

Osteomyelitis Presenting as Swollen Elbow in A Child: A Case Report

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ABSTRACT

Background: Pediatric osteomyelitis is a severe disease that requires early diagnosis and prompt treatment to minimize the potential risk of developing severe complications, including septic arthritis. Identifying clinical features and applying relevant diagnostic tools are necessary to yield an early diagnosis. Osteomyelitis may show various clinical presentations depending on the etiology, especially in children, making the diagnosis difficult. Therefore, a thorough clinical history, detailed physical examination, and a high index of suspicion are imperative to early diagnose this condition. One should be aware of the evolving epidemiology, emergence of antibiotic-resistant strains, and requirement of specialized targeted therapy to tackle the disease.

Case presentation: Here, we present a case of an eight-year-old male patient with an extra-articular abscess around his left-elbow osteomyelitis, which was clinically confused with septic arthritis. The causative organism was methicillin-resistant *Staphylococcus aureus* (MRSA), which was resistant to most of the antibiotics but sensitive to linezolid. Given that pediatric osteomyelitis has a higher chance of articular extension, prompt treatment is essential to avoid permanent damage to the joint.

Conclusion: In conclusion, considering the rarity of MRSA-induced intra-articular osteomyelitis, a high index of suspicion is needed to diagnose it as soon as possible clinically and radiologically. This disease should be considered as a differential diagnosis in patients with painful joint swelling.

Keywords: Juxta-articular osteomyelitis, MRSA, Osteomyelitis, Septic Arthritis.

INTRODUCTION

Osteomyelitis is a bone infection that is frequently caused by bacteria, leading to necrosis and bone destruction. However, in immunocompromised children, it can also be caused by fungal infiltration. Osteomyelitis is classified into three major categories according to the duration of symptoms and their progression: acute (<2 weeks), subacute (between 2 weeks and 3 months), and chronic (>3 months) [1].

Osteomyelitis commonly spreads through hematogenous seeding of the pathogens. Other potential sources of spread include penetrating injury, surgery, trauma, and nearby infection, exposing the bone to an adjacent contaminated environment. It commonly affects the metaphysis of long bones in the upper and lower limbs [2].

Pediatric osteomyelitis is a severe disease that requires early diagnosis and prompt treatment to minimize the potential risk for severe complications, such as septic arthritis. Identifying clinical features and applying relevant diagnostic tools are important for an early diagnosis. However, the occurrence of atypical clinical features is challenging for clinicians [3]. For

Instance, our patient in this case presented with osteomyelitis near the joint.

CASE REPORT

We present a case of an eight-year-old male Saudi patient with no known medical condition who presented to the Emergency Department (ED) of King Fahad Hospital in Al-Hofuf in the eastern province of Saudi Arabia after falling from stairs 2 days ago. He complained of pain in the left elbow, inability to move the joint, and a fever of 39.5 °C measured at home. Neonatal and family histories were uneventful, and no evidence of any recent infections was found.

On physical examination, he was febrile, conscious, alert, and oriented; other vital signs were also stable. Local physical examination revealed a hot and reddish left elbow with tenderness at the anterior aspect of the proximal forearm and a restricted range of motion associated with pain. The patient kept his forearm in a neutral position. The ED physician who initially assessed him suspected septic arthritis based on an X-ray of the left elbow (Figure 1). Thus, he was referred to an orthopedic on-call.



