Rare Case of Fungal Osteomyelitis Affecting an Intramedullary Lag Screw

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ABSTRACT

Osteomyelitis is an infection of the bone that is most commonly of bacterial origin. Cases of fungal osteomyelitis are rare, and treatment often requires a prolonged course of antimicrobials. The authors report a case of a 72-year-old man with fungal osteomyelitis affecting an intracortical lag screw, which was discovered during fixation of the left femoral shaft following an injury that occurred 68 years after placement of the affected lag screw. Chronic osteomyelitis can be indolent and subclinical, with the patient experiencing no signs or symptoms of the disease despite having bone infection for decades. This condition may become clinically apparent when a later injury necessitates operative treatment and potentially adversely affects the recovery from that injury.

Keywords: Intramedullary Fracture Fixation; Invasive Fungal Infections; Osteomyelitis

INTRODUCTION

Osteomyelitis is an acute or chronic infection of the bone that is often of bacterial origin and characterized by inflammation and progressive destruction of bone tissue.[1] While bacteria are the most implicated pathogens in osteomyelitis, fungal pathogens are uncommon causes of osteomyelitis.[2] Osteomyelitis is classified as acute or chronic based on histopathological findings and the temporality of disease.[3] Chronic osteomyelitis is classically characterized by the presence of separated pieces of necrotic bone, also known as necrotic bone sequestra.[4,5] When left untreated, osteomyelitis can progress to infection into other regions of bone and surrounding tissues.[6] Even with appropriate treatment, osteomyelitis can lead to adverse outcomes.[6,7]

Chronic osteomyelitis may remain indolent and subclinical, only becoming apparent when there is an injury that the infection predisposes the patient to. Additionally, in the case of operative repair of a fracture at or near the site of infection, a subclinical infection may become apparent when the recovery process is adversely affected.[8] In the orthopaedic trauma setting, recognizing chronic or indolent osteomyelitis is an important factor for consideration as it can affect the treatment course and recovery of the patient's injury. Even without recent symptoms or signs of issue, history or clinical evidence of remote skeletal injury or infection should alert the surgeon to possible chronic indolent and subclinical infection. Treatment of the new injury may be complicated by the possible pre-existing osteomyelitis.[9] Furthermore, the organism may be quite unusual or hard to treat, such as fungus.

This report describes a case of chronic fungal osteomyelitis, involving a previously placed femoral lag screw, that was diagnosed during surgical fixation of the same femur.

CASE REPORT

History: A 72-year-old man presented to the emergency department with complaint of left lower-extremity pain following a fall while attempting to dismount a motorcycle. The kickstand malfunctioned and, as the motorcycle fell to the left, he braced himself with his left leg and struck the ground at a 45° angle, feeling an immediate onset of severe pain.

Physical Exam: The left thigh was grossly deformed, shortened, and externally rotated with no appreciable abrasions, lacerations, or ecchymosis. A 13-centimeter scar was noted on the lateral proximal thigh.

Radiographic Exam: Initial radiograph of the left femur demonstrated an oblique fracture at the junction of the proximal to mid diaphysis of the left femur with displacement and rotational malalignment. An intracortical screw was noted to be approximately 6 centimeter proximal to the fracture. In addition, there was sclerosis and cyst-like irregularities of the bone adjacent to the fracture and to the intracortical screw with scalloping of the endosteum and stippling of the

proximal diaphysis (Figures 1, 2). A computed tomography (CT) scan was consequently indicated showing irregular, sclerosed bone (Figure 3). Irregularities in bone quality generated a differential diagnosis of neoplastic versus chronic osteomyelitis, prompting biopsy of the bone.

Figure 1. *Initial AP radiograph demonstrates an oblique fracture at the junction of the proximal to mid diaphysis of the left femur with displacement and rotational malalignment.*

Figure 2. *Initial lateral radiograph demonstrates an oblique fracture at the junction of the proximal to mid diaphysis of the left femur with displacement and rotational malalignment.*

Figure 3. *CT image revealing a displaced acute femoral mid diaphyseal fracture with a metallic screw shown to be embedded in the proximal femoral shaft lateral cortex.*

Related History: The patient in this study reported a history of left femur fracture in 1955, when he was five years old. He reports having fallen from an 8 ft height, landing on his left thigh, causing a closed transverse fracture of his left femur. He underwent open reduction internal fixation and placement of a single intracortical screw and was placed in a spica cast for three months. The patient was not given antimicrobials as the fracture was closed and demonstrated no signs of infection. No subsequent operations were performed. He reported no pain near the site of injury until 20 years to 30 years ago when he began experiencing dull pain around his incision site while participating in sports. This pain was relieved by rest and anti-inflammatory medications and was non-debilitating.

Laboratory Results: The patient had unremarkable lab values and inflammatory markers were not elevated (ESR 7, CRP < 0.3, WBC 7.09).

Treatment Course: He was placed in skeletal traction and underwent open reduction internal fixation with placement of an intramedullary nail. The authors biopsied reamings of the intramedullary canal and samples of bone taken with a pituitary rongeur. The surgical pathology report showed necrotic bone with numerous fungal organisms present. The patient was diagnosed with indolent fungal osteomyelitis. The patient completed a 12-month course of Voriconazole prescribed by an infectious disease physician. There were no postoperative complications or clinical signs of exacerbation of chronic indolent infection at the patient's one-year follow-up appointment. Radiographs demonstrated a healed fracture with an intramedullary nail and retained intracortical screw (Figures 4, 5).

