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Review Article

Handling Osteomyelitis in Patients with sickle cell disease

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Abstract

Hundreds of thousands of people throughout the world suffer from sickle cell disease (SCD), a widely prevalent genetic hematological condition. Osteomyelitis is most often caused by Staphylococcus aureus. Although it can be hard to tell the difference between benign SCD disorders and osteomyelitis, the latter is a dangerous and ultimately incapacitating illness. A thorough assessment of the clinical presentation, laboratory findings, and imaging is necessary for the diagnosis of osteomyelitis. Individuals with SCD may get medicinal or surgical therapies for osteomyelitis; however, in order to achieve the best results, care must be exercised in the preoperative and postoperative choice of antibiotics and maintenance.

Keywords: Sickle cell disease, *Staphylococcus aureus,* Osteomyelitis, Diagnosis, surgical

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Introduction

Osteomyelitis, according to Momodu and Savaliya (2023), is a dangerous bone infection that can be either acute or persistent. Pyogenic organisms that spread through the bloodstream, fractures, or surgery produce an inflammatory process that affects the bone

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and its structures. The assessment and treatment of osteomyelitis are described in this exercise, along with the importance of the interprofessional team in enhancing patient care. According to Hosfstee et al. (2020), osteomyelitis is an infectious disease that affects the bone and bone marrow. In humans, 30% to 60% of cases are caused by *Staphylococcus aureus* (Martí-Carvajal and Agreda-Pérez, 2019), and staphylococci as a group account for about 75% of cases (Walter Martí-Carvajal and Agreda-Pérez, 2019). Hematogenous or traumatic sources are the usual causes of osteomyelitis.

Staphylococcus aureus is the most frequent cause of osteomyelitis (Urish and Cassat, 2020). On the other hand, it is commonly recognized that Salmonella infection frequently causes osteomyelitis in children with SCD. One question that comes up is whether *S aureus* or Salmonella is the most likely cause of infection in these kids overall. Osteomyelitis resulting from direct injection or contiguous spread is either polymicrobial or monomicrobial, whereas hematogenous osteomyelitis is predominantly monomicrobial (Urish and Cassat, 2020). The age of the patient determines which microorganisms are most prevalent in osteomyelitis. The most frequent cause of both acute and chronic hematogenous osteomyelitis in adults and children is *Staphylococcus aureus* (Hofstee et al. (2020). *Staphylococcus aureus* that is resistant to antibiotics is being identified from osteomyelitis patients more frequently (MRSA).

A class of hereditary illnesses known as sickle cell disease, or sickle cell anemia, impact hemoglobin, the primary oxygen-carrying protein in red blood cells. Red blood cells often have a disc shape and are flexible, which allows them to pass through blood vessels with ease. Red blood cells with sickle cell disease usually have a crescent or "sickle" shape because of a gene mutation that alters the hemoglobin molecule. Red blood cells that are sickled can obstruct blood flow to the rest of the body because they are rigid and difficult to move (National Heart, Lung, and Blood Institute, 2024). Mangla et al. (2023) describe sickle cell anemia as an inherited globin chain abnormality that results in hemolysis and long-term organ damage. The most prevalent type of sickle cell disease (SCD) is sickle cell anemia, a lifelong hemolytic anemia condition that causes organ damage, blood transfusions, and pain crises. Our knowledge of the illness has significantly changed since the abnormal sickle-shaped red blood cells (RBCs) were initially described more than a century ago. SCD is an autosomal recessive condition characterized by defective "sickle-shaped" erythrocytes, according to Al Farii et al. (2020). These erythrocytes are more prone to produce vaso-occlusion because of their morphology, which makes them more likely to become stuck in tiny, slowly moving capillaries.

