Metacarpal Coccidioidal Osteomyelitis

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Coccidioidomycosis is endemic to the southwestern United States, Mexico, Central America, and South America. In endemic areas, the risk of exposure to *Coccidioides immitis* is estimated to be approximately 3% per year.[1] The annual number of infections has risen to approximately 150,000 as a result of population increases in Arizona and central California.[2] Coccidioidomycosis is primarily a lung infection with secondary dissemination to bone.[3] Osseous involvement may occur in 10% to 30% of patients.[4] Common osseous sites involve the spine, patellae, metacarpals, metatarsals, carpal bones, and the diaphysis of long bones.[5] However, bone infections of the hand usually occur in children.[4,6,7] Here, we report the case of a man with coccidioidal osteomyelitis of the fifth metacarpal. Our patient reviewed the manuscript for this case report and provided informed, written consent for us to publish it in print and electronically.

Case Report

A right-hand–dominant incarcerated African American man in his early 50s stated that he had fallen on his left hand 4 weeks before presenting to the emergency department. To our knowledge, there was no evidence of an open wound at time of injury. He was diagnosed with a left fifth metacarpal neck fracture, casted, and discharged back to jail (Figure 1). Two weeks after casting for the metacarpal fracture, he developed an abscess over the right anterior shoulder; the abscess was drained and treated with intravenous (IV) antibacterial agents in the jail infirmary (abscess cultures and type of antibiotic were unknown, as records were not available). Three weeks after casting, he noticed drainage within the cast but did not seek medical attention and waited an additional week before being seen and having the cast removed in the orthopedic clinic at the jail. He denied fever, chills, coughs, and use of IV drugs. Past medical history was significant for chronic hepatitis B and C infections.

On physical examination, a 3×2-cm granulomatous ulceration with frank purulence was noted over the dorsal left fifth metacarpal head. There were no exposed tendons or bone. The small finger, held in a flexed position at the metacarpophalangeal joint, lacked full active and passive extension, though the patient could make a fist. The right anterior shoulder, where the abscess was drained, showed evidence of a granulating wound but no evidence of continued infection.

White blood cell count was normal, but erythrocyte sedimentation rate was elevated (110 mm/h), and C-reactive protein was 16 times normal. A hepatitis panel was positive for hepatitis B and C. However, liver transaminase levels and function tests were normal, except for an elevated international normalized ratio (1.34) and slightly decreased albumin. The patient tested negative for human immunodeficiency virus. A chest radiograph was unremarkable.

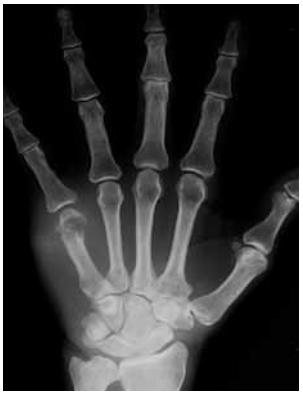

Figure 1. Initial radiograph in emergency department, showing evidence of osteomyelitis at fifth metacarpal.

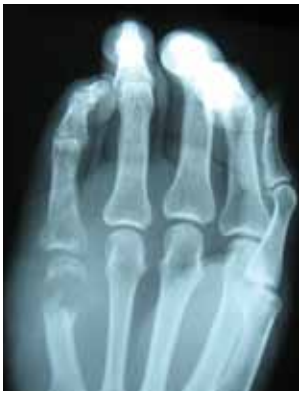

Figure 2. Radiograph 4 weeks later, after cast removal, showing increased erosion at fifth metacarpal neck and head.

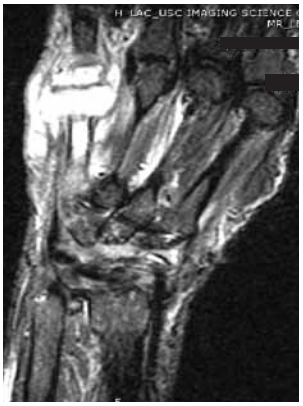

Figure 3. T_2-weighted magnetic resonance image, showing increased signal in fifth metacarpal head and shaft with surrounding edema.

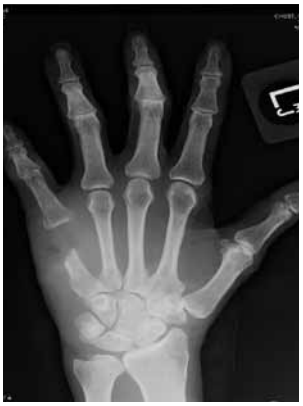

Figure 4. Postoperative radiograph, showing resection of metacarpal head and shaft.

