

## Answer to this month's Radiological Conference

### Answer:

- a) Chondrocalcinosis

### Radiological findings

The anteroposterior (AP) (**Figure 3**) and lateral (**Figure 4**) radiographs of the left knee show linear calcifications affecting the articular cartilage in the medial and lateral compartments. Similar findings were present on radiograph of the right knee (not shown).

**Figure 3:** Same radiograph as Figure 1 with the addition of arrows. Chondrocalcinosis (arrows) are present in the medial and lateral compartments of the knee



**Figure 4:** Same radiograph as Figure 2 with the addition of arrows. Prominent cartilage calcification is present (arrow)



### Discussion

#### Chondrocalcinosis

Chondrocalcinosis refers to calcification of the hyaline cartilage. The causes of chondrocalcinosis are listed in the **Table 1**. The most common cause of chondrocalcinosis is advancing age. Radiographic incidence in cadavers vary from 2.2% to 30% while the incidence in calcium pyrophosphate deposition disease is about 8%. These patients are usually asymptomatic and chondrocalcinosis is an incidental finding. Chondrocalcinosis is associated with many diseases, including diabetes and gout. However, if a patient with gout demonstrates chondrocalcinosis on radiographs, the chondrocalcinosis is not secondary to deposition of urate crystals but to deposition of calcium pyrophosphate crystals. Radiological screening for calcium pyrophosphate deposition disease should include AP views of both knees, AP view of the pelvis, including the hips and symphysis pubis, and a posteroanterior (PA) view of both hands. Cartilage calcification at the medial and lateral compartments of the knee, the triangular fibrocartilage of the wrist and symphysis pubis are virtually diagnostic of calcium pyrophosphate deposition disease. Isolated patellofemoral degenerative changes also suggest the diagnosis.

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**Table 1: Causes of chondrocalcinosis**

|   |
|---|
| <b>Metabolic “cation” disease</b>                   |
| Hyperparathyroidism (Ca <sup>++</sup> )             |
| Haemochromatosis (Fe <sup>++</sup> )                |
| Wilson’s disease (Cu <sup>++</sup> )                |
| <b>Crystal deposition disease</b>                   |
| Gout (sodium monourate)                             |
| Calcium pyrophosphate deposition (CPPD, pseudogout) |
| <b>Cartilage degeneration</b>                       |
| Onchrosis   |
| Acromegaly  |
| Hypophosphatasia                                    |
| Osteoarthritis                                      |
| Old age   |

Gout (sodium monourate) is usually diagnosed and treated long before radiological changes develop. These changes take 6-8 years to develop. The presence of sclerotic overhanging erosions is very suggestive of the diagnosis. In hyperparathyroidism, the presence of features such as subchondral resorption and Brown tumours points towards the diagnosis. The combination of bilateral symmetrical sacroiliitis with widened symphysis pubis on the pelvic radiograph is also a useful finding. In Wilson’s disease, growth arrest lines, premature osteoarthritis, splenomegaly due to liver failure with portal hypertension, and basal ganglia calcification are suggestive radiological findings. The clinical findings of Kyaser-Flesher rings, signs of liver failure, and high copper concentration in serum ceruloplasmin are diagnostic.

Haemochromatosis is usually found in Caucasians and are rare in Asians. The bony radiographic changes are predominantly premature symmetrical osteoarthritis occurring in a young patient. However, the hook-like osteophytes found at the metacarpal heads are characteristic findings. The diagnosis is easily established by the presence of elevated serum ferritin levels. Other clinical findings include possible heart failure, diabetes mellitus, enlarged liver and bronze-coloured skin. In onchrosis, there is calcification of the intervertebral disc with significant lumbar spondylosis. The patient’s urine turns black on standing and this is diagnostic of

onchrosis. In acromegaly, radiographs may show increased soft tissue, prominent phalangeal hooks and joint widening which would suggest the diagnosis. Elevated growth hormone levels are also diagnostic. In hypophosphatasia, these patients have rickets/osteomalacia. In addition, characteristic notching of the metaphysis indicates the correct diagnosis. Clinical findings of low serum alkaline phosphatase and increased levels of hydroxyproline excretion further support the diagnosis.

