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Clinics in diagnostic imaging (95)

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Fig. 1 Lateral radiograph of the left ankle and hindfoot.

CASE PRESENTATION

A 19-year-old boy presented to the Accident and Emergency Department with a complaint of pain in his left ankle and foot. He had sustained trauma while playing soccer. There was generalised but mild tenderness over the left ankle on physical examination. Range of ankle and foot movements were full. He was treated by the attending medical officer after radiographs were obtained. What does the radiograph of the left ankle (Fig. 1) show? What is the diagnosis?

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Fig. 2 Frontal radiograph of the right big toe in a 50-year-old man shows a bipartite medial sesamoid (arrows).This may mimic a fracture.

Fig. 3 Frontal radiographs of the (a) left and (b) right feet in a 9-year-old girl shows bilateral unfused apophyses (arrows) of the 5th metatarsal bases, mimicking fractures.

Fig. 4 Frontal radiograph of the left foot in a 35-year-old woman shows a slightly displaced transverse fracture (arrows) across the 5th metatarsal base.

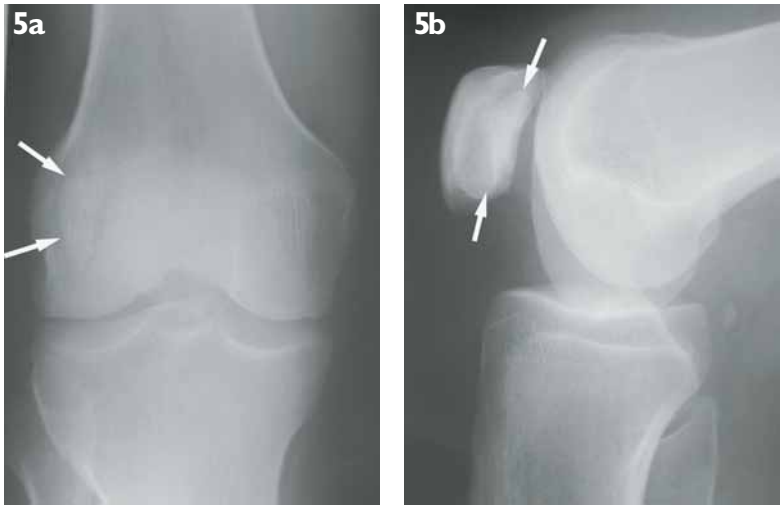

Fig. 5 (a) Frontal and (b) lateral radiographs of the right knee in a 38-year-old man shows a rounded well-corticated component (arrows) of a bipartite patella.

IMAGE INTERPRETATION

The lateral radiograph of the left ankle shows a plaster cast encasing the left ankle and foot. There is a triangular fragment of bone posterior to the left talus. It is well- corticated and regular in appearance. There is no evidence of a fracture or bony defect.

DIAGNOSIS

Os trigonum.

CLINICAL COURSE

The patient had been misdiagnosed by the attending medical officer to have a fracture and was treated with application of a plaster cast. After the radiographical report was obtained, the patient was recalled and the plaster cast removed. His diagnosis was revised to an ankle sprain from which he subsequently made a complete recovery. He did not require further follow-up.

DISCUSSION

Despite advances in magnetic resonance (MR) imaging and computed tomography (CT) in musculoskeletal imaging, radiography still remains the most appropriate initial imaging modality in many suspected bony abnormalities[1,2]. The decision to engage in further imaging, biopsy or even surgery, often rests on the radiologist's or clinician's prior interpretation of the radiographical findings. It therefore stands to reason that a sound knowledge of the principles in the analysis of bony lesions and the various radiological pitfalls that may cause confusion is of critical importance. This is particularly so in a group of skeletal processes that are so radiologically distinctive, that further

Fig. 6 (a) Frontal and (b) lateral radiographs of the right elbow in a 5-year-old boy shows a multicentric ossification centre of the capitellum. This may be mistaken for fracture fragments.