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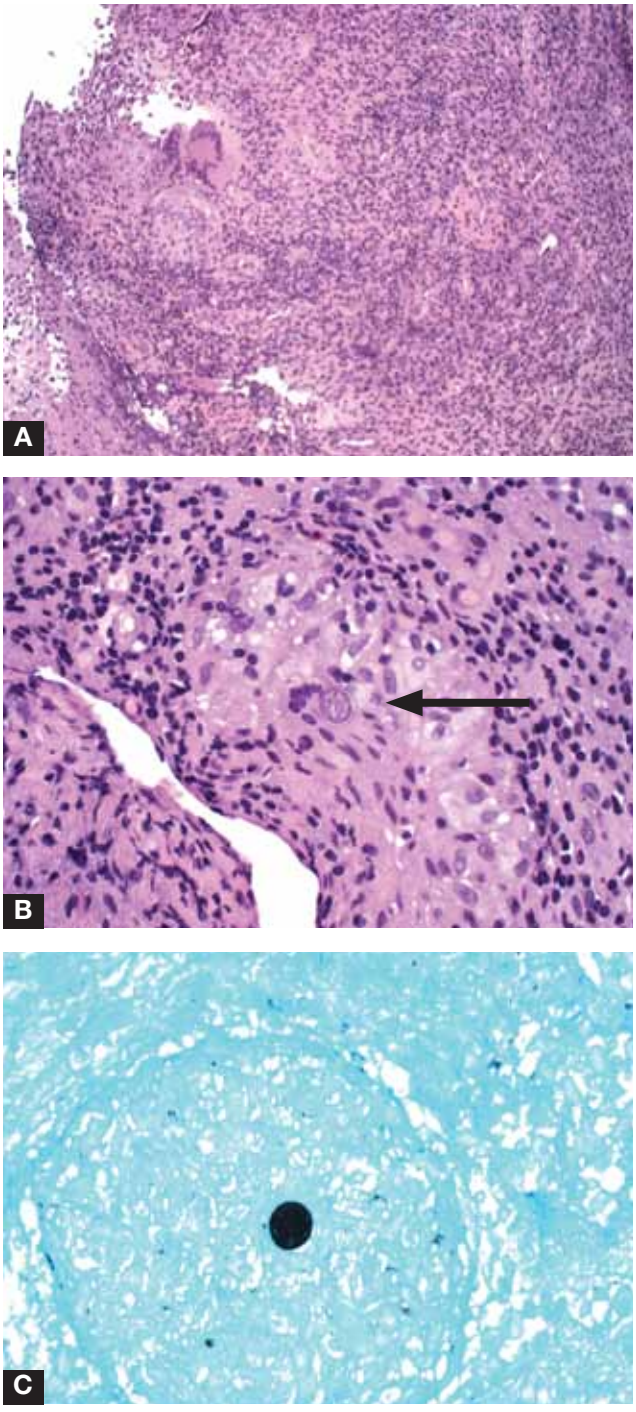

Figure 5. **(A)** Low-power photomicrograph, showing lymphocytic infiltrate with noncaseating granulomas. **(B)** High-power photomicrograph, showing granuloma surrounding coccidioides spherule, which contains endospores (black arrow). **(C)** Photomicrograph, showing coccidioides spherule (Gomori methamine silver).

Radiographs at time of initial injury showed evidence of bone changes consistent with possible osteomyelitis. Current radiographs showed erosion of the fifth metacarpal neck and head; the latter was completely separated from the shaft, again consistent with osteomyelitis (Figure 2). Anaerobic and aerobic cultures were taken. The patient was started empirically on IV vancomycin and oral levofloxacin.

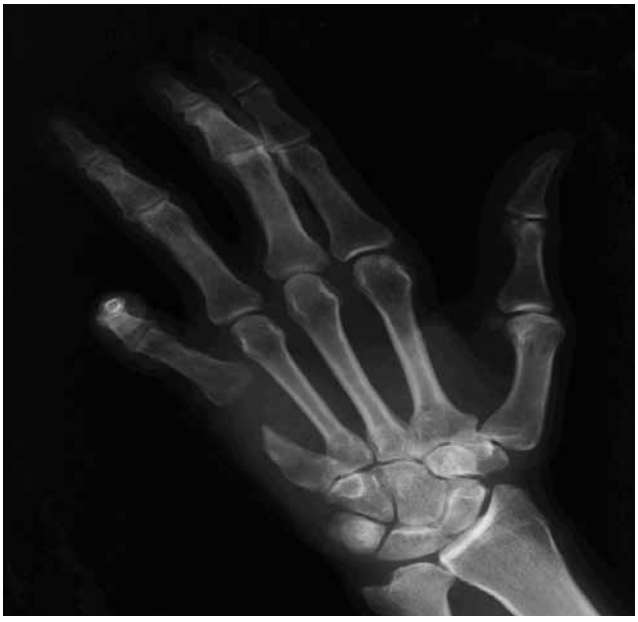

Figure 6. Radiograph 4 months after surgery, showing no evidence of further infection.

