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Case Report

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Chronic osteomyelitis of tibia with implant exposed outside & it's successful management: A Case Report

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Abstract

Introduction:

Osteomyelitis (OM) is an inflammatory process which is accompanied in many cases by bone destruction and caused by an infecting microorganism. Depending upon the duration it can be divided into acute and chronic type. Tibia is the most common site of osteomyelitis because of less soft tissue coverage on anteromedial site and therefore more vulnerable for injury and fractures. Treatment of chronic osteomyelitis is challenging for the orthopedic surgeon because of high chances of recurrence& resistance of microorganisms. Here we are presenting a case report of 54-year-old man, a chronic smoker as well as alcoholic, with chronic osteomyelitis of the right tibial shaft with implant (plate and screw) in situ and exposed outside. He was treated successfully with conventional treatment like antibiotics, debridement, implant removal, multiple drilling of the cortex and VAC dressing in first stage and skin grafting in second stage. Till most recent follow up there are no signs of recurrence. Uniqueness of this case is long term skin loss, plate and screw over the shaft of tibia exposed out for two years with pus discharge, still the case could be managed successfully by conventional management strategy.

Case Report:

A 54-year-old male patient presented to the outpatient department in June 2023 with a wound over the right lower limb, purulent discharge, and exposed plate and screw with a foul odour. The patient had a history of a road traffic accident 3 years prior, resulting in a closed fracture of the lower third tibia and fibula on the right side.

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He underwent surgery with open reduction and internal fixation (ORIF) using a plate and screws at another hospital. One year post-operation, the patient developed a discharging sinus at the surgical site, which gradually worsened, leading to skin loss and exposure of the plate and screws. The patient was admitted, and the pus discharge was sent for culture and antibiotic sensitivity testing. The culture was positive for MRSA, which was sensitive to Linezolid and Co-trimoxazole. Radiological evaluation showed the fracture was united, with cortical thickening, irregular periosteal reaction, and small lytic areas in the metaphyseal region. Implant removal and wound debridement were performed. Multiple drill holes were made in the cortex, and vacuum-assisted closure (VAC) dressing was applied. After granulation tissue appeared, skin grafting was done, with 95% of the graft taking successfully. The wound healed well. Antibiotic therapy with intravenous medication was given for 3 weeks, followed by oral antibiotics for another 3 weeks. The patient is now walking with full weight-bearing and has had no recurrence to date.

Conclusion:

The rate of chronic osteomyelitis and recurrence is very high in the tibia. In cases of tibial fractures, the appropriate surgical method/implants must be carefully selected. During surgery, minimal handling of the soft tissue is necessary to avoid damage to the blood supply. Long-term antibiotic therapy, based on the culture report and the drug's ability to penetrate bone, is essential. Conventional techniques such as thorough debridement, removal of sequestrum, multiple cortical drillings, vacuum-assisted closure (VAC) dressing, antibiotic cement beads, and bone grafting to fill dead space once the infection is controlled, along with local flap or skin grafting, can be considered. In the future, more trials are needed to identify cost-effective and novel techniques for treating chronic osteomyelitis.

Key Words

Chronic osteomyelitis of tibia, pus culture, debridement, antibiotics, skin cover, less invasive surgery

INTRODUCTION

Osteomyelitis of the tibia has been known for centuries and was first described in humans by Hippocrates in 460 BC. It is defined as the ‘inflammation of bone and bone marrow.[1] The tibia is the most common site of osteomyelitis due to its reduced soft tissue coverage on the anteromedial side, making it more vulnerable to injury and fractures.[2] Road traffic accidents are a common cause of tibial injury in developing countries. Infection is more common due to local injury, compound fractures, and surgical intervention.[3] Chronic osteomyelitis is clinically diagnosed by the presence of a discharging sinus and radiologically by the presence of sequestrum, the dead bone fragment. Treatment of chronic osteomyelitis is challenging for orthopedic surgeons because of the high recurrence rate.[4] Here, we present a case report of a 54-year-old man with chronic osteomyelitis of the right tibial shaft with an implant in situ, exposed to the atmosphere for two years. He was successfully treated with conventional methods including antibiotics, debridement, implant removal, multiple cortical drillings, and VAC dressing in the first stage, followed by skin grafting in the second stage. At present, there is no recurrence. The uniqueness of this case lies in the fact that despite the pus discharge and exposed implant for two years, as well as the large soft tissue defect over the distal tibia, successful management was achieved with conventional techniques.

