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Fungal Infection in Chronic Wound

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Abstract

Osteomyelitis is common following open fractures and is accentuated in the presence of devices like prosthetics or external fixators. It is most commonly caused by gram-positive bacteria. Fungal infections are rarely reported. This is the report of a case of zygomycosis of bone in an open fracture of femur with exposed knee joint with external fixator and proximal femoral nailing.

Keywords: Fungal; Osteomyelitis; Chronic; Wound; Zygomycosis; Trauma; Management.

INTRODUCTION

Osteomyelitis infection can result from the spread of a contiguous source by trauma or surgical contamination, can be secondary to vascular insufficiency or neuropathy (e.g., diabetic foot ulcers) or can be acute hematogenous osteomyelitis, which is more common in paediatric patients.[1,2] Osteomyelitis can be acute or chronic based on histopathological findings. Acute osteomyelitis is associated with inflammatory bone changes caused by pathogenic bacteria, and symptoms typically present within two weeks after infection whereas chronic osteomyelitis has necrotic bone presents 6 weeks after infection.[3] Staphylococcus aureus is the most common cause of acute and chronic hematogenous osteomyelitis in adults and children. In adults, S. aureus is the most common pathogen in bone and prosthetic joint infections. Fungal and mycobacterial infection of bone have been reported in patients but these are uncommon and are often associated with immunocompromised states.[4] Post traumatic osteomyelitis is a common cause of osteomyelitis caused by direct inoculation of cutaneous flora, and is often of bacterial origin, Staphylococcus aureus being the most common cause. Fungal infection of bone following trauma is rarely noted especially in immunocompetent individuals. This case report is on a case of post traumatic fungal osteomyelitis in a chronic wound.

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MATERIALS AND METHODS

This study was done at tertiary care hospital after obtaining approval of departmental scientific and ethics committee. Informed consent was obtained

from the patient. This case report is on a 31-year-old male, with no known comorbidities, who presented with blunt injuryto abdomen,left lower limb and left upper limb following a road traffic accident 3 months back. On examination, he was found to have multiple areas of soft tissue loss in the left lower limb. There was fracture of left femur with open knee joint for which intramedullary nailing was done and fracture of 4th and 5th metatarsals of left foot for which k-wiring was done. He also had a hematoma of transverse mesocolon for which he underwent transverse colectomy with colostomy under general surgery. The open left knee joint with exposed femur with active pus discharge (Fig. 1), raw area of size 20 x 10 cm on medial side of left lower limb with exposed knee joint. Initial cultures showed growth of gram-negative bacteria for which culture sensitive antibiotics were started. After improvement of general condition of the patient, wound bed preparation was done. Multiple regenerative strategies were used along with traditional methods. Hydro jet debridement, prolotherapy, insulin spray, autologous platelet rich plasma (APRP), low level laser therapy (LLLT), vitamin-D therapy, Centinela extract, phenytoin therapy along with cyclic negative pressure wound therapy (NPWT) were done. Skin grafting (Fig. 2) was then done over the left knee joint. Following this regular negative pressure wound therapy was done over the left knee joint. Bone biopsy was sent for culture and histopathological examination. X-ray shows periosteal reaction of the distal femur. Bone scan report suggested avascular necrosis of the medial femoral condyle. CT scan shows post traumatic defect involving the medial condyle of the left femur with air foci within the medullary cavity of distal femur and adjacent hypodense areas opening on to skin surface. Biopsy showed multiple fragments of dead bony trabeculae with few necrotic areas showing fungal hyphal formswhich were broad, aseptate and ribbon shaped hyphae morphologically consistent with zygomycosis. Exudate culture from the knee showed the persistence of Enterobacter spp. and Klebsiella pneumoniae. The patient was started on intravenous Amphotericin B with regular monitoring of renal functions and steroids were discontinued. Along with this, sensitive antibacterial drugs were also administered. Regular negative pressure dressing with debridement was also carried out.Once wound bed got ready then skin grafting was done for the raw area other then the site of exposed knee joint (Fig. 2).

Fig. 1: Left lower limb chronic wound with exposed knee joint

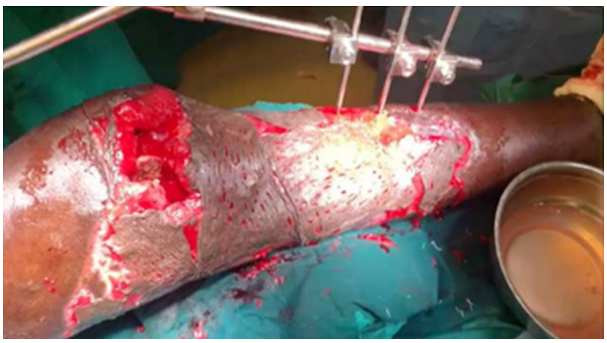

Fig. 2: After skin grafting leaving exposed knee joint

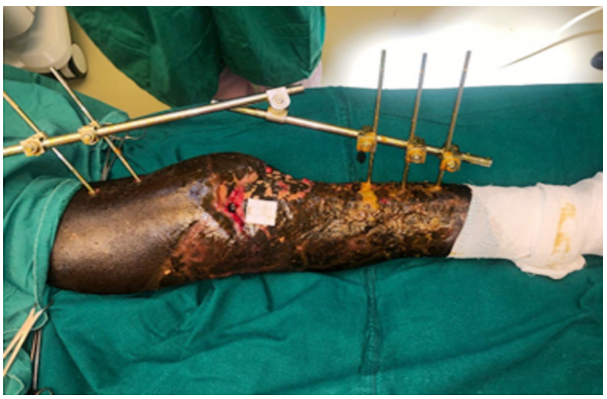

Fig. 3: Healed wound after skin grafting except exposed knee joint to be covered by flap once fungal infection is controlled

RESULTS

Skin graft took well over the raw area other then the exposed knee joint (Fig. 3). Fungal management is continuing till completely resolves, which may take 2 to 3 months & then flap cover will be proved to the exposed knee joint site.

