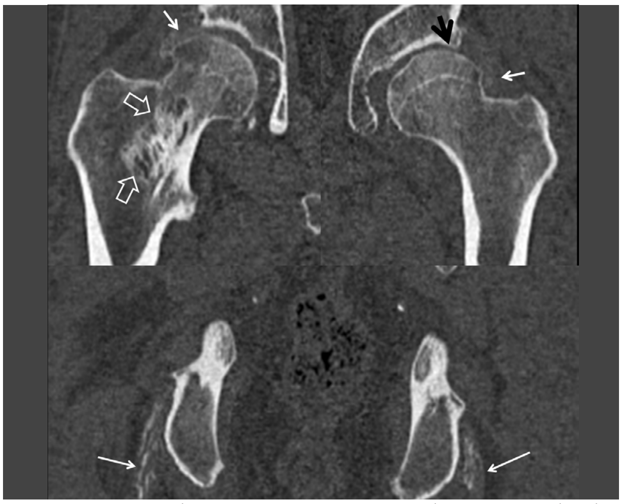

Fig. 3. *CT coronal reconstruction images show synovial calcifications in both hip joints (short arrows), calcifications at the hamstrings (long arrows) and a predominantly sclerotic lesion in the right proximal femoral bone (short open arrows). In addition, there is joint space narrowing on the left (black arrow).*

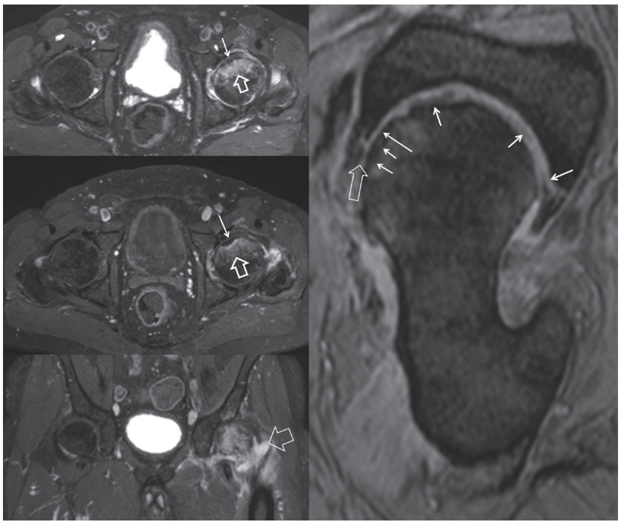

Fig. 5. *Axial fat suppressed PD-w (upper left), axial fat suppressed contrast enhanced T1-w (middle left), coronal fat suppressed contrast enhanced T1-w (lower left) and oblique axial T2* (right) MR images showing bone marrow oedema (open arrows), mild articular collapse (long thin arrow), subcortical sclerosis (short thin arrows) and anterior labral degenerative tear along with anterior joint space narrowing (thin open arrow). Marked synovitis is shown on the left lower image (open arrow).*

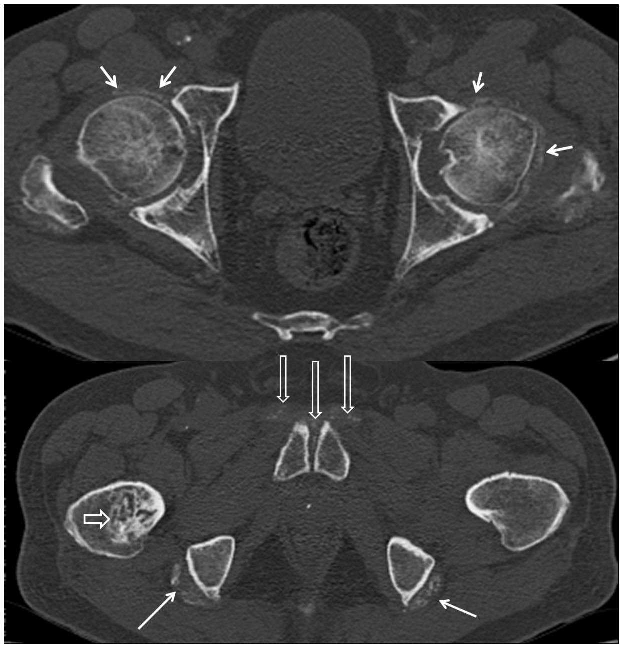

Fig. 2. *CT images show synovial calcifications in both hip joints (short arrows), calcification at the hamstrings (long arrows) and a sclerotic lesion in the right proximal femoral bone (short open arrow). In addition, there is chondrocalcinosis in the pubic symphysis as well as calcifications in the adductor tendons (long open arrows).*