### Bone infarct

Bone infarcts can be divided into medullary and cortical infarcts. A medullary infarct is caused by occlusion of a nutrient artery (which is the sole supply for the diaphysis) while a cortical infarct requires occlusion of both nutrient artery and periosteal vessels. In the acute phase, a medullary infarct shows no radiographic change. In the chronic phase, there is a linear or serpiginous calcification demarcating the lesion. Increased dense bone indicates revascularisation.

In cortical infarcts, there is osteonecrosis or osteochondrosis dissecans. In osteonecrosis, destruction of the articular surface occurs. Osteochondritis dissecans is an osteochondral lesion with a bony fragment inside the joint and a corresponding defect in the articular surface. None of the radiological features of infarct are seen in this patient.

### TB arthritis

Tuberculosis (TB) arthritis usually occurs secondary to adjacent bony osteomyelitis. The patient is often a middle-aged or elderly person presenting with chronic pain, weakness, soft tissue swelling and sometimes, a draining sinus. In the acute phase, there is loss of knee joint space with irregular bone destruction at the margins of the joint. Joint swelling and relative preservation of the weight-bearing portions of the articular surfaces are typical of this condition. Although some inflammatory arthropathies exhibit periarticular osteoporosis, this process usually shows relatively-normal density in the remainder of the bone ends. Calcification is extensive and is seen in the healing phase. The absence of joint destruction is against the diagnosis of TB arthritis in this patient.

## Synovioma

Synovioma or synovial sarcoma is a slow-growing expansile malignant tumour originating in the synovial lining, bursa or tendon sheath. It presents as a slowly-enlarging, painless juxtaarticular mass in the knee or feet, and it may be confused with a ganglion. The tumour is often located close to a joint. In the upper extremity, it is found more commonly on the palmar surface. Evidence of regional lymph node involvement strongly supports the diagnosis. Although synovial cell sarcomas are rare, those that do occur are frequently seen in the foot (12-18%). However, the calcification that is present in 30% of cases is usually amorphous. The presence of periosteal reaction, bone remodeling and invasion of the cortex allows differentiation from chondrocalcinosis.

## Synovial osteochondromatosis

This condition is due to benign reactive metaplasia of synovium which results in formation of multiple intra-articular nodules. This typically occurs in male patients in their 3rd to 4th decades of life, who present with a

swollen joint and reduced motion. The most commonly-affected joint is the knee (>50%), followed by the elbow, hip, shoulder, ankle and wrist. The temporomandibular joint, acromioclavicular joint, interphalangeal joint or vertebral joint may also be affected. Rarely are extra-articular sites such as the tendon sheaths involved. On radiographs, multiple nodules of fairly uniform size within the joint space are seen. The nodules are faintly calcified and later ossify. If calcification is present, the radiographic features are diagnostic. Erosions with sclerotic margins may be seen. ■

## Further reading

1. Brower A. *Arthritis in Black and White*. 2nd ed. Philadelphia: WB Saunders 1996;343-366.
2. Chapman S, Nakielny R. *Aids to Radiological Differential Diagnosis*. 3rd ed. London: WB Saunders 1995;540-605.
3. Dähnert W. *Radiology Review Manual*. 3rd ed. Baltimore: Williams & Wilkins 1996;1-126.
4. Greenspan A. *Differential Diagnosis of Tumors and Tumor-like Conditions of Bone and Joints*. Philadelphia: Lippincott-Raven 1998;409-414.
5. Helms C. *Skeletal Radiology*. 2nd ed. Philadelphia: WB Saunders 1996; 115-146.
6. Resnick D. *Diagnosis of Bone and Joint Disorders*. 3rd ed. Philadelphia: WB Saunders 1995;1556-1615.