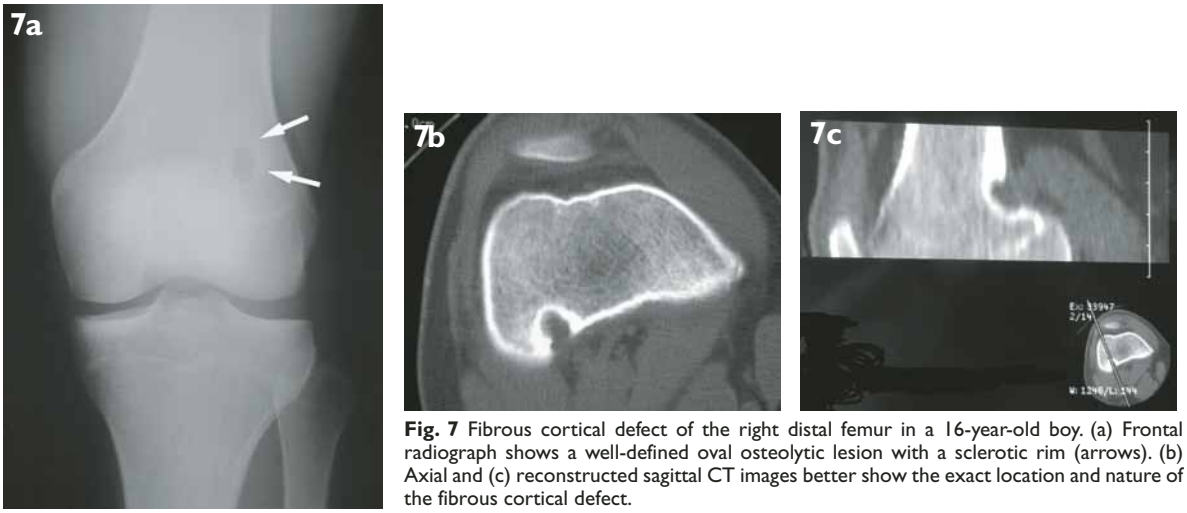

Fig. 7 Fibrous cortical defect of the right distal femur in a 16-year-old boy. (a) Frontal radiograph shows a well-defined oval osteolytic lesion with a sclerotic rim (arrows). (b) Axial and (c) reconstructed sagittal CT images better show the exact location and nature of the fibrous cortical defect.

imaging or biopsy is not only unnecessary but may lead to unnecessary surgery.

Clyde Helms coined the term "Don't touch lesions" to describe this group of bony entities[3]. For our purposes, these may be classified into three broad categories, namely: (1) normal variants, (2) lesions that are real but obviously benign, and (3) lesions that are related to degenerative disease.

Normal variants

There are several anatomical normal variants that may sometimes cause confusion. Unfused apophyses in the elbow and in the foot are commonly encountered in the paediatric population and may be problematic, especially in the emergency setting when the patients have a history of trauma. However, their characteristic location, well-corticated margins and occurrence in the appropriate age group should allow them to be distinguished from fractures. On the rare occasion, radiographs of the contralateral side showing symmetry of the variant allows confirmation.

In the foot, there are numerous sesamoid bones and accessory ossicles, which are usually of no clinical importance, but their recognition is important in the differential diagnosis of fracture[4]. The os trigonum is an accessory ossicle found posterior to the talus which may be confused with a fracture of the posterior process of the talus (Shepard's fracture) (Fig. 1). The sesamoid bones are found around the metatarsophalangeal and interphalangeal joints, and may occasionally be bipartite (Fig. 2).

The apophysis of the base of the fifth metatarsal is usually seen in children and young teenagers, and may be confused with an avulsion fracture at the insertion of the peroneus brevis, proximal to the metatarsal tuberosity[4, 5]. The normal apophyseal line runs parallel to the shaft of the metatarsal along its inferolateral margin and does not extend proximally into the joint (Fig. 3). In contrast, an avulsion fracture of the base of the fifth metatarsal is seen as a transversly-orientated lucent line with respect to the metatarsal shaft (Fig. 4). The patient may have focal swelling or tenderness at that site.

Fig. 8 Bone infarct of the right distal femur in a 74-year-old man. (a) Frontal and (b) lateral radiographs show a dense sclerotic lesion in the femoral shaft, typical of a medullary infarct.

Fig. 10 Lateral radiograph of the lumbar spine in a 77-year-old man shows a focal area of sclerosis adjacent to the inferior end-plate of L3 (arrow) associated with narrowing of the intervertebral disc space and marginal osteophytes. There is no bony erosion and the findings are consistent with degenerative lumbar spondylosis.

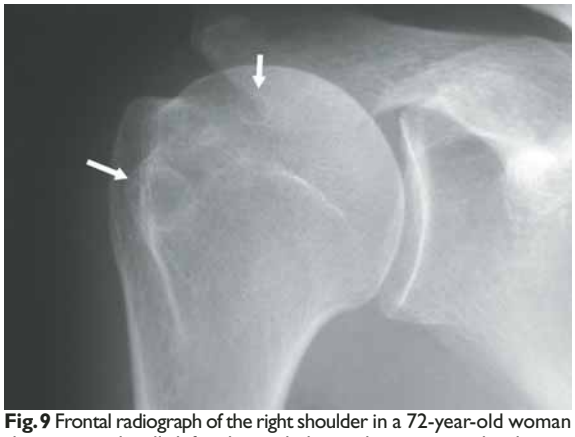

Fig. 9 Frontal radiograph of the right shoulder in a 72-year-old woman shows several well-defined rounded osteolytic areas with sclerotic borders (arrows) in the greater tuberosity and subchondral region of the right humeral head compatible with subchondral cysts. There is associated mild narrowing of the glenohumeral joint space and osteoarthritic changes in the acromioclavicular joint.

The bipartite patella is a congenital synchondrosis of the patella and is seen in about 1% of the population. They are usually asymptomatic but are occasionally painful. Classically, the majority of bipartite patellae occur in the superolateral corner and are bilateral. They are corticated and have well-rounded contours (Fig. 5), features that help discriminate them from fractures. Occasionally, the synchondrosis may occur in the inferior pole or the patella may have more than two segments[4].

