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ANKLE JOINT CHRONIC OSTEOMYELITIS: A CASE REPORT AND UPDATED INSIGHTS

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ABSTRACT
Osteomyelitis is an infectious disease of the musculoskeletal system that can cause inflammation of the bones and joints caused by infectious agents. To date, there has been an increase in Osteomyelitis cases especially in individuals with comorbidities. The aimed of this study was to explore the frequent cases of chronic ankle joint osteomyelitis experienced by the public and provide new insights into the future treatment of this disease. In this study, we report the case of a patient with type 2 diabetes mellitus who developed osteomyelitis due to a wound caused by a scratch on a prickly pandanus leaf mat. A 58-year-old man presented to the emergency room with complaints of sores and pain, accompanied by swelling of the right foot. The wound on the leg oozed pus had an odor, and the patient had difficulty walking and fever for two weeks. Her hemoglobin level was 10 mg/dl, her leukocyte count was 20,040/µL, her current blood sugar level was 323 mg/dL, her 2-hour PP blood sugar level was 415 mg/dL, and her HbA1c level was 12. On foot examination, a CRT of < 2 s was found, and the degree of dorsal pedic artery pulsation was weak. An opaque area was observed in the ankle joint of the right foot, accompanied by a distal 1/3 epi-metaphyseal fracture of the right fibula bone with swelling, a distal 1/3 epiphyseal deformity of the right tibia bone, and a calcaneal spur on X-ray. Trauma and systemic risk factors such as diabetes mellitus were found in the patient, increasing the risk of worsening chronic osteomyelitis. The principles of osteomyelitis management include optimizing the patient's general condition; performing pharmacological debridement, reconstruction, and stabilization; and completing rehabilitation. Recent insights highlight the importance of a multidisciplinary approach, advanced diagnostic tools, antibiotic stewardship, novel therapies, and patient-centered care to improve outcomes for individuals affected by this challenging condition in the future.

Keywords: comorbidity; degenerative disease; infectious disease; osteomylitis; type 2 diabetes mellitus

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INTRODUCTION

Osteomyelitis is a condition characterized by inflammation of the bone tissue and is typically triggered by bacterial infection. This infection can spread to various areas within the bone, including the bone marrow, cortex, periosteum, and surrounding soft tissue. The infection may be limited to a single site or extend throughout the body. Osteomyelitis is a serious condition requiring prompt medical attention to prevent further complications (Zeng et al., 2023). Osteomyelitis is a progressive infection that causes inflammation, destruction,

necrosis, and neoformation of bone. Inflammation in the bone is difficult to heal because of the limited blood intake into the bone due to inflammation, which compresses the periosteum. Without an adequate blood supply, a part of the bone that is not supplied with blood causes death of the bone tissue. Bone damage is caused by suppurative microbial infections, mostly by the local spread of infection after trauma, surgery, joint replacement, or repetitive physical injury (Carro et al., 2023).

The incidence of osteomyelitis in the United States is approximately 21.8 cases per 100,000 person-years, with men experiencing a higher annual incidence than women and an increase in incidence with increasing age. Data reveal a growing trend in incidence, from 11.4 cases per 100,000 people/year during the period 1969-1979 to 24.4 cases per 100,000 people/year during the period 2000-2009 (Carro et al., 2023; Kremers et al., 2015). In the Philippines, the prevalence of osteomyelitis among pediatric patients is approximately 15 per 100,000 individuals. Similarly, in Cambodia, the rate of musculoskeletal infections among the pediatric population is approximately 13.8 per 100,000 people, with approximately 51% of cases involving single-limb osteomyelitis (Irianto, 2019). However, data on the incidence of musculoskeletal infections, especially chronic osteomyelitis, in Indonesia are limited. A 2018-2020 study of Dr. M. Djamil Hospital in Padang city showed that the highest percentage of osteomyelitis patients aged 50-54 years (17.0%) and 79.5% more common osteomyelitis occurred in men than in women. The microorganism that causes osteomyelitis is Staphylococcus aureus (25.6%), and antibiotics, mostly ceftriaxone (64.1%), are used (Coonahan et al., 2024; Soares et al., 2024). The tibia was the most commonly infected bone site (25.6%), and debridement was the most commonly performed surgical management technique (35.9%), with the longest length of hospitalization for patients ranging from 8-14 days (51.3%) (Sitinjak et al., 2022).