CASE REPORT

A 54-year-old male patient presented to our outpatient department in June 2023 with a wound over the right lower limb, with purulent discharge, exposed plate and screw, and a foul odour. (Figure 1) The patient had a history of a road traffic accident 3 years prior, which resulted in a closed fracture of the lower third tibia and fibula on the right side. He was initially treated at a government hospital, where he underwent surgery for the fracture. Open reduction and internal fixation (ORIF) with a distal tibia locking compressive plate and screws (LCP) was performed for the tibia, and a rush nail was placed for the fibula. The patient is a known chronic smoker and alcoholic for the past 10

years. He recovered well after the initial surgery. There was no history of diabetes mellitus. One year post-operation, the patient developed a discharging sinus at the wound site, which gradually worsened, resulting in skin loss and exposure of the plate and screws. The patient was referred to our hospital for pain, discharging sinus, and difficulty walking.

Upon admission, pus was sent for culture and antibiotic sensitivity testing. The culture was positive for MRSA, sensitive to Linezolid and Co-trimoxazole, which were started in IV form. Radiologically, the fracture was united, with cortical thickening, an irregular periosteal reaction, and small lytic areas in the metaphyseal region. In the first stage of treatment, the patient underwent implant removal and wound debridement. Multiple drill holes were made in the cortex, and VAC dressing was applied. After granulation tissue appeared, skin grafting was performed as the second stage of treatment. (Figure 2) Antibiotic coverage was provided intravenously for 3 weeks, followed by oral antibiotics for another 3 weeks. The patient was instructed to walk with partial weight-bearing using a walker for one month, followed by full weight-bearing with a stick after one month as a precautionary phase.

Figure 1:- Clinical Photograph (Left), X-Ray Evaluation (Middle), Middle Drilling of the cortex (Right)

After debridement and implant removal, multiple cortical drillings were performed. VAC dressing was applied. Healthy granulation tissue was observed at the wound site. Skin grafting was performed, with 95% take. The wound healed well, and partial weight-bearing was initiated immediately, followed by full weight-bearing after one month. The patient is now one year post-operation, with no recurrence to date.

Figure :- VAC Dressing (Left upper), Multiple Cortical Drilling (Right Upper), Healthy Granulation Tissue (Left lower), Skin Graft (Right Lower).

DISCUSSION

The tibia's medial one-third is covered with only fascia and skin, making it highly susceptible to injury and infection. Compound fractures and surgical interventions in closed tibial fractures are major causes of chronic osteomyelitis. The Cierny-Mader classification is useful for chronic osteomyelitis of long bones in adults and includes anatomical and physiological types. Anatomical types include Type I (Medullary Osteomyelitis), Type II (Superficial Osteomyelitis), Type III (Localized Osteomyelitis), and Type IV (Diffuse Osteomyelitis).[5] The physiological types include Type A (good immune system and delivery), Type B (compromised locally or systemically), and Type C (requires no treatment, minimal disability). Chronic osteomyelitis is also classified as exogenous or hematogenous. The most common mechanism is the direct inoculation of pathogens at the time of trauma. Vascular insufficiency is a major factor in chronic osteomyelitis, along with the distant spread of infection. Malnutrition and diabetes mellitus are other factors contributing to the transmission of infection to bones. The incidence of chronic osteomyelitis decreased after the introduction of antibiotics in the 1940s. Trauma-induced

osteomyelitis is the most common cause, with an infection rate of 4%-64% and a recurrence rate of 20%-30%. Prosthetic joint infection rates are 1.5%-2.5%, and up to 20% in revision surgeries. Staphylococcus aureus/MRSA are the most common organisms involved. These pathogens adhere to collagen receptors, enter host cells, and degrade the extracellular matrix. Some may survive within host cells for extended periods. These pathogens produce an impermeable protein matrix called a 'biofilm,' which is multilayered and presents with altered phenotypes, gene expression, and protein production, protecting them from host defence mechanisms and systemic antibiotics.[6]