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This article is significant because it can help with clinical outcomes when sickle cell disease (SCD) and osteomyelitis coexist. It can also help understand preventive strategies to improve patient care because it can be challenging to distinguish between sickle cell and osteomyelitis crises in patients. Because osteomyelitis is difficult to diagnose and treat in sickle cell patients, it is a serious healthcare concern. The reason is that it is challenging to differentiate between osteomyelitis and vaso-occlusive disease due to their same symptoms. Patients with sickle cell disease are susceptible to infections from staphylococci and salmonella, which makes treatment challenging. Therefore, to minimize negative health outcomes, effective management calls for more sophisticated diagnostic instruments, focused therapies, and a deeper comprehension of the connection between osteomyelitis and sickle cell disease. Thus, the purpose of this paper is to address the pathogenesis, clinical manifestation, diagnosis, and treatment of osteomyelitis in the population with sickle cell disease. To achieve this aim, the following objectives will be followed:

Objectives

i. Handling Osteomyelitis in Sickle Cell Disease
ii. Case reports
iii. Nursing implications

The connection between sickle cell disease and Osteomyelitis

One of the main reasons for hospitalization and a severe consequence in SCA is bone infection. According to earlier studies, people with SCA become highly vulnerable to uncommon pathogens, with a prevalence of salmonella-caused osteomyelitis being noted.

According to Viñuales et al. (2024), around 13% of cases of osteomyelitis resulted in complications. The morbidity of chronic osteomyelitis combined with the various impacts of hemoglobinopathy results in a decline in quality of life. Furthermore, a multitude of factors contribute to these patients' elevated infection rates. Following infarction, which mostly happens in childhood, and the ensuing fibrosis, hyposplenism is a significant component. A favorable environment is created for bacterial development and dissemination by medullary bone infarction and necrosis. Moreover, patients may be increasingly exposed to specific strains of harmful bacteria as a result of repeated hospital visits (Ahmed et al., 2024).

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Osteomyelitis frequently manifests as an infection of the vertebrae, tibia, and diaphysis of the femur and humerus. Because of its delayed onset, the infection is hematogenous in nature. Salmonella, particularly enteritidis, typhimurium, paratyphi B, choleraesuis, and aureus, is the most often occurring casual organism. *Staphylococcus aureus*, which is present in 10% of individuals with sickle cell-related osteomyelitis, is the second most prevalent casual organism. *Haemophilus influenza, Escherichia coli*, and *Enterobacter spp*. are a few more pathogenic bacterial species (Martí-Carvajal and Agreda-Pérez, 2019). It is thought that gastrointestinal infarction following sickling inside the mesenteric arteries is the source of bacteremia brought on by gram-negative bacteria. Furthermore, the infection frequently spreads directly as a result of the leg ulcers.

Handling Osteomyelitis in Sickle Cell Disease
Pathophysiology
A point mutation on chromosome 11 in the beta-globin subunit gene is the genetic basis of sickle cell disease (SCD). This results in the formation of hemoglobin S by substituting the less polar amino acid valine for the amino acid glutamic acid. According to Eaton et al. (2020), hemoglobin S has a propensity to polymerize when it is deoxygenated, giving erythrocytes a crescent or, more often, "sickle" form. Sickle cell erythrocytes are characterized by a much shorter lifespan than normal erythrocytes and a higher propensity to become stuck in slow-moving venules due to their stiff design (Eaton et al., 2020). Heterozygote carriers of this mutation experience sickle cell trait. The high frequency of the gene in regions where *Plasmodium falciparum* malaria is endemic can be attributed to carriers' relative protection from the deadly disease. However, sickle cell trait carriers typically do not have any clinical symptoms of their sickness. This review focuses on sickle cell disease (SCD), which is inherited recessively.

The abnormal erythrocytes in SCD have the potential to cause acute episodic clinical episodes. Sickle cell buildup in the circulation can obstruct the microvasculature, resulting in bone infarction and triggering inflammatory processes. The splenic, hepatic, renal, neurological, and musculoskeletal systems are among the systems that can be impacted by VOC, often referred to as sickle cell crisis. Children with sickle cell disease (SCD) often have autoinfarction before the age of five, which results in functional hyposplenia. The body's immunological response to encapsulated microbes is weakened as a result. Osteomyelitis is observed to be more common in sickle cell patients when infarcted bone is present (Al Farii et al., 2020).

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Staphylococcus aureus, or *S aureus*, is the most prevalent pathogen linked to osteomyelitis in the general population. When compared to other pathogens recovered from SCD patients, it is also the most prevalent osteomyelitis pathogen in Africa and the Middle East (39% and 62%, respectively). Nonetheless, in the SCD population in America, gram-negative enteric bacilli such *Salmonella spp*. (70%) are more frequently detected than S aureus (16.4%). According to Al Farii et al. (2020), there is a theory that these enteric bacteria originate from ischemia infarction of the bowels during vaso-occlusive (VOC) episodes.