Bone infections are distinct from soft tissue infections in that the former are composed of a series of rigid compartments, increasing susceptibility to vascular damage and cell death as a result of pressure buildup during acute inflammation. Numerous factors can rapidly increase the risk of bone infections, including local factors such as trauma, scarring, impaired circulation, decreased bone sensitivity, and chronic bone or joint diseases, as well as systemic factors such as malnutrition, frailty, diabetes, rheumatoid diseases, and the administration of corticosteroids or immunosuppressive drugs, both acquired and induced. The fundamental principles of treating bone infections involve administering analgesics, resting the affected area, identifying the causative organism, administering effective antibiotics or chemotherapy, stabilizing the fractured bone, managing avascular and necrotic tissue, restoring continuity if there is a bone gap, and maintaining soft tissue and skin cover (Apley & Solomon, 2019). In this study, we present a case of chronic ankle joint osteomyelitis that is often experienced by the community and present new insights into the treatment of this disease in the future. This article provides an overview and up-to-date information on the importance of managing and preventing the worsening of osteomyelitis in the community.

METHOD

In this study, we report the case of a patient with type 2 diabetes mellitus who developed osteomyelitis due to a wound caused by a scratch on a prickly pandanus leaf mat. A 58-year-old man presented to the emergency room with complaints of sores and pain, accompanied by swelling of the right foot.

RESULTS

A 58-year-old man presented with a foot wound caused by the edge of a plastic mat approximately five months prior to admission. Initially, the wound was only 1.5 cm long and not deep. The wound was then cleaned using betadine. After the administration of betadine, the wound was allowed to dry. The patient continued with daily activities without any complaints. Approximately 2 months after the incident, the patient complained of pain around the wound accompanied by swelling. At that time, the patient visited the clinic to receive painkillers and swelling medications. The wound began to widen by approximately 2–3 cm, and wound care was performed at the clinic. The patient's blood sugar levels were also checked at the clinic. The patient's blood sugar level was 512 mg/dL, and she was started on blood sugar-lowering medication.

One month before admission to the hospital, the patient experienced leg discomfort, such as pain, that arose and disappeared. However, this can be overcome by painkillers purchased by family members using a Copyan prescription at a previous clinic. According to the patient, the wound began to dry, but the swelling did not disappear. Occasionally, the treatment was painful. As he felt that his complaint did not stop, the patient came to the health center for treatment. According to the patient at that time, the staff cleaned the wound, administered several kinds of medicines, and advised the patient to be referred to the hospital. However, the patient felt exhausted, so the patient went home first with the medicine provided by the health center. One week prior to admission to the hospital, the patient had a fluctuating fever, and the wound became increasingly wider. The wound was oozing pus with an odor. The patient began to limp and lose her appetite. Red bowel movements were ruled out, as were red or black bowel movements. The patient was admitted because no relatives complained of the same complaint. The patient had a history of smoking and was likely to consume sweet drinks. Because it was felt that the situation was worsening, the patient was immediately taken to the hospital for treatment. A picture of the wound on the right lateral ankle joint and the right medial ankle joint is presented in Figure 1.

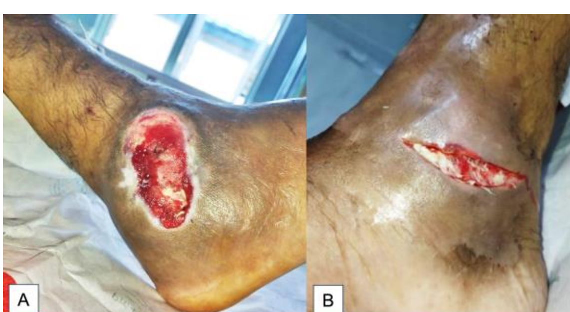

Figure 1. (A) Lateral right ankle joint wound and (B) medial right ankle joint wound.