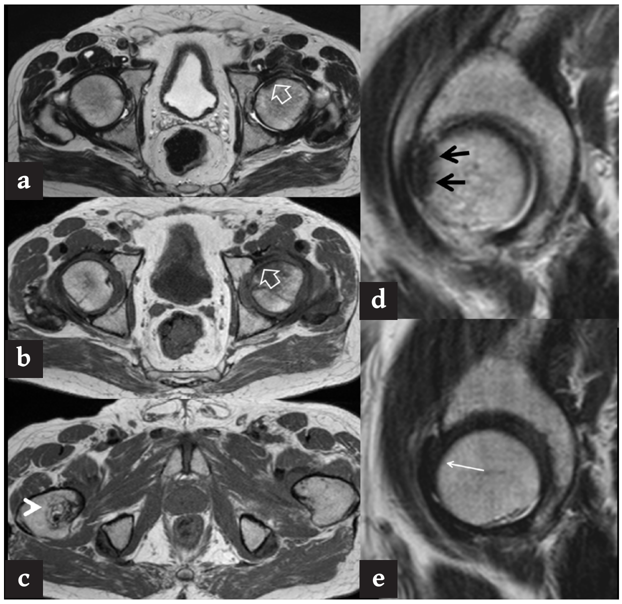

Fig. 4. *Axial T2-w (**a**), T1-w (**b, c**) show the subcortical low signal intensity fracture (open arrows). The benign lesion is shown on the right hip (arrowhead in **c**). The sagittal T2-w MR image of the left hip (**d**) shows the low signal intensity fracture (black arrows). Note for comparison the corresponding sagittal image on the right (**e**) where the bone marrow is normal (arrow).*

taken regarding the nomenclature [7]: *Chondrocalcinosis* is used to describe the radiologically detected cartilage calcification on plain radiographs or CT, the latter being the study of choice. CPP deposition disease (*CPPD*) is used to describe the presence of CPP crystals in or around joints. Asymptomatic chondrocalcinosis is the most common form of CPPD. *Pseudogout* and *pseudo-osteoarthritis*, with or without synovitis, are clinical terms used to describe the clinically detected acute arthritis because of CPP deposition. Hydroxyapatite deposition disease is used to describe the deposition of BCP crystals in tendons and ligaments causing often the painful syndrome of *acute calcific tendinitis*. The intra-articular BCP deposition in the shoulder, results in a destructive process, known as *Milwaukee Shoulder*.

The pathophysiology of crystal deposition has not been fully clarified [8]. The deposition of CPP crystals is as a rule asymptomatic and is depicted as an incidental imaging finding. Idiopathic CPPD has been detected in up to 30% of radiographs of patients older than 80 years old. In a minority of patients, it may cause a range of clinical manifestations such as acute inflammatory arthritis and rapidly destructive osteoarthritis [9]. In our patient, no symptoms were reported in the history regarding the location of the crystal deposition.

The incidentally found benign lesion in the right femoral bone shows the typical imaging findings of the polymorphic fibroosseous bone lesion, also called liposclerosing myxofibrous tumour (LSMFT). This is a rare benign lesion that is usually asymptomatic. It appears in about 90% of the cases in the intertrochanteric region and histologically consists of fat, fibrous, myxoid, ossified and ischaemic tissues [10]. LSMFT appears on plain radiographs and CT as a well-defined lesion with amorphous matrix consisting of fatty islands surrounded by sclerotic bone, without bone remodelling. T1-w MR images show the high signal intensity fatty areas surrounded by the low signal intensity of bone sclerosis. LSMFTs have a low malignant potential [10].

In conclusion, imaging plays an important role in diagnosing the IF, particularly MRI which shows the typical subcortical sclerosis with surrounding BME. Additional findings, such as chondrocalcinosis and soft tissue calcifications, should not be misleading, provided that the natural history of these disorders is known and the imaging findings thoroughly evaluated. **R**

Conflict of interest

The authors declared no conflicts of interest.

KEY WORDS
Insufficiency fracture/femoral head; Crystal deposition disease; Fibroosseous lesion; MR imaging/diagnosis; Computed Tomography

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