Clinical manifestations

While VOC is up to 50 times more common than osteomyelitis in patients with SCD, the two conditions are almost identical at the acute stage of presentation (Jang et al., 2021). Patients may exhibit a fever and a painful, swollen limb with restricted range of motion in both situations. Osteomyelitis typically affects the diaphysis of long bones, including the humerus and femur, but it can affect any bone. According to Al Farii et al. (2020), in children with sickle cell disease, osteomyelitis was significantly predicted by fever, pain that persisted for at least 24 hours before to symptom presentation, and enlargement of the affected limb. Additionally, compared to patients undergoing a vaso-occlusive episode, patients with osteomyelitis may have had fewer painful areas overall.

Because both osteomyelitis and VOC might have high inflammatory markers (such as C-reactive protein and erythrocyte sedimentation rate) and leukocytosis, laboratory testing is not always reliable in differentiating between the two illnesses. A positive culture from a sample of blood, synovial fluid, or bone is the standard for diagnosing osteomyelitis. The diagnosis of osteomyelitis is not necessarily ruled out, even in the absence of a positive culture. In order to diagnose osteomyelitis in patients with SCD, incorporating imaging investigations is essential because getting bone cultures is a very intrusive procedure and blood cultures commonly return false negative results. Early detection of osteomyelitis is essential to start the right antibiotic treatment and avoid the need for surgery.

Diagnosis

It is challenging to distinguish OM in SCD patients from VOC. Even though VOC is far more prevalent, OM is a diagnosis that is crucial and shouldn't be disregarded (Al Farii et al., 2020; Jang et al., 2021). To direct additional diagnostic testing and treatment, clinical characteristics, laboratory results, and radiographic aspects must be considered jointly.

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The radiographic characteristics listed below have the potential to raise a clinical suspicion of OM.

Radiographs

Plain radiographs are typically reported to be either normal or just displaying soft-tissue edema, periostitis, or osteopenia in the early stages of osteomyelitis and VOC (Vanderhave et al., 2018). On radiographs, the lytic alterations characteristic of osteomyelitis appear at least two weeks after the infection process. Therefore, it is necessary to evaluate other imaging modalities due to plain radiography's low sensitivity and specificity for early detection (Hussain et al., 2022).

Ultrasonography

According to Al Farii et al. (2020), ultrasonography is a quick and noninvasive test that can reveal acute extraosseous pathological findings and/or periosteal elevation in osteomyelitis. The sensitivity of ultrasonography has been demonstrated to be as high as 76% to detect osteomyelitis in SCD patients with an increased C-reactive protein and/or white cell count at admission (Hussain et al., 2022). It has been noted that a subperiosteal fluid accumulation >4 mm is a strong predictor of osteomyelitis, even though subperiosteal fluid can also be detected in VOC (Al Farii et al., 2020).

The aforementioned results are suggestive indicators of osteomyelitis, but they can be useful instruments when combined with solid clinical data. Ultrasonography has grown in popularity as a portable, low-cost method of detecting early indirect symptoms of osteomyelitis in patients with sickle cell disease (SCD), particularly in low-resource settings.

Magnetic Resonance Imaging

According to Stokesbury (2021), magnetic resonance imaging (MRI) is the preferred imaging modality for osteomyelitis diagnosis because of its reported 100% sensitivity. As early as 24 hours after the infection starts, early pathological signs can be identified, such as bone marrow edema. A localized marrow abnormality with decreased signal on T1-weighted images and increased signal on T2-weighted images is the typical MRI presentation of bone marrow edema. Similar MRI signaling properties (decreased on T1, but enhanced on T2) are also seen in other secondary findings of osteomyelitis, such as soft-tissue collections, cellulitis, and cortical bone sinus tracts. Without running the risk of ionizing radiation, MRIs can be used consecutively and linked with clinical data to assess the response to antibiotic medication.

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When gadolinium is administered, the areas of infection exhibit significant contrast enhancement, which can increase the accuracy of MRIs.3. Gadolinium contrast imaging is usually used in conjunction with MRI to help detect and define problems such abscesses or sinus tracts, which may go unnoticed otherwise, unless it is contraindicated (i.e., reduced renal function).