On physical examination, she was found to have moderate pain, compositional consciousness, a blood pressure of 100/70 mmHg, a pulse of 86x/min, a respiratory rate of 22x/min, a temperature of 37.8°C, and a body mass index of 22.5 (normal weight). The patient's head, neck, thorax, and abdomen were within normal limits. Figure 1 shows the local status of the lateral dextra pedis region, revealing a wound measuring 7 × 5 cm × 0.5 cm. The wound appeared hyperemic and edematous, and pus and odor were visible. CRT < 2 s, dorsal pedic artery pulsation present and weak. In the medial pedis region, there was an 8 × 3 cm × 0.5 cm wound that was hyperemic, edematous, and smelled. According to the complete blood laboratory examination, her hemoglobin level was 10 mg/dl (normal: 12-16 g/dl), her leukocyte count was 20,040/luL (normal: 3,200-10,000/luL), her blood sugar level was 323 mg/dL (normal <200 mg/dL), her blood sugar level was 2 h (415 mg/dL), and her HbA1c

level was 12% (normal <7%). The results of the ankle joint AP/LAT Dextra X-ray showed that the epimetaphyseal fracture of the distal 1/3 of the right fibula was accompanied by soft tissue swelling and osteomyelitis, and the epiphyseal deformity of the distal 1/3 of the right tibia os and calcaneal spur is presented in Figure 2. Based on the patient's complaints and examination, the working diagnosis was osteomyelitis with type 2 DM. The patients were managed using general and specific methods. General management aims to educate patients and families about the course of osteomyelitis with DM and its complications to maintain the hygiene of wounds on the feet, to change wound dressings every day, to eat nutritious foods accordingly, to avoid sweet foods, to regularly control sugar intake and to use footwear when walking. The specific management regimens used were 0.9% NaCl (18 g/min), 1 × 8 U long-acting insulin (0-0-0), 3 × 10 U short-acting insulin (Novorapid) (10-10-0), 1 g/12 h ceftriaxone, and 500 mg/8 h metronidazole. The patient received treatment in the hospital for eight days to correct the main complaint. After the main complaint was corrected, the patient was advised to be referred to a bone surgeon for osteomyelitis treatment.

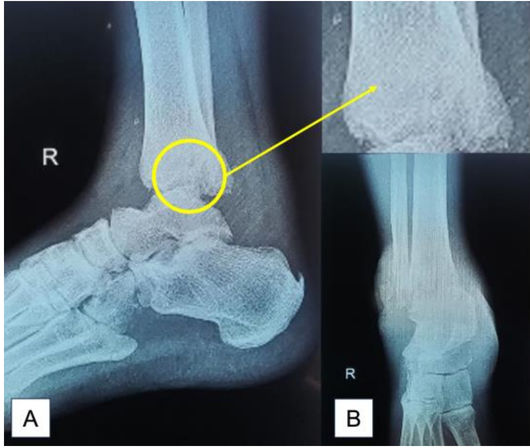

Figure 2. (a) AP/LAT radiograph of ankle joint osteomyelitis with epimetaphyseal fracture of the distal 1/3 of the right fibula with (b) soft tissue swelling.

Acute and chronic clinical manifestations of osteomyelitis

There are several predisposing factors for osteomyelitis, such as recent trauma or surgery, immunocompromised status, systemic conditions such as diabetes and sickle cells, malnutrition and general weakness, administration of corticosteroids and immunosuppressive drugs, intravenous drug use, invasive iatrogenic procedures, peripheral vascular disease, loss of sensitivity, venous stasis in the extremities, and peripheral neuropathy (Apley & Solomon, 2019). The mechanism of spread can be divided into three categories: hematogenous spread through the blood to cause systemic disease caused by bacteria or viruses generally occurring in children and, in adults, through the spine, the most common hematogenous site; adjacent spread, such as trauma, previous surgical wounds, or poor vascularization; and direct inoculation, such as penetrating wounds, open fractures, or surgical contamination (Wijendra et al., 2023). Acute osteomyelitis may result from open fractures and upper respiratory tract infections, among other conditions that involve varying degrees of infection. By means of blood circulation, a bacterial infection may spread throughout the body due to inappropriate treatment or immunodeficiency. This can lead to the disruption of arteries that provide nutrients to the epiphyses of bones, particularly in growing bones such as those found in children. Symptoms of acute osteomyelitis typically last for less than two weeks and are accompanied by local inflammatory reactions, such as hyperemia, edema, and leukocyte infiltration. As a result of these reactions, the local intracranial pressure may increase, leading to severe pain. Oculization and osteonecrosis may ensue if the pressure begins to diminish

following the release of lysozyme to eliminate the bone matrix abscess and if a portion of the tissue necrotizes. In such cases, the infection may propagate to the articular tissues via the Havelian and Volkman canals (Hosseini et al., 2018; St. Jeor et al., 2020). The mechanisms and clinical manifestations of acute and chronic osteomyelitis are shown in Figure 3.