Figure 4. *AP radiograph at one-year post-fixation demonstrated a healed fracture with an intramedullary nail and retained intracortical screw.*

Figure 5. *Oblique view radiograph at one-year post-fixation demonstrated a healed fracture with an intramedullary nail and retained intracortical screw.*

DISCUSSION

The authors believe this infection was initially contracted via direct inoculation at the time of the patient's initial injury. Although less likely, a hematogenous secondary seeding of the fracture site could have occurred. The patient healed his original fracture 67 years ago and the femur appeared grossly normal. However, there were focal changes within the femur, which may have caused weakening of the bone.[10] The presence of chronic indolent osteomyelitis of the femur shaft may have contributed to the second fracture.

The treatment team in this study elected not to remove the screw that was thought to be infected at the time of the initial surgery. This is due to the unknown infection status of the patient at the time of surgery, the fact that the screw did not interfere with the planned operative fixation, and the removal requiring additional approach through the thigh to retrieve the screw. If the screw

were intramedullary, it could have potentially prevented passage of the implant through the canal. The authors chose not to remove the screw for the reasons noted above, but recognize that screw removal as an adjunct to fracture treatment and anti-fungal medication would be reasonable in this situation. Theoretically, an infected retained foreign body cannot be sterilized by antibiotics alone and retention of the infected foreign body likely increases the probability of persistence of the infection.

Infectious disease physicians and orthopaedic surgeons weighed the potential benefits against costs for three separate treatments: 1) repeat surgery; 2) antifungal therapy; and 3) a combination treatment method to remove the screw and eliminate the infection once confirmed. The benefits of a repeat operation include removal of the foreign body thought to be the source of infection and debridement of infected bone, which is otherwise prone to cause persistence of fungal infection.[11,12] An additional operation may avoid the side effects of prolonged treatment, and may be less expensive than one year of antifungal therapy.[13,14] Bone debridement is an important treatment for acute osteomyelitis, but the role of debridement in chronic indolent infection is more controversial. It is generally impossible to identify the full extent of infected bone in chronic indolent osteomyelitis. The bone is usually functional and extensive removal may create a bone defect that causes more functional problems than retention of bone affected by indolent infection. Treatment should be considered on an individual patient basis and be specific to the extent of their disease.

In conclusion, the authors report a rare case of fungal osteomyelitis affecting an intramedullary lag screw that was treated with long-term antifungal therapy. Early intervention in this condition is recommended to avoid complications, such as impaired wound healing leading to possible subsequent bone injury.

REFERENCES

1. Motsitsi NS. Management of infected nonunion of long bones: the last decade (19962006). Injury. 2008;39(2):155-160. doi: 10.1016/j.injury.2007.08.032.
2. Fritz JM, McDonald JR. Osteomyelitis: approach to diagnosis and treatment. Phys Sportsmed. 2008;36(1):nihpa116823. doi: 10.3810/psm.2008.12.11.
3. Clare MP, Fitzgibbons TC, McMullen ST, et al. Experience with the vacuum assisted closure negative pressure technique in the treatment of non-healing diabetic and dysvascular wounds. Foot Ankle Int. 2002;23(10):896-901. doi: 10.1177/107110070202301002.
4. Allahabadi S, Haroun KB, Musher DM, et al. Consensus on surgical aspects of managing osteomyelitis in the diabetic foot. Diabet Foot Ankle. 2016;7:30079. doi: 10.3402/dfa.v7.30079.
5. Riel RU, Gladden PB. A simple method for fashioning an antibiotic cement-coated interlocking intramedullary nail. Am J Orthop (Belle Mead NJ). 2010;39(1):18-21.
6. Hotchen AJ, McNally MA, Sendi P. The classification of long bone osteomyelitis: a systemic review of the literature. J Bone Jt Infect. 2017;2(4):167-174. doi: 10.7150/jbji.21050.
7. Pandey M, Kumar P, Khanna AK. Marjolin's ulcer associated with chronic osteomyelitis. J Wound Care. 2009;18(12):504-506. doi: 10.12968/jowc.2009.18.12.45607.
8. Cha JG, Hong HS, Koh YW, et al. Candida albicans osteomyelitis of the cervical spine. Skeletal Radiol. 2008;37(4):347-350. doi: 10.1007/s00256-007-0429-9.
9. Asperges E, Albi G, Truffelli F, et al. Fungal osteomyelitis: a systematic review of reported cases. Microorganisms. 2023;11(7):1828. doi: 10.3390/microorganisms11071828.
10. Gamaletsou MN, Walsh TJ & Sipsas NV: Epidemiology of Fungal Osteomyelitis. Curr. Fungal Infect Rep. 2014;8:262-270.
11. Bariteau JT, Waryasz GR, McDonnell M, et al. Fungal osteomyelitis and septic arthritis. J Am Acad Orthop Surg. 2014;22(6):390-401. doi: 10.5435/JAAOS-22-06-390.
12. Cetrulo CL Jr, Leto Barone AA, Jordan K, et al. A multi-disciplinary approach to the management of fungal osteomyelitis: current concepts in post-traumatic lower extremity reconstruction: a case report. Microsurgery. 2012;32(2):144-147. doi: 10.1002/micr.20956.
13. O'Doherty M, Hannan M, Fulcher T. Voriconazole in the treatment of fungal osteomyelitis of the orbit in the immunocompromised host. Orbit. 2005;24(4):285-289. doi: 10.1080/01676830500187696.
14. Liò P, Paoletti N, Moni MA, et al. Modelling osteomyelitis. BMC Bioinformatics. 2012;13 Suppl 14(Suppl 14):S12. doi: 10.1186/1471-2105-13-S14-S12.