Since MRI is known to have lower specificity than sensitivity (75% to 96% vs. 82% to 100%), it is critical to match the clinical presentation with the findings. This is due to the fact that many OM and VOC MRI findings overlap and there isn't yet a trustworthy imaging characteristic that can be used to distinguish between the two conditions. According to Weaver et al. (2022), MRI results may overstate the extent of the infection or be confused with other diseases including cancer. Lastly, while magnetic resonance imaging (MRI) is an effective diagnostic tool, it is still expensive and may not be appropriate for patients with metal implants, small children, or instances where a vast portion of the body needs to be imaged.

Radionuclide Imaging

When the osteomyelitis diagnosis is still ambiguous, radionuclide scans may be performed (Bury et al., 2021). Since MRI has a very high diagnostic accuracy, it is utilized far less frequently. Nuclear medicine scans should, in general, only be performed in certain situations where the advantages outweigh the risks due to the high radiation dose involved. Clinicians can distinguish between OM and VOC even though it may be challenging to do so based just on clinical picture in patients with SCD. Combined, clinical features, laboratory results, and radiological workups will aid make this distinction.

Management

A combination of medications with sufficient antibacterial coverage and, if required, surgical care with débridement and wound repair constitute the ideal treatment for osteomyelitis. Optimizing people with sickle cell disease (SCD) necessitates comprehensive patient care, which includes proper diet, quitting smoking, and attending to underlying chronic medical issues, in addition to medicinal and surgical management.

Medical Management

Until OM is diagnosed, initial care usually consists of IV hydration, oxygenation, and pain treatment. To improve the chance of finding a pathogen, suitable cultures should be acquired prior to administering antibiotics, unless the patient exhibits hemodynamic

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instability and indications of sepsis. If OM is not the diagnosis, then empiric antibiotics can be stopped. Parenteral antibiotic therapy for osteomyelitis typically lasts between four and six weeks. Studies on longer courses of parenteral or oral antibiotics have not revealed any better results than six weeks of treatment. A peripherally implanted central catheter line may be used to deliver outpatient intravenous antibiotics to patients who are judged stable enough to be discharged.

In the SCD population, *S aureus*, Salmonella, and other gram-negative bacilli are the most frequently isolated microorganisms from osteomyelitis patients. Antibiotic selection should ideally be guided by the findings of a positive blood culture, biopsy, or aspiration. According to Al Farii., (2020), there is currently insufficient data to guide the use of antibiotics for patients with SCD who also have osteomyelitis. As a result, it is crucial to have a case-by-case conversation with an infectious disease specialist to decide on the best antimicrobial medication and duration of treatment. In order to guarantee that the previously stated pathogens are covered, Arumugham et al. (2023) advised using a third-generation cephalosporin as the first line of treatment for osteomyelitis, whether it was proven or suspected. Vancomycin and ciprofloxacin together make sense as a further combination for empirical antibiotic treatment (George et al., update 2019). To determine which antibiotic is best for osteomyelitis in the SCD population, more research is required.

Surgical Management

An MRI can be helpful in assessing how osteomyelitis responds to antibiotic therapy. Surgical débridement and antibiotic therapy are necessary for areas of necrotic bone or residual or nonresponsive infection (George et al., update 2019). For best results, an orthopedic surgeon must evaluate the patient and their most recent MRI. Surgical management may not always be possible in compromised hosts. In cases where the host's condition is extremely compromised and operating would not be beneficial, the only available therapy option can be nonsurgical methods such suppressing antibiotics. Amputation might be required as a life-saving measure in extreme circumstances (Arumugham et al., 2023).

Following surgical débridement to remove necrotic and infected material, either direct closure or flap covering is used to cover the soft tissues in cases of osteomyelitis. Usually, intraoperative cultures are sent to identify the organism that is causing the problem. It is best to stop antibiotics for at least two weeks prior to débridement if a patient started empiric antibiotic therapy and is no longer critically sick (i.e., shows no signs of sepsis or

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soft-tissue infection). This makes microbiologic identification more accurate (Al Farii et al., 2020).