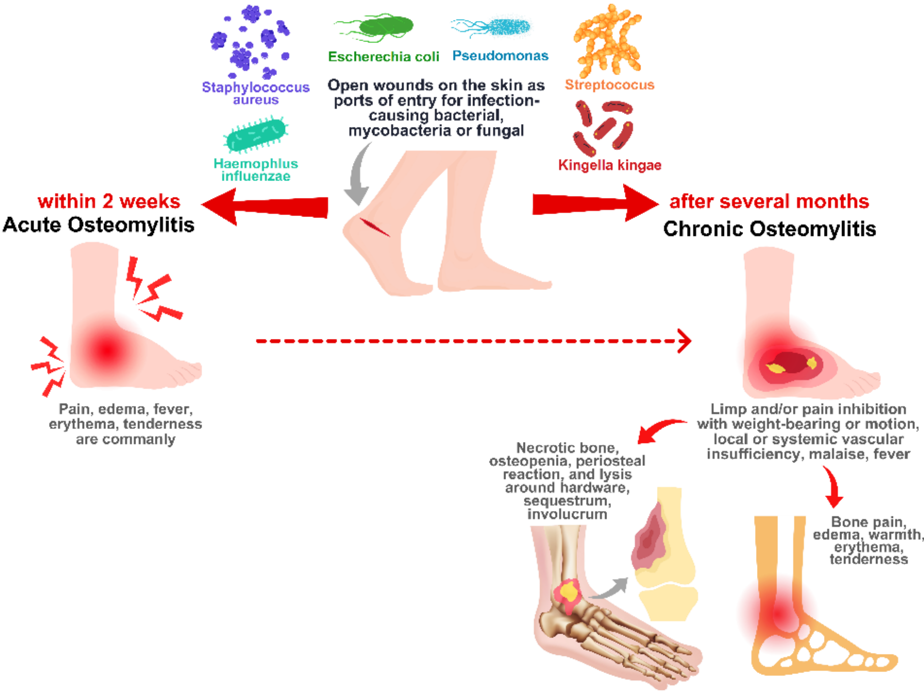

Figure 3. Acute and chronic clinical manifestations of osteomyelitis (Apley & Solomon, 2019).

Necrotic bone is encircled by granulation and fibrous tissue, which persists for an extended duration, resulting in the creation of necrotic bone and cavities, potentially leading to bone defects (Subramanyam et al., 2023; Zaki & Morrison, 2023). Mismanagement of acute osteomyelitis often results in chronic osteomyelitis. This occurs when the infection fails to destroy the periosteum, which stimulates new bone formation beneath it. This new bone can encase both dead and living bone segments both above and below the affected area. Chronic osteomyelitis is most commonly caused by acute osteomyelitis in childhood, followed by posttraumatic osteomyelitis, which leads to overt colonization of the bone tissue by bacteria. The incidence of the disease is significantly increased in individuals with comorbidities such as decreased immunity, diabetes, and atherosclerosis (Hogan et al., 2013).

The classification and management of osteomyelitis

In determining the management of osteomyelitis in health care settings, decision makers such as health and medical personnel must consider the severity of the disease based on existing classifications. At this stage, a summary of the classification and management of osteomyelitis is presented in Table 1.

Table 1.
Classification and management of osteomyelitis

Classification	Type I: Medullary osteomyelitis	Type II: Superficial osteomyelitis	Type III: Localized osteomyelitis	Type IV: Diffuse osteomyelitis
Description	Osteomyelitis is restricted to the medullary cavity of	Osteomyelitis typically affects only the cortical bone and	Osteomyelitis commonly affects the cortical and	Osteomyelitis typically extends to the entire depth of the bone,

