Musculoskeletal images. Chronic osteomyelitis

A 32-year-old man was involved in a severe motor vehicle collision in India, 6 years before the current presentation. He suffered multiple fractures, including a closed fracture of his proximal femur that was treated with open reduction and internal fixation. Shortly after that operation, his femur became infected and was treated with irrigation and débridement. Nine months after the index procedure, his femoral fracture had healed and hardware was removed. He was left with a leg-length discrepancy, leg pain and a persistently draining sinus. He had no other significant medical history and did not report fever, chills or night sweats.

Physical examination revealed a short-leg gait on the right side with a 3-cm leg-length discrepancy and a healed lateral incision with a 1-cm draining sinus located anterolaterally. Quadriceps strength was 4+/5.

Anteroposterior (Fig. 1) and lateral (Fig. 2) radiographs of the femur showed bony bridging across the previous fracture site, with sequestrum formation. Technetium-99m bone scanning showed slightly increased uptake at the mid-femur on immediate, blood pool, and delayed images. Gallium scanning showed moderate increase in uptake at the same site. Magnetic resonance imaging confirmed bony destruction anterolaterally with a sequestrum and sinus tract visible on gadolinium-enhanced T_2-weighted images (Fig. 3).

A diagnosis of chronic osteomyelitis was made from the patient's

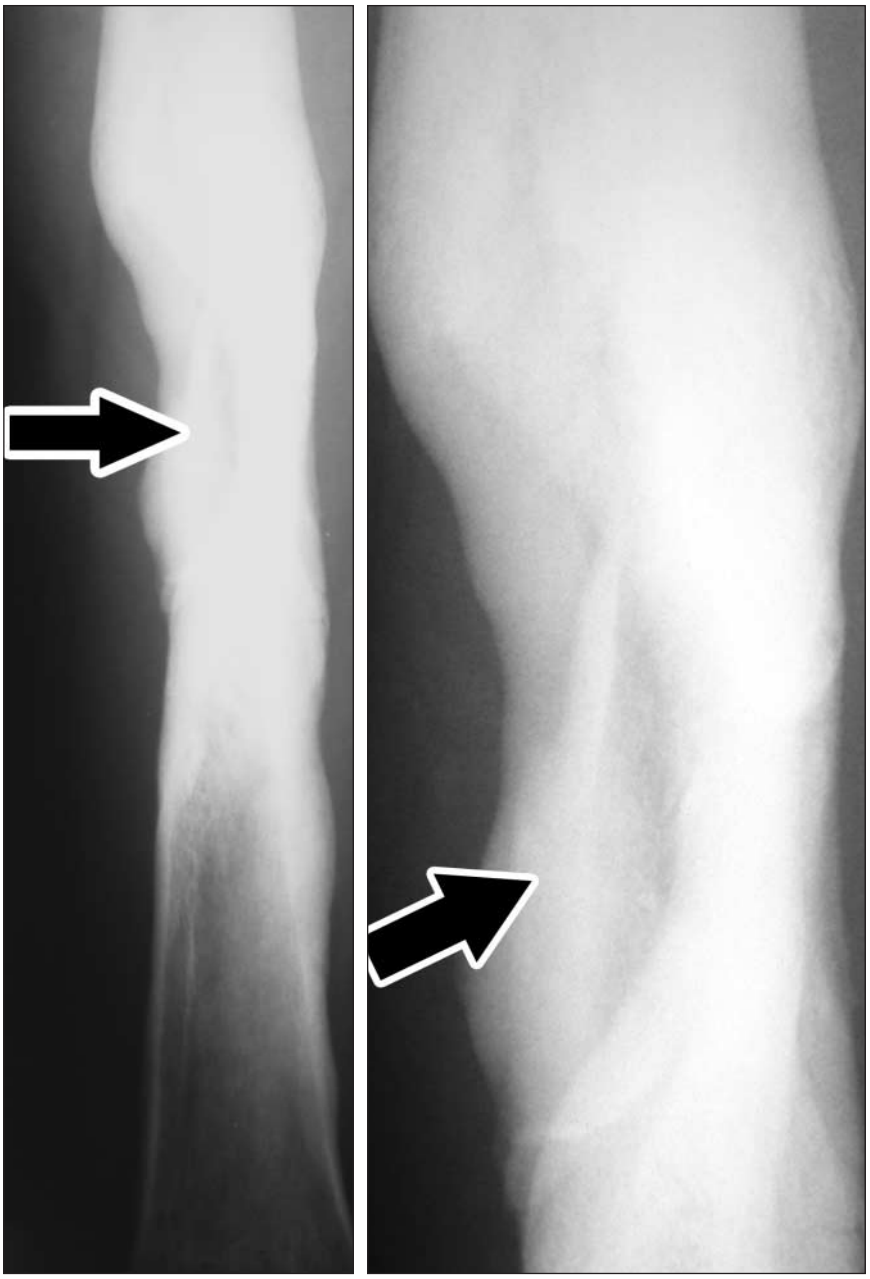

FIG. 1. Anteroposterior (left) and anteroposterior close-up (right) views of the right distal femur. Black arrows show the sequestrum.

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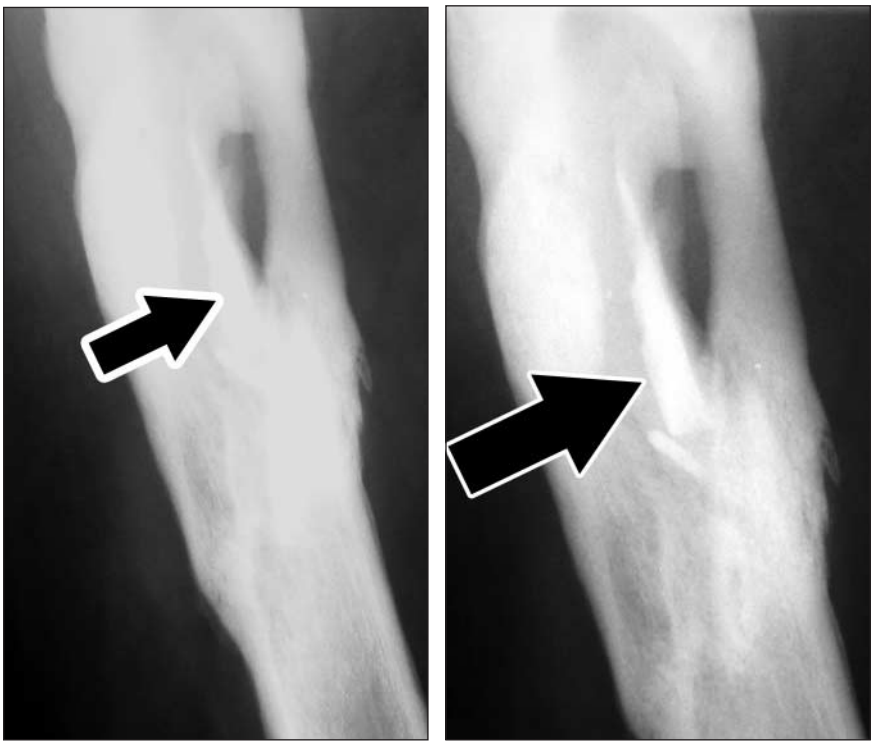

FIG. 2. Lateral (left) and lateral close-up (right) views of the right distal femur. Black arrows show the sequestrum.