Bone débridement is carried out up till punctate bleeding—also referred to as the "paprika sign"—is discovered (Al Farii et al., 2020). Margin of at least 5 mm is advised in immunocompromised individuals, such as the SCD population, to lower the chance of recurrence. Local antimicrobials can be applied directly to the infection site during débridement using either absorbable (like calcium sulfate beads) or nonabsorbable (like polymethyl methacrylate) carriers. These serve as a temporary dead space maintainer and sterilization tool, however after two to four weeks, they can be replaced with a cancellous bone graft. Skeletal stability may need to be improved during the healing phase in order to lessen the strain on the afflicted bone region and the surrounding soft tissues. Since internal fixation tends to get secondary infections, external fixation is often advised (Al Farii et al., 2020).

Either direct closure or flap coverage can be used to achieve sufficient soft-tissue coverage of the bone following débridement. When surgical surgery leaves a minor defect that is easily wrapped around the soft tissues and bone, then direct closure is the chosen course of action. Large soft-tissue defects or situations where tendons, joints, or bones may be visible can benefit from local muscle flaps or free flaps because they promote vascularization, which enhances the healing environment. This enhances the administration of antibiotics and introduces natural host defense mechanisms (Al Farii et al., 2020). For the best outcome when flap covering is required, speaking with a plastic surgeon is advised. It is usually advised to close the wound completely because subsequent intention healing could result in the development of avascular scar tissue in the defect.

Induced membrane (Masquelet) approach was adopted more recently to treat bone abnormalities following osteomyelitis débridement (Al et al., 2021). A cement spacer is first inserted into the flaw. The polymethyl methylacrylate spacer induces Osteomyelitis by releasing osteoprogenitor cells and inhibits the formation of scar tissue in the defect. Six to eight weeks after the initial procedure, a second procedure is carried out to precisely cut the induced membrane and replace the spacer with an autologous bone graft (Gehweiler et al., 2021). Using a reamer/iIrrigator/aspirator (RIA) system, Gehweiler et al. (2021) reported extracting this graft material from the femoral intramedullary cavity. Since the Masquelet approach is relatively new, more research is required to ascertain its effectiveness in attaining bone union and eliminating infection. According to a systematic

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study by Hoit et al. (2021), 18% of patients needed reintervention due to infection persistence or nonunion, and nearly 50% of patients experienced sequelae (superficial or deep surgical site infections).

Perioperative Consideration

When individuals with sickle cell disease (SCD) have orthopaedic intervention, the risk of complications is higher than when people without SCD undergo identical procedures.

Hemoglobin S level (HbS%), oxygen saturation, liver function, renal function, and serial hemoglobin are all evaluated preoperatively in patients undergoing transfusion. Using sickle-negative blood, simple transfusion therapy—also referred to as conservative transfusion—raises hemoglobin levels to 10 g/dL. It has been demonstrated that these results are comparable to those of aggressive transfusion, which aims to lower the HbS% to less than 30%. Another preoperative transfusion method is exchange transfusion, which entails taking the patient's sickled blood and substituting it with red blood cells that have been packed by a donor. According to studies, exchange transfusion produces results comparable to those of simple transfusion, but it necessitates the transfusion of a larger volume of blood and has a higher incidence of transfusion-related problems (Hall et al., 2022).

Patients with SCD are more likely to get VOC and acute chest syndrome (ACS) when under general anesthesia (Al Farii et al., 2020). Fever and respiratory symptoms accompanied by newly discovered pulmonary infiltrates on a chest radiograph are signs of acute coronary syndrome (ACS), a potentially fatal illness caused by blockage of the pulmonary vasculature. As part of the initial therapy, bronchodilators, empiric antibiotics, pain control, extra oxygen, and hydration management are necessary (Yawn et al., 2021). When extra oxygen is given but the hypoxemia still becomes worse, immediate transfusion therapy is necessary. Patients with SCD should have close monitoring of their blood pressure, oxygen saturation, and heart rhythm throughout surgery. Intraoperative warming methods (warming blankets) are beneficial because they also raise the risk of hypothermia (Wang et al., 2021).