Classification	Type I: Medullary osteomyelitis	Type II: Superficial osteomyelitis	Type III: Localized osteomyelitis	Type IV: Diffuse osteomyelitis
	the bone alone.	is most frequently caused by direct inoculation or contamination of an adjacent site.	medullary bones, where the bone structure remains stable and the infectious process does not extend to the entire diameter of the bone.	leading to a loss of stability, much like an infected nonunion..
Anatomic Location	Medullary	Superficial	Localized	Diffuse
Transverse section				
Side trim				
Sagittal section				
Imaging	Endosteum nidus of biofilm (scar, implant, dead bone)	Nidus in an exposed osseous surface; absence of medullary participation	Soft tissue defect, complete thickness, cortical sequestration, and medullary involvement are all potential.	Unstable permeative bony deterioration that is frequently circumferential
Initial surgical debridement and dead space management	Roof unroofing via canal reaming, corticotomy, or both +/- Antibiotic depot (PMMA) +/- Primary closure Guard against fracture risk (cast or Ex-Fix)	Loss of soft tissue is the primary concern. Bony superficial debridement	A blend of Types I and II. Defects in soft tissue and bone. For those at risk of fracture (cast or ex-fix), utilize an antibiotic depot (PMMA).	The most challenging treatment is invariably phased. A segmental deformity or skeletal instability results from extensive debridement. Antibiotic depot plus/- (PMMA). Guard against fracture

Classification	Type I: Medullary osteomyelitis	Type II: Superficial osteomyelitis	Type III: Localized osteomyelitis	Type IV: Diffuse osteomyelitis
				risk (cast or Ex-Fix).
Treatment	Management of dead space in the medullary canal via bone grafting	Flap for local transposition	Flap for local transposition Management of dead space in the medullary canal via bone grafting	Strategies such as acute shortening, bone transport, bypass treatments, osteotomy, and lengthening are employed either individually or in combination.

Source: Cierny–Mader theory (Apley & Solomon, 2019; Hatzenbuehler & Pulling, 2011; Yeo, A.;Ramachandran, 2014).

DISCUSSION

Management of ankle joint chronic osteomyelitis

Osteomyelitis is a medical condition characterized by inflammation of the bone marrow and is commonly caused by infection. If left untreated, this procedure can lead to further complications, such as osteonecrosis, bone destruction, and septic arthritis (Lee et al., 2016). The disease name is one of the most severe illnesses affecting both children and adults. It can cause permanent disability and is considered one of the most significant health issues worldwide (Arnold & Bradley, 2015). The incidence of osteomyelitis is known to be highest in individuals aged less than 5 years and more than 50 years. With regard to children, the incidence of acute osteomyelitis is reportedly approximately 8-10 per 100,000 in developed nations, whereas in developing countries, the incidence is as high as 80 per 100,000 (Alkhalfan et al., 2024; Llewellyn et al., 2020). Chronic osteomyelitis frequently affects individuals older than 60 years who have comorbid conditions, including diabetes, which accounts for 44% of the cases caused by Staphylococcus aureus. Approximately 36.5% of patients are diagnosed with diabetic foot infections, which translates to 1000 cases per year. Furthermore, it is worth noting that diabetic ulcers occur at an estimated rate of 25%. Notably, osteomyelitis accompanies 20–68% of diabetic ulcers (Coonahan et al., 2024; Zeng et al., 2023).

The microorganisms that cause osteomyelitis can vary with age; however, in children and adults, 80% of the cases are caused by Staphylococcus spp. In adults, osteomyelitis can be caused by streptococcosis or Enterobacter infections, with influenza being the most common infection (Colston & Atkins, 2018; Desimple et al., 2017). Normal skin bacterial flora, including coagulase-negative Staphylococcus spp., can act as significant pathogens when microorganisms attach themselves to inertial surfaces that are partially shielded from blood flow, the immune system, or antibiotics. Some bacteria, such as Staphylococcus spp., can generate extracellular polymeric substances (EPS) that can lead to biofilm formation on inertial surfaces (Bermejo Olano et al., 2024; Rafferty & Thakrar, 2024). These biofilms can help bacteria grow and adapt to their surroundings. Biofilm formation is a crucial mechanism that enables bacteria to survive chronic bone and joint infections. Chronic infections of the bone and joints can persist, worsen, or recur even after extended courses of antimicrobial treatment. These biofilms have important implications for diagnosis, surgical management, and antibiotic use (Mifsud & McNally, 2023; Yılmaz & İncesoy, 2024).