The inflammatory reaction causes bone necrosis, with dead bone being an ideal site for bacterial growth. Clinically, symptoms such as chronic pain, erythema, swelling, bone tenderness, impaired wound healing, sinus tract formation, pus discharge with bony spicules, chills, and general malaise are significant indicators. Radiologically, it takes 10-21 days for diagnosis and requires a 30%-50% loss of bone mineral content. X-rays are useful in differentiating infection from malignancy and reveal soft tissue swelling, periosteal reaction, loss of cortical definition, osteolysis, bone resorption, and formation of sequestrate and new bone.[7] CT scans provide detailed information regarding sequestrate, intraosseous fistulae, and cortical condition, and they are helpful for biopsy. MRI is useful for evaluating bone marrow changes, soft tissue involvement, the extent of the lesion, and assessing response to treatment, though its value is limited with implants in situ, recent surgery, and scar tissue.[8] Bone scans have a limited role, while PET scans have the highest specificity and sensitivity in the early stages. 2-fluoro-2-deoxyglucose PET scans provide the highest diagnostic accuracy for chronic osteomyelitis but are more expensive compared to other tests. Ultrasonography (USG) is useful for diagnosing fluid collection, pus formation, and pyoarthrosis. ESR and C-reactive protein have prognostic value, while WBC counts remain normal most of the time. If hemoglobin is low, it may suggest anemia. Pus culture or culture from bone biopsy is critical for diagnosis. In implant-related infections, biopsies from five different areas and prolonged enriched broth cultures increase accuracy.[9]

The diagnosis of chronic osteomyelitis is challenging, requiring a combination of clinical symptoms, radiology, blood investigations, and cultures. Management depends on the duration and severity of symptoms and the presence of medical comorbidities. The primary goal is to remove all pathogens and devitalized tissue while promoting healing through antibiotic agents, surgical debridement, and managing dead space. Generally, six weeks of antibiotics are essential, as 4-6 weeks are required for neovascularization of the infected area and for antibiotics to reach the site. Oral versus intravenous administration has shown no significant difference according to meta-analyses. The choice of antibiotic depends on the culture report, sensitivity, and its capacity for bone penetration. Antibiotic-impregnated cement beads, biodegradable calcium sulfate beads, and hydroxyapatite ceramic cement beads, as well as biodegradable polylactide and polyglycolide copolymer implants, are useful and do not require removal. Surgical techniques such as reamer irrigator aspirator (RIA) with insertion of antibiotic-impregnated cement rods, followed by bone grafting after membrane formation (Masquelet technique), can be considered. Removal of sequestrum, saucerization, vascular or non-vascular bone grafting, VAC dressing, free flaps or skin grafting, and bioactive glass techniques—which have antimicrobial, osteoconductive, and angiogenic properties—are essential along with good soft tissue coverage. Ilizarov circular fixators, LISS, or external fixators are other treatment options for chronic osteomyelitis with pathological fractures.[10]

During wound debridement in this case, we employed multiple cortical drillings to decompress the medullary cavity, and this technique produced an excellent response. Once granulation tissue covered the bone, split-thickness skin grafting was performed. The wound healed well, and there has been no recurrence to date. However, there is always a risk of complications in chronic osteomyelitis, such as Marjolin's ulcer (squamous cell carcinoma), which has an incidence of 1.6%-23%, pathological fractures (3%-5%), and

recurrence. The latent period for squamous cell carcinoma is typically 27-30 years.

CONCLUSION

Tibial fractures, whether simple or compound, should be managed with a multidisciplinary team approach. The rate of osteomyelitis is very high in the tibia, and the recurrence, along with multiple drug-resistant microorganisms, makes management more challenging. In the case of tibial fractures, the surgical procedure and choice of implants must be carefully selected. The presence of a discharging sinus clinically and sequestrum on radiology are key signs of chronic osteomyelitis. Bone biopsy, culture, and long-term antibiotics that are sensitive and have high bone penetration are necessary for early cure. PET scans are highly sensitive and specific for early diagnosis. During surgery, minimal handling of the soft tissue is essential to avoid damage to the blood supply. Conventional techniques, starting with thorough debridement, removal of sequestrum, multiple cortical drillings, VAC dressing, and antibiotic cement beads, followed by bone grafting and free flaps or skin grafting in the second stage, are cost-effective and highly effective for the treatment of chronic osteomyelitis. Further research and randomized trials focusing on novel techniques, such as biodegradable glass and titanium cages with bone grafts, are required to establish definitive and cost-effective treatments for chronic osteomyelitis of the tibia, as the prevalence and burden of this condition are increasing in developing countries.

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