SCD patients are advised to employ incentive spirometry and chest physical therapy following surgery in order to avoid ACS. Additionally, appropriate IV antibiotics are administered, taking into account the sensitivity of the infected organisms in particular. Lastly, IV hydration and more oxygen are essential to preventing a vaso-occlusive crisis. It is also advisable to think about starting routinely prescribed drugs like L-glutamine or hydroxyurea again at this point. According to Yawn et al. (2021), patients with sickle cell

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disease (SCD) should take hydroxyurea at their regular dosage while in the hospital, unless they have secondary cytopenia or are nursing a baby.

Treatment Management

Whereas osteomyelitis brought on by direct injection or contiguous spread is typically polymicrobial or monomicrobial, hematogenous osteomyelitis is predominantly monomicrobial. The age of the patient determines which microorganisms are most prevalent in osteomyelitis. According to Zhang et al. (2022), *Staphylococcus aureus* is the most frequent cause of both acute and chronic hematogenous osteomyelitis in adults and children. It is important to take immunocompromised individuals and less common infections into account in the right epidemiological context. These include Candida species; fungi like Blastomyces, Coccidiodes, Cryptococcus, and Aspergillus; nontuberculous mycobacteria (Mycobacterium avium intracellulare, Bacille Calmette-Guerin, which may complicate intravesical therapy for bladder cancer); and Mycobacterium tuberculosis, which can spread from the lungs to the spine. Actinomyces and Sporothrix infections typically occur after a traumatic inoculation. While Brucella and Salmonella are associated with spinal infections, *S. aureus* and Salmonella are linked to hematogenous osteomyelitis in sickle cell illness (Zhang et al., 2022). *Pasteurella multocida* or *Eikenella corrodens*, which are found in bites from humans or animals, may be linked to HIV-related osteomyelitis, as well as *Bartonella henselae*.

The management of osteomyelitis necessitates the cooperation of numerous surgical and medical disciplines. Prolonged antibiotic use and surgical infection containment are the two essential components of therapy. Since antibiotics do not readily permeate into infected fluid collections such as abscesses and wounded or necrotic bone, surgical debridement of all diseased bone is frequently necessary (Zhang et al., 2022). Therefore, where practical, the excision of necrotic tissue and bone is advised. The degree of the infection can be determined before to surgery with the use of imaging modalities like MRI, but it can still be challenging for the surgeon to ascertain during surgery whether all necrotic bone and tissue have been successfully removed.

In addition, it is critical to control diabetes mellitus, revascularize the affected limb prior to surgical intervention if there is evidence of significant peripheral vascular disease, and address other host factors such as tobacco use, malnutrition, chronic hypoxia, immunodeficiency states, chronic lymphedema, and peripheral neuropathy that may impede wound healing (Zhang et al., 2022).

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The mainstay of osteomyelitis treatment is long-term antibiotic use. If culture and sensitivity results are not available, it is permissible to begin empiric antibiotic treatment (Momodu and Savaliya, updated 2023). However, the results of these tests should ideally guide antibiotic treatment. Vancomycin (15 mg/kg IV every 12 hours) combined with either a beta-lactam/beta-lactamase inhibitor combination (e.g., piperacillin/tazobactam 3.375 IV every 8 hours) or a third-generation cephalosporin (e.g., ceftriaxone 2 gm IV daily) is a widely used broad-spectrum empirical antibiotic regimen against both gram-positive and negative organisms, including MRSA.

Case reports

According to Mehrabani et al. (2019), sickle cell disease is an inherited autosomal recessive hemoglobinopathy. Acute abdominal pain is the cause of hospitalization in 10% of patients with sickle cell disease and usually occurs during vaso-occlusion or distal tissue ischemia. Determining the etiology of abdominal pain is very difficult in these patients because it is associated with several rare diagnoses, such as pancreatitis and splenic abscess in some patients. We represent a 14-year-old boy with sickle cell disease who was hospitalized due to acute abdominal pain and indicated multiple and scarce disturbances in the spleen and hepatobiliary system (Mehrabani et al. (2019).

Yolande et al. (2021) reported the case of a three-year-old SCA girl who appeared incapable of bearing weight in a feverish environment in Cameroon. After a number of biological and imaging tests, the original diagnosis of VOC was modified to include both a right distal femoral osteomyelitis and a left chronic tibial osteomyelitis. Following surgical debridement and drainage, fever and leg pain started to subside nine weeks later. In low-income nations, osteomyelitis linked with sickle cell disease (SCD) is a deadly and terrible illness that mimics a volatile organic compound (VOC). For this reason, a higher suspicion index is advised. Yolade et al. (2021) state that in order to quickly begin multidisciplinary treatment for individuals with homozygous sickle cell disease, it is crucial to take this into account at an early stage. Reducing morbidity and mortality would be substantially aided by adequate investigations, suitable antibiotic medication, and timely surgical intervention.