In this patient, the open wound was accompanied by comorbid disease, which paved the way for osetomileitis to become more progressive, and the infection could spread through the lymphatic or bloodstream system. The accompanying systemic reactions range from lethargy with a low-grade fever to shock. Acute bone infections are typically characterized by the formation of pus,

which results from the accumulation of dead leukocytes from nonfunctional tissue remnants. This pus is often localized as an abscess, and pressure can accumulate within the abscess as the infection spreads to the adjacent joints or through the bone cortex along the tissue. Tissue ischemia of the foot is commonly found in patients with diabetic foot infection, where the main factor causing skin damage is the presence of an open wound that becomes a place for bacterial colonization of the normal flora and continues to become more invasive, and bacterial infection extends rapidly. Diabetic foot wounds often become chronic, resulting in wounds that are difficult to heal and sustain; these wounds are caused by the formation of advanced glycation end products (AGEs), continuous inflammation, and apoptosis triggered by hyperglycemia (Hutagalung et al., 2019).

The patient's overall health suggested the development of late-stage osteomyelitis, transitioning from acute to chronic. This stage is marked by the ongoing presence of pathogenic microorganisms within necrotic tissue pockets. The buildup of pus can spread through sinuses or injuries, resulting in inadequate healing. Manifestations may include muscle damage, bone death, reduced blood supply, and a weakened body response. The severity of infection in these patients can be influenced by predisposing factors, which can occur in very old patients and those with diabetes mellitus. The diagnosis of this patient was made through medical history, physical examination, and supportive examination. During the anamnesis, symptoms such as pain when stepping on the foot, which initially disappeared, became more frequent, with an onset time of approximately 5 months since this complaint appeared. These findings indicate that the progression of osteomyelitis continues through the chronic phase. Pain is caused by an inflammatory reaction in the bone due to infection and worsens with comorbidities such as diabetes mellitus. Infection can destroy the bone cortex, which can spread to the periosteum, reducing the blood supply to the periosteum and causing bone necrosis (Carro et al., 2023; Cheng et al., 2023).

On physical examination, there were signs of preshock, namely, blood pressure, pulse, respiratory rate, and temperature, in the weak category. Furthermore, examination of the head, neck, thorax, and abdomen revealed no abnormalities; however, an open wound was found in the lateral dextral pedal region. The wound appeared hyperemic and edematous, with pus and odor. This raises the suspicion that osteomyelitis may be preceded by clinical symptoms of infection. Patients with acute osteomyelitis experience bone pain, which is usually accompanied by local symptoms, such as redness and tenderness, and systemic symptoms, such as fever. Patients with chronic osteomyelitis experience pain, redness, progressive edema, and sinus discharge, which are pathognomonic signs of osteomyelitis (Alkhalfan et al., 2024; Senneville & Robineau, 2021). A complete blood test showed a progressive increase in leukocytes, indicating that the infection had spread and persisted for a long time. In such cases, infection can occur in an open wound, which becomes an entry point for pathogens. Anatomically, the muscle tissue around the dorsum pedis is minimal compared to that around the tendons and ligaments; only the musculus extensor digitorum brevis and extensor hallucis brevis are branches of the musculus extensor digitorum longus (Berendt et al., 2008; Lázaro-Martínez et al., 2017; Woo et al., 2023). Therefore, predisposing factors in the form of open wounds on the dorsum pedis that infect the bones must be considered. Moreover, increased blood sugar can be a factor in worsening bone healing due to a too high concentration of sugar in the blood, such that vascularization is inhibited or even stopped. Osteomyelitis is a prevalent form of foot infection that affects 10-15% of moderate infections and 50% of severe infections (Ferguson & Carpenter, 2023).

Osteomyelitis and soft tissue edema were observed in addition to an epimetaphyseal fracture of the distal third of the right fibula, as detected by ankle joint radiography. Furthermore, a

calcaneal spur and an epiphyseal deformity were observed in the distal portion of the right tibia. The site of infection observed in the patient was customary. The most prevalent form of primary osteomyelitis, hematopoieticous osteomyelitis, impacts the metaphysis of long bones, including the femur (23–29%), tibia (19–26%), and humerus (5-13%). More frequently, the lower extremities were impacted. Osteomyelitis can be categorized using the Cierny–Mader classification system. In this case, the patient fulfilled the requirements for Stage II classification, which designates superficial osteomyelitis as an open wound in which neighboring infections have developed. In individuals who are suspected of having osteomyelitis, the presence of bone involvement must be confirmed via radiological testing. However, in 30–50% of damaged bones, visible indications of osteomyelitis are absent, and the onset of this condition typically occurs after 2–3 weeks. Osteopenia, cortical bone degradation, cortical lysis, osteolysis, periosteal thickening, and bone sequestration are all characteristics of radiographic images of osteomyelitis. A reduction in pathological fractures attributed to bone infection and mineralized bone neoformation in areas compromised by infection are considered indicators of bone laxity (Berendt et al., 2008; Cheng et al., 2023; Hosseini et al., 2018).