Coagulase-negative *Staphylococcus* grew from the initial cultures. Magnetic resonance imaging (MRI) scans of the left hand were consistent with osteomyelitis of the fifth metacarpal head and shaft (Figure 3). The patient developed a drug reaction to vancomycin; the medication was discontinued, along with the levofloxacin, and oral linezolid was initiated.

During surgery, the granulomatous lesion was removed, purulence (5 cm^3) was encountered, the metacarpal head was removed, and the metacarpal shaft was resected just above the base. The metacarpal base was preserved, as the bone was of normal quality with no overt osteomyelitis at this level, and it was hoped that extensor carpi ulnaris function could be preserved (Figure 4). Intraoperative cultures and pathologic specimens were sent for permanent sections. The cultures grew coagulase-negative *Staphylococcus* and *C immitis*. The permanent sections revealed osteomyelitis with surrounding noncaseating granulomatous inflammation (Figures 5A–5C). Given the wound size, wet-to-dry dressing changes were initiated.

After surgery, linezolid was continued, and fluconazole was initiated. The patient remained afebrile, and the wound continued to granulate and heal with wet-to-dry dressings. He was discharged back to the jail infirmary with instructions to continue linezolid for 6 weeks, to continue fluconazole for 3 months, and to receive wound care. Hematologic monitoring of linezolid, which can cause neutropenia, and fluconazole, which can cause hepatotoxicity, was performed at the discretion of the jail infirmary physician. (However, jail infirmary records were not available). Furthermore, a short course of fluconazole treatment was started because of the risk for hepatotoxicity in this patient with chronic hepatitis. Follow-up 4 months after surgery revealed that the wound was completely healed, with no evidence of further infection. The patient could clench his fist but

lacked full extension at the fifth metacarpophalangeal joint. Radiographs were obtained (Figure 6). The patient eventually was lost to follow-up.

Discussion

C immitis usually causes pulmonary infection through airborne spores in endemic areas. Most people with respiratory tract colonization remain asymptomatic, and about two-thirds of the estimated cases of coccidioidomycosis remain subclinical and resolve without therapy.[8] Progressive hematogenous dissemination occurs in approximately 1% of patients, usually in the setting of immunocompromise (AIDS, steroid use, diabetes, immunosuppressive therapies), and the organism may involve the skin, meninges, and bones.[9] Other risk factors for dissemination are pregnancy and race (people of African or Filipino descent).[10]

Coccidioides infection of bone typically causes chronic osteomyelitis with reactive granulomas in the tissues, purulence in the acute lesions, and fibrosis in the chronic stages.[11] Radiographically, the lesions tend to be lytic without much surrounding sclerosis of bone.[3,7]

Diagnosis. The clinician should have a high index of suspicion for patients who present from or have traveled through endemic areas. Occasionally, chest radiographs show infiltrate, hilar adenopathy, or pulmonary cavities or nodules.[12] Elevated *C immitis* complement fixation antibody titers are associated with disseminated disease. Titers equal to or higher than 1:16 are suggestive of dissemination, including dissemination to bone.[13] Isolation of *C immitis,* which grows readily in 3 to 4 days in cultures of infected bone, tissue, and joint fluid, definitively establishes the diagnosis.[11] Special microbiology methods, such as Gomori methamine silver stain and fluorescent antibody techniques, may be used to obtain a diagnosis.[14]

Treatment of coccidioidal osteomyelitis. Best results are achieved with surgical débridement and medical treatment rather than with medical treatment alone.[4,5,11,15] The goal of surgery is to remove all infected bone and tissue from the affected area. Adjuvant treatment with antifungal agents, such as amphotericin B, fluconazole, itraconazole,[5,9,16] and voriconazole,[17] has been used successfully to control or eradicate the infection. However, some studies have shown a recurrence rate as high as 75%, with disseminated coccidioidomycosis to bone. Therefore, lifelong suppression may be indicated.[7,15,18] Other studies have suggested that treatment be continued until systemic signs of infection are resolved and complement fixation titers remain below 1:16—outcomes that usually require 3 to 6 months of therapy.[4,9] In addition, when reactivation does not occur within the first 5 years after treatment, recurrence is unlikely.[4]

Conclusions

The diagnosis of coccidioidal osteomyelitis can be challenging. It is an uncommon bone infection, and a high index of suspicion is required when treating patients from endemic areas, particularly patients at increased risk for acquiring disseminated disease. Our patient's case also highlights the utility of sending, at time of surgery, pathologic specimens for infections with unusual presentations. Treatment regimen varies according to length of medical treatment, but the consensus is that surgical débridement combined with medical treatment produces the best results.

Authors' Disclosure Statement

The authors report no actual or potential conflict of interest in relation to this article.

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This paper will be judged for the Resident Writer's Award.