Skeletal Radiology
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TEST YOURSELF: ANSWER

Swollen and painful distal phalanx

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Discussion

In order to get a definitive diagnosis as to the aetiology of the mass in the patient's finger, an operation to remove it was performed. During the operation, the surgeon recalled pus spewing forth from the bone once the periosteum was pierced, confirming the diagnosis of acute osteomyelitis. The surgeon drained and curetted the cavity, sending a sample to the lab for analysis which came back positive for *Pseudomonas aeruginosa*.

Osteomyelitis is mostly caused by a hematogenous spread of bacteria, patients having a history of trauma in one-third of acute cases, with the two other modes being direct contact or spread from surrounding soft tissue [1, 2]. If the infection is via hematogenous spread, the affected region is generally the metaphysis, or metaphyseal equivalents at the junction of cartilage and flat bones, in children [1, 2]. Furthermore, most infections occur in the lower half of the body, generally in the tibia or femur [1]. As the infection progresses, it can block vascular nourishment from the periosteum, resulting in necrosis and the formation of an intraosseous abscess [1]. If dead bone is trapped within the cavity of infected bone, it is referred to as a sequestrum [1].

The American College of Radiologists (ACR) recommend standard radiography as the first line of imaging, which can show findings of soft tissue swelling, periosteal reaction, or vague bone lucency or be found to be normal (80% of cases) [1–3]. The ACR then recommends MRI, whose findings for osteomyelitis include bone marrow that shows hyperintensity on fluid-sensitive sequences, and hypointensity on T1-weighted sequences [1–3]. In osteomyelitis, the T1 signal is hypointense when compared to the adjacent muscles tissue [3]. If the initial MRI findings are suggestive of osteomyelitis, intravenous contrast should be administered as it can reveal central marrow non-enhancement or hypoperfusion without abscess formation [1]. Furthermore, contrast enhancement can help in the visualisation of abscesses but demonstrating their enhancing rim and non-enhancing centre [2]. The use of contrast may also help to identify sinus tracts. Sinus tracts, defined as a tract from the skin or mucous surface to a deep soft tissue or joint abscess, will be T1 hypointense and hyperintense on fluid-sensitive sequences, and have peripheral enhancement after contrast administration [3]. Cloacas, found in musculoskeletal infections and defined as a rupture of the cortex allowing pus to decompress and escape, will be hypointense on T1-weighted images and hyperintense on fluid-sensitive images [3]. One may also find involucrum, defined as a capsule of new, viable, bone around a sequestrum, which may be seen as a high T1 signal-intensity granulation tissue surrounding an involucrum [3]. In cases of osteomyelitis, one may find a cloaca serving as the drainage point of a sequestrum by means of a sinus tract [3].

There are, however, several pitfalls including that patients with vascular insufficiency will not have the characteristic T1 hypointensity of bone replacement and may have limited post-contrast enhancement [3]. Another pitfall is encountered in diabetic patients with foot ulcers, where one may find a high T2 signal intensity without the decreased T1 signal intensity [4].

Ultrasonography can also be used, though it is not as sensitive or specific due to its inability to penetrate bone, with findings of soft tissue swelling, subperiosteal, and/or soft tissue abscess as well as deep vein thrombosis being possible findings [1]. CT imaging is not an initial modality for the study of osteomyelitis but can be useful in identifying a sequestrum and demonstrating subtle cortical erosions [2, 5]. Other, less common, imaging modalities for investigating osteomyelitis are PET-CT and ^{99m}Tc-methylene diphosphonate scintigraphy [2].

The differential diagnosis of infectious osteomyelitis includes chronic recurrent multifocal osteomyelitis, sarcomas, myelomas, and lymphomas amongst others, making clinical correlation essential in finding a definitive diagnosis [1, 2, 5]. One should also consider neuropathic arthropathy, if the clinical setting is appropriate [2, 5].

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