The characteristic radiologic features of bone infections are the Codman Triangle sign, sunburst, and fine hair. However, these features were not observed in this patient; only sunbursts were observed as an inflammatory reaction in the surrounding tissue. A Codman triangle-like pattern was not discernible because of the bone infection in the distal region of the tibia near the ankle joint. This pattern is classified into two categories nonnaggressive (thin, irregularly thick, solid, and shell) and aggressive and is commonly observed in periosteal reactions (tip hair, sunburst, lamellated, and Codman triangle) (Allen et al., 2023). Typically, osteomyelitis is identified via bone biopsy, a procedure that provides microbiological and histological information. Histological features such as bone degradation, marrow edema, fibrosis, necrosis, and the presence of inflammatory cells are diagnostic of this illness (acute or chronic). In addition, bone biopsy facilitates the accurate identification of bacteria that are involved in the course of the infection and assesses the individual's vulnerability to antibiotic treatment. This technique is widely regarded as the diagnostic gold standard for osteomyelitis. Malone et al., 2013) demonstrated a high degree of similarity between the pathogens obtained from deep tissue cultures and those obtained from bone biopsies. Specifically, 74.3% of the pathogens were isolated from deep tissue cultures, which were obtained from the area nearest to the bone, similar to the percentage obtained from bone biopsy, whereas 82.2% of the pathogens were obtained from bone biopsy, similar to the percentage obtained from deep tissue cultures.

Both general and specific management were performed for this patient. General management, which is very important, involves controlling risk factors in patients with diabetes mellitus. The patient had a history of uncontrolled diabetes mellitus; therefore, special treatment was required to lower the blood sugar level before debridement was performed. Metabolic control, such as blood glucose, lipid, albumin, and Hb levels, needs to be performed, and vascular control must be monitored to avoid delayed tissue necrosis. Specific management of cefalosporin-class antibiotic therapy in the form of ceftriaxone 1 g/12 h and nitroimidazole class metronidazole 500 mg/8 h was carried out for this patient to prevent the spread of infection (Ferguson & Carpenter, 2023; Senneville & Robineau, 2021). The principle of management in patients with OM is to optimize their general condition through debridement, dead space management, reconstruction or stabilization, rehabilitation, and pharmacology. Bacteria causing osteomyelitis were identified, the initial antibiotic was selected, and the antibiotic was modified based on culture results (Wassif et al., 2021).

Chronic osteomyelitis can rarely be completely cured until all infected dead bones have been separated, sequestered, and removed spontaneously through the sinus or have been removed surgically (sequestrectomy). The management of chronic osteomyelitis in adults relies on the Cierny–Mader classification (Carro et al., 2023; Zeng et al., 2023). The selection of appropriate antibiotics in patients with osteomyelitis is important for suppressing infection, preventing spread to healthy bones, and controlling acute attacks (Bor et al., 2022; Sananta et al., 2021). The selected antibiotic should penetrate the sclerotic bone and have a minimal effect if used for a long time. Fusidic acid, clindamycin, and cephalosporins are considered the most suitable antibiotic therapy options for the treatment of chronic osteomyelitis. Vancomycin and teicoplanin are effective against most methicillin-resistant Staphylococcus aureus (MRSA) infections. It is common practice to administer a combination of antibiotics for a period of 4-6 weeks, from the initiation of treatment until debridement is performed (Qin et al., 2020).