Nursing implications

Salvador and Wagner (2022) suggest that efficient treatment of osteomyelitis requires teamwork among several medical and surgical fields. When it comes to managing osteomyelitis in patients with sickle cell illness, nurses' roles are not implausible. Nurses

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support patients in their efforts to promote bed rest, evaluate their nutritional needs, administer antibiotics and pain medications as directed, monitor and dress wounds as directed, help patients get out of bed, provide deep vein thrombosis and pressure sore prophylaxis, educate patients about medication compliance, enhance muscle strength and function, engage social workers in home care, and provide other patient needs (Momodu et al., updated 2023).

Since antibiotics can only partially treat abscesses and damaged or necrotic bone, surgical debridement of the entire affected bone is frequently required. Necrotic tissue and bone excision may therefore be necessary. The patient will receive antibiotic medication administration and education from the nurse. Long-term antibiotics will be provided if surgical debridement is not an option because of the infection's location (such as pelvic osteomyelitis). Patients need to be made aware of the length of therapy and the significance of following the prescribed course of action. This reduces the chance of recurrence and aids in adequate wound healing.

The nursing care plans associated with osteomyelitis involve inadequate assessment of tissue. Edema, thrombosis, tissue degradation, abscess formation, and vascular enlargement can all contribute to ineffective tissue perfusion in osteomyelitis. Nursing diagnosis, which comprises evaluations and interventions, need to be provided by a nurse (Salvador and Wagner, 2022). As an illustration of a nursing intervention's steps (Haws et al., 2024): Evaluation of osteomyelitis in a sickle cell disease patient

i. Examine the area for indications of infection and inflammation
ii. ii. Track analgesic response and pain intensity
iii. iii. Look for indications of systemic infection or sequelae
iv. iv. Evaluate the patient's capacity to carry out activities of daily living

Nursing Interventions

i. Controlling infections: Give recommended antibiotics and keep an eye on their efficacy.

   Justification: To address the underlying infection and stop it from spreading

ii. Pain management: Give analgesics as directed and implement pain alleviation techniques.

   Justification: To reduce pain and enhance the patient's comfort and range of motion.

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iii. Wound care: Use the proper wound care methods to treat any surgical wounds or exposed regions.

Justification: To encourage recovery and avert reinfection.

iv. Patient Education: Provide information on the significance of wound care, infection indicators, and medication adherence.

Justification: To enable the patient to take care of themselves and identify problems early on.

v. Mobility Support: Promote sensible exercise and, if required, the use of assistive technology.

Justification: To preserve muscular and joint strength.

Evaluation for Osteomyelitis in Sickle cell patients

i. Keep an eye out for pain relief and infection resolution.
ii. Evaluate the healing of any surgical sites or wounds.
iii. iii. Assess the patient's compliance with the prescribed course of action and comprehension of their ailment.
iv. iii. Keep an eye on the preservation or enhancement of your physical mobility

Conclusion

Although osteomyelitis has been defined differently by several writers, it is ultimately understood to be an infection of the bone. Furthermore, a class of hereditary illnesses known as sickle cell disease impact hemoglobin, the primary oxygen-carrying protein in red blood cells. The most common cause of osteomyelitis in children with sickle cell disease (SCD) is *Staphylococcus aureus*, which can lead to problems. Recurrent hospital visits may expose most people to ever more strains of specific dangerous germs. The second most common accidental pathogen is *Staphylococcus aureus*, which is found in 10% of patients with osteomyelitis associated to sickle cell disease. The pathophysiology, diagnosis, radiography, ultrasonography, magnetic resonance imaging, radionuclide

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imaging, medical care, surgical management, perioperative consideration, and therapeutic management are all covered in this article on handling osteomyelitis in sickle cell disease. Regarding the nursing implications, it is proposed that collaboration between multiple medical and surgical specialties is necessary for the effective treatment of osteomyelitis in sickle cell disease patients.

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