The paediatric elbow is a difficult area in the detection of fractures. This is due in part to the multiple ossification centres, which appear and fuse at different ages. There are a total of six ossification centres, namely: capitellum, radial head, internal (medial) epicondyle, trochlea, olecranon and the external (lateral) epicondyle, hence the mnemonic "CRITOE". The specific order in which the ossification centres appear is of clinical importance in discriminating between an avulsion fragment or ossification centre[4,5]. For example, if the ossification centre of the lateral epicondyle is seen but that of the medial epicondyle is not, it should raise the suspicion of an avulsion fracture of the medial epicondyle. Clinical features such as localised tenderness of swelling may be helpful. The individual ossification centres may uncommonly be multicentric themselves, giving the epiphysis a fragmented appearance[6] (Fig. 6). In such situations, symmetry, regular outlines and cortication of the fragments should allow differentiation from fractures.

Other anatomical variants that may cause confusion in interpretation are those that simulate aggressive lesions. The humeral pseudocyst is one such example that may be confused with a more sinister type of osteolytic lesion[4,7]. The increased lucency in the region of the greater tuberosity is caused by an increased amount of cancellous bone. It may be more obvious in young patients, compared to older adults where loss of the trabecular bone in this region makes the lucency less apparent[7]. Its characteristic location and lack of other aggressive features should allow it to be differentiated from other pathology that can occur in the greater tuberosity such as chondroblastoma, infection or metastasis.

Obviously benign lesions

The fibrous cortical defect and its larger counterpart, the non-ossifying fibroma, are commonly encountered lesions in children above the age of two years and young adults under the age of 30 years. The metaphysis

of the femur or tibia are the most commonly affected sites, and these may be multifocal. Radiographically, they present as radiolucent areas in the cortex with normal or adjacent sclerotic, scalloped bone (Fig. 7). On occasion, they may be associated with mild cortical expansion or pathological fracture[3,8]. The natural history is one of regression as the skeleton matures[8,9]. These features are characteristic of a non-ossifying fibroma and other differentials such as osteoid osteoma, periosteal chondroma and chondromyxoid fibroma can generally be excluded, without having to resort to biopsy.

Another entity that can cause some diagnostic confusion is the bone infarct (Fig. 8). It may present as an area of mixed osteolysis and sclerosis, and can mimic a low-grade chondrosarcoma or enchondroma. However, bone infarct should be considered if the lesion is located in the intramedullary region, is bilateral, and occurs in a patient with underlying predisposition such as sickle cell anaemia, systemic lupus erythematosus or is on long- term steroids[3]. If the radiographs are equivocal, MR imaging may be helpful by showing the characteristic serpiginous high signal border of hyperaemic tissue surrounded by a low signal border of sclerotic tissue on T2-weighted images, producing the "double- line " sign[10]. Bone scintigraphy shows an area of photopenia in the early stages when there is cessation of blood supply. Weeks or months later, the bone heals with revascularisation and hyperaemia, and increased radioisotope uptake may be seen[11]. In such circumstances, biopsy is rarely required to achieve a definitive diagnosis.

Lesions related to degenerative disease

Geodes and large subchondral cysts are common findings in osteoarthritis (Fig. 9). When they are large, they can sometimes be confused with other lesions. However, the presence of joint space narrowing, osteophytes, sclerosis and their subarticular location should allow the correct diagnosis to be made on radiography alone and biopsy is often unnecessary[3]. Degenerative disc disease can, on occasion, mimic metastatic disease, especially in the clinical setting of an elderly patient with backache. The radiographs typically show an area of sclerosis adjacent to an end-plate (Fig. 10) which may be misinterpreted as a bony secondary. Nevertheless, recognition of the other hallmarks of degeneration such as narrowing or vacuum phenomenon of the corresponding intervertebral disc space and marginal osteophytes should lead the observer to the correct diagnosis. Sclerotic metastasis to the spine may manifest as an "ivory vertebrae" where the entire vertebral body is radiodense, or as ill-defined areas of sclerosis with cortical, pedicular or spinous process destruction, features that are absent in degenerative disc disease[3].

In conclusion, John Caffey once said that the diagnostician must be familiar with normal variants and not give patients diseases that they do not have. In addition to normal variants, we have tried to show a few examples of "do not touch" lesions which by virtue of their characteristic appearances, can usually be confidently diagnosed on radiographs usually without the need for further imaging or diagnostic tests.

ABSTRACT

A 19-year-old boy presented to the Accident and Emergency Department after sustaining trauma to his left ankle and foot while playing soccer. The radiograph of his left ankle showed a well-corticated triangular fragment of bone posterior to the left talus, typical of an os trigonum. This accessory bone was initially mistaken for a fracture fragment and a plaster cast was applied. The term, do not touch lesion, has been coined to describe this group of benign bony entities which may be classified into three broad categories, namely: normal variants, lesions that are real but obviously benign, and lesions that are related to degenerative disease. The importance of recognising the characteristic radiographical appearances of these entities is emphasised, as the need for further imaging or diagnostic tests can usually be avoided.

Keywords: Benign bone lesion, do not touch lesion, normal variant, pseudolesion, radiography

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