Updated insights

Chronic osteomyelitis of the ankle joint is a persistent bone infection that presents a considerable challenge for clinicians. This condition, which affects the ankle region, can result in significant morbidity if not effectively treated. Fortunately, advances in medical research and clinical practice have provided new insights into the diagnosis and treatment of this condition, offering hope for improved patient outcomes and enhanced clinical care. These recent insights highlight the importance of reviewing important aspects of chronic osteomyelitis in the community. As these insights continue to shape clinical practice, there is optimism regarding improving treatment strategies and enhancing the quality of life of patients with chronic osteomyelitis of the ankle joint. Updated current insights into the management of osteomyelitis-related infectious diseases have been proposed, considering several advances and limitations. Recent developments in diagnostic imaging techniques have played an important role in the early and accurate detection of chronic osteomyelitis of the ankle joint (Foti et al., 2023; Xin et al., 2022). Modalities such as magnetic resonance imaging (MRI), computerized tomography (CT), and nuclear medicine studies provide a detailed picture of the bone structure and help identify the extent of infection (Ariastuti et al., 2023; Balasubramanian et al., 2023; Sambri et al., 2021). These advancements allow doctors to make informed decisions regarding appropriate and timely treatment according to the patient's condition (Peng et al., 2023; Ziegeler et al., 2020).

Recognizing the complex nature of chronic osteomyelitis of the ankle joint, healthcare providers are increasingly adopting multidisciplinary approaches for patient care (Solomon et al., 2010). Orthopedic surgeons, infectious disease specialists, radiologists, and wound care experts collaborated to design the comprehensive treatment plan. This collaborative effort ensures a holistic approach that addresses not only infection but also associated complications such as soft tissue involvement and chronic wounds. In addition, with the increase in antibiotic-resistant bacteria, there is an increased emphasis on antibiotic stewardship programs for the management of chronic osteomyelitis (Kliushin et al., 2022; Sananta et al., 2021). Adjusting antibiotic regimens based on culture and sensitivity results and utilizing targeted therapies can help optimize treatment outcomes while minimizing the risk of resistance. A one-health approach must be pursued to prevent this condition from developing further (Adnyana, 2022; Adnyana et al., 2023). This approach contributes to more effective infection control and reduces the overall and indiscriminate burden of antibiotic use (Kliushin et al., 2022; Wassif et al., 2021). To date, researchers have explored innovative therapeutic approaches for the treatment of chronic osteomyelitis of the ankle joint. Regenerative medicine, including the use of growth factors and stem cell therapy, shows promise for promoting bone healing and tissue regeneration (Juliasih & Adnyana, 2023; Liu et al., 2021). In addition, advances in biofilm-disrupting agents and local antibiotic delivery systems offer new avenues for targeted and sustainable treatment strategies

(Caravaggio et al., 2021). As the understanding of chronic osteomyelitis of the ankle joint has increased, the focus on patient-centered care has also increased. Tailoring treatment plans according to individual patient needs, considering factors such as comorbidities and lifestyle, contributes to better overall outcomes (Sutriyawan et al., 2023). Patient education and engagement also play important roles in long-term management, ensuring adherence to prescribed therapy and encouraging active participation in the recovery process.

CONCLUSION

Osteomyelitis is frequently observed in health centers and clinics every day, and its incidence has significantly increased with the increasing incidence of various comorbidities. The incidence of these conditions increases with the number of individuals with diabetes mellitus. osteomyelitis causes inflammation, destruction, necrosis, and neoformation of the bone through direct open wounds or infection of the bone itself. Management depends on the severity of the infection. Proper treatment of diabetes mellitus and selection of antibiotics according to the results of bacterial culture examination, as well as fast and appropriate treatment management, reduce the spread of infection in patients with osteomyelitis to avoid wider disease complications, such as sepsis and death. The principles of osteomyelitis management include optimizing the patient's general condition; performing pharmacological debridement, reconstruction, and stabilization; and completing rehabilitation. Recent insights highlight the importance of multidisciplinary approaches, advanced diagnostic tools, antibiotic stewardship, novel therapies, and patient-centered care in improving the outcomes of individuals affected by this challenging condition in the future. In this study, there are limitations in the form of culture examinations in type C regional hospitals that cannot be carried out because patients and families refuse to be referred to higher health services. As a result, the treatment provided is not in accordance with the causative agent; treatment can be administered only if there is support from smears or slices of the patient's wound, and further management cannot be performed comprehensively. Further research is needed on the determinants that can occur when management is not carried out comprehensively to provide an overview of the community and information on the importance of carrying out further treatment.

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