DISCUSSION

The incidence of infection following skeletal trauma ranges from as low as 2% for low grade open fractures to up to 50% for the most severe injuries.[5-8] The incidence of significant infection within three months after an open fracture has been reported to be as high as 27 percent. The incidence appears to be independent of the length of time from the injury to surgery.[9] Due to this high incidence, prophylactic antibiotics are often used in the setting of an open fracture.[10,11] The causative organism for osteomyelitis following trauma is dependent on the mechanism and severity of injury, the presence of environmental contamination, and whether or not indwelling devices like external fixators were used to stabilize damaged bone. In open fractures without gross environmental contamination, osteomyelitis typically is caused by skin flora, S. aureus and coagulase negative staphylococci. However, in open fractures with gross contamination, an array of environmental organisms, including gram negative bacteria like Pseudomonas aeruginosa, Enterobacter cloacae, and Escherichia coli, as in the case above, other gram-positive bacteria like Bacillus and Enterococcus spp., anaerobes like Clostridium spp,nontuberculous mycobacteria and fungi can also lead to subsequent osteomyelitis.[12-14]

Clinical symptoms of osteomyelitis can be nonspecific and difficult to recognize. They include chronic pain, persistent sinus tract or wound drainage, poor wound healing, malaise, and sometimes fever. The diagnosis is based on clinical signs, imaging modalities like plain radiography, magnetic resonance imaging and bone scintigraphy and laboratory parameters (ESR, CRP). Physical examination should focus on locating a possible nidus of infection, assessing peripheral vascular and sensory function, and exploring any ulcers for the presence of bone.[15] Laboratory investigations are non-specific. Leucocytosis and increased erythrocyte sedimentation rate and C-reactive protein levels may be present.[16]

The preferred diagnostic criteria for chronic osteomyelitis are a positive culture from bone biopsy and histopathology consistent with necrosis.[17,18] Superficial wound cultures do not help significantly with the diagnosis of osteomyelitis as the organisms identified by such cultures correspond with bone biopsy culture results in only about one-third of cases.[19] Chronic infections are more likely to have polymicrobial involvement, including anaerobic, mycobacterial, and fungal organisms requiring specific cultures.[20]

Plain radiography findings in osteomyelitis includes non-specific periosteal reaction and osteolysis and are not seen until about two weeks after the initial infection, when nearly 50 percent of the bone mineral content has been lost.[21] Computed tomography cane be used to determine the extent of bony destruction or in patients with contraindications to MRI.MRI is often the radiological investigation of choice for diagnosis of osteomyelitis. It can detect changes within three to five days of disease onset.[21] The sensitivity and specificity of MRI in the diagnosis of osteomyelitis may be as high as 90 percent.[22,23] Nuclear imaging like three phase technetium 99 bone scintigraphy and leukocyte scintigraphy are usually positive within a few days of the onset of symptoms.[23] Positron emission tomography has the highest sensitivity and specificity, but is expensive and not as widely available.[23] MRI can also detect necrotic bone, sinus tracts, or abscesses and is therefore considered to be superior to nuclear imaging.[22]

Fungal infections are described in the literature as rare, underestimated and diffcult to detect, often diagnosed late due to low clinical suspicion.[24] A meticulous combination of pharmacotherapy with surgery is of paramount importance in treatment of fungal infections.[25,26] Elimination of predisposing factors for infection, such as hyperglycemia, metabolic acidosis, deferoxamine administration, immunosuppressive drugs, and neutropenia, is also critical. Intravenous (IV) amphotericin B (lipid formulation) is the drug of choice for initial therapy.[27,28] Posaconazole or isavuconazole is used as step down therapy for patients who have responded to amphotericin B and can also be used as salvage therapy for patients who don't respond to or cannot tolerate amphotericin B. Surgical intervention with removal of necrotic tissue and debulking infection has been associated with improved survival in anecdotal clinical reviews of rhinocerebral and pulmonary infection and these findings can be extrapolated to osteomyelitis at other sites.[29] Parenteral antibiotic therapy for two to six weeks is generally recommended followed by oral antibiotics for a total treatment period of four to eight weeks.[30] Despite the use of surgical debridement and long-term antibiotic therapy, the recurrence rate of chronic osteomyelitis in adults is about 30 percent at 12 months. Recurrence rates is about 50% in cases involving P. aeruginosa.[31] Many bacteria form a biofilm which lead to persistence of fungal infections. This symbiosis needs to be appropriately tackled with a combination of antibacterials and antifungals. The patient under study had received low dose corticosteroid for

over a month for fluconazole induced adrenal suppression by endocrinologist. We suspect the use of steroid to be the possible cause of zygomycotic infection in this patient.

CONCLUSION

Osteomyelitis remains a clinical challenge and is best approached with evidenced based clinical care guidelines and a multidisciplinary team. Fungal infections of bone are not just an opportunistic infection, they are also crucial in the persistence of complex infections. This case report highlights the importance of keeping a high clinical suspicion towards fungal infections of bone, their early identification, appropriate pharmacological treatment and surgical management.

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