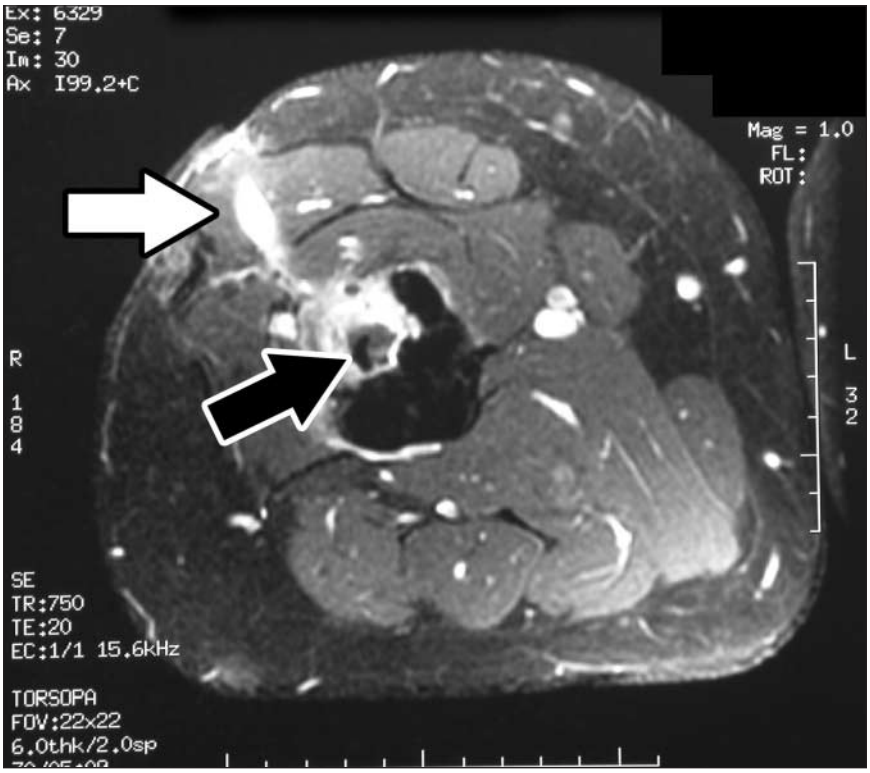

FIG. 3. T_2-weighted, gadolinium-enhanced axial magnetic resonance image of the right femur. The black arrow shows the sequestrum and the white arrow shows the sinus tract leading to a periosteal abscess, which is highlighted by gadolinium enhancement.

medical history, physical examination and imaging studies. He was treated with irrigation and radical débridement, followed by insertion of antibiotic-impregnated beads to eradicate the infection. Culture of tissue taken intraoperatively grew methicillin-resistant *Staphylococcus aureus.* For 6 weeks postoperatively he was treated intravenously with vancomycin through a peripherally inserted central catheter. Eighteen months postoperatively, he was pain-free and had a clean, dry, healed wound.

Chronic osteomyelitis is a suppurative infection of bone that follows a long-term course of intermittent symptoms. Although acute osteomyelitis occurs in the first 6 weeks after the initial infection, chronic osteomyelitis can flare years later, often following a waxing and waning course of purulent drainage, fistulas and long-term radiographic changes. The primary cause of persistent infection is the presence of dead bone to which systemic antibiotics cannot be effectively delivered. A fragment of dead bone in the centre of the infection is termed a sequestrum. New bone is formed (the involucrum) in an attempt to wall-off the infection, which may be contained in a chronic medullary abscess (Brodie's abscess) or drain via a sinus tract to the skin.

Although patients may report an insidious onset with multiple exacerbations, they may be completely asymptomatic between episodes of pain, draining sinus formation or fever. Physical examination may reveal a draining sinus, bony tenderness and, in cases of juxta-articular infection, a reactive joint effusion. Especially in children with metaphyseal infection, a septic arthritis can occur and should be considered in the differential diagnosis of joint pain and effusion in the setting of osteomyelitis.

Plain radiographs often show the involucrum as intense sclerosis and cortical thickening often described as "onion-skinning." The sequestrum may be visible on plain radiographs

and represents the nidus of infection. If not present on plain films, adjunctive modalities include computed tomography, which may show the sequestrum and surrounding tissue edema. Technetium-99m scans often show increased uptake on acute and delayed images, but inflammation is included in the differential diagnosis for this finding alone. The addition of abnormal findings on the gallium scan increases the sensitivity for a diagnosis of chronic osteomyelitis. Magnetic resonance images show a darker T_1 and a brighter T_2 signal in the area of osteomyelitis owing to replacement of normal marrow by exudate and edema. With the small subset of patients in whom the diagnosis is still unclear, tissue biopsy and culture remain the standard diagnostic method.

The mainstay of treatment is radical surgical débridement of all devitalized or infected tissue. Antibiotics are an important adjuvant treatment and should be started at the time of surgery. Antibiotic therapy should be based on results of intraoperative tissue cultures, but if the organism has not been recognized, empiric intravenous antibiotics are started to treat the most common organisms, *S. aureus*, *Pseudomonas*, and anaerobic bacteria. The duration of antibiotic therapy is controversial, but most patients are treated for at least 6 weeks, which can include 2 weeks of parenteral and 4 weeks of oral therapy or, for virulent organisms or immunocompromised hosts, 6 weeks of intravenous antibiotic therapy. Dead space is managed by insertion of antibiotic-impregnated beads. Other adjuvant treatments to promote healing include proper nutrition, smoking cessation, control of medical conditions such as diabetes and, in extreme situations, hyperbaric oxygen.

Squamous cell carcinoma can develop in long-standing sinus tracts, and can be identified by biopsy. In situations where infection is uncontrollable despite aggressive surgical débridement followed by appropriate antibiotic therapy, amputation remains the best alternative to restore a pain-free, stable, functional limb.■