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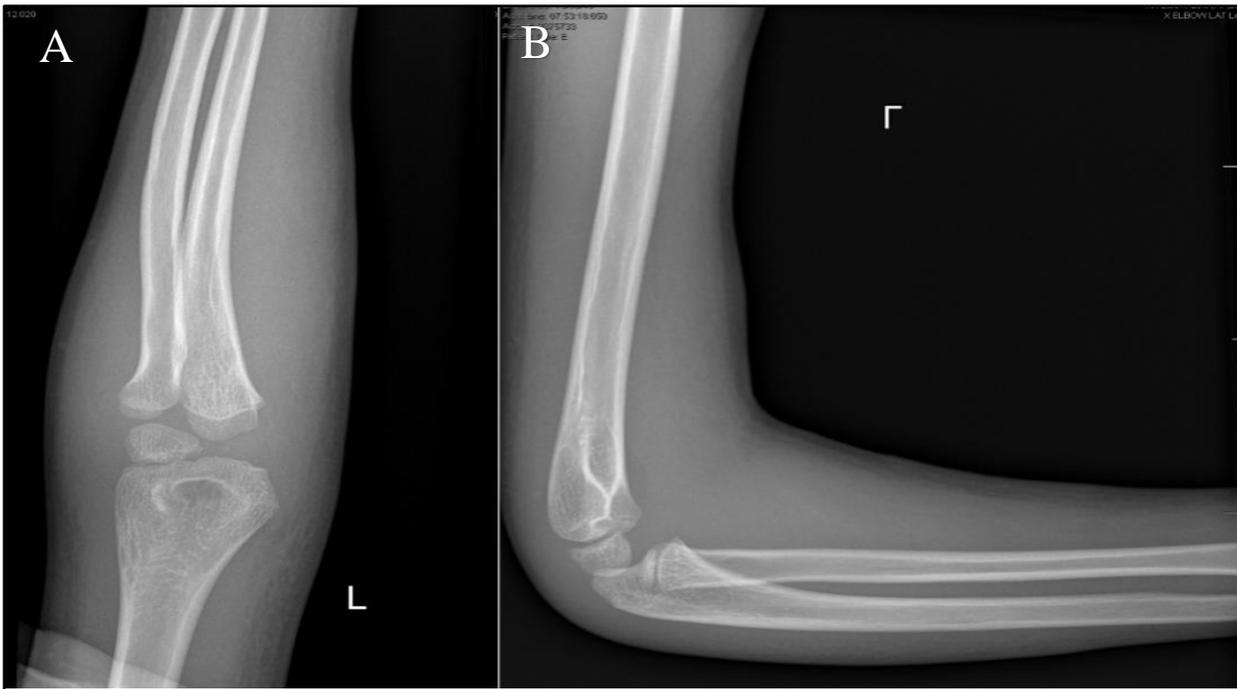


Figure 1 : X-ray of the left elbow at the time of presentation in the emergency department, **A:** Anteroposterior and **B:** lateral view showing soft-tissue swelling. No fracture line and no dislocation or subluxation is seen. An ultrasound of the left elbow was done urgently, but no any effusion or pathology in the joint was detected. Next, he underwent joint aspiration, which also yielded no result. Finally, a magnetic resonance imaging (MRI) of the affected region (Figure 2) was performed, showing an extra-articular abscess with no joint involvement.

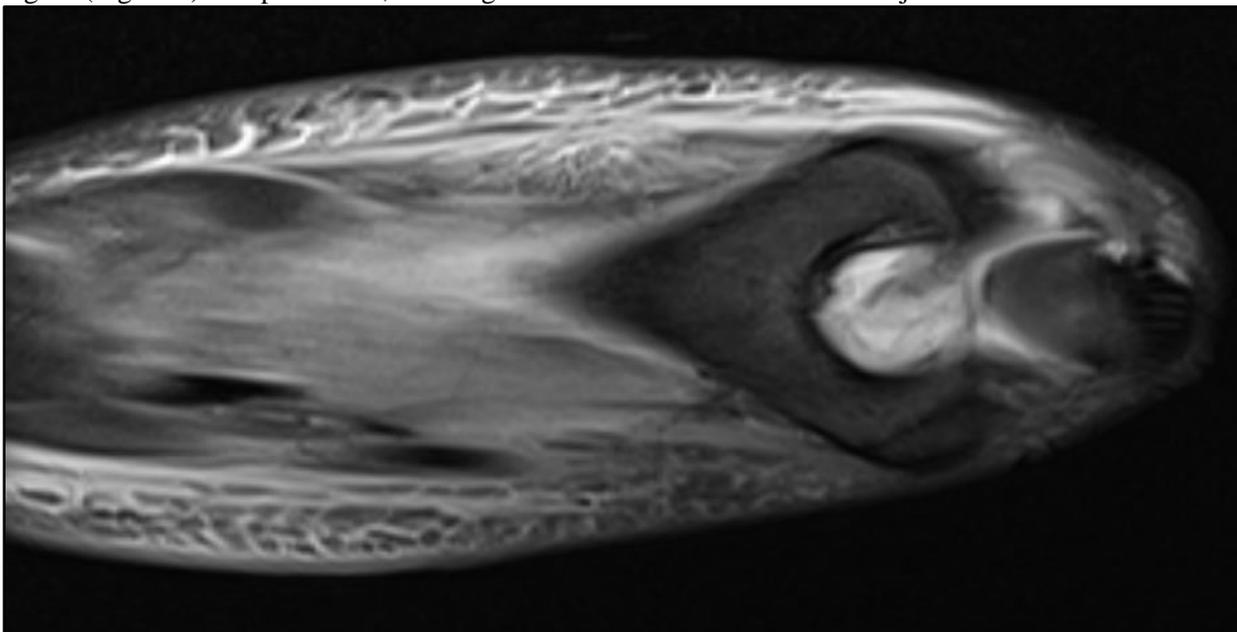


Figure 2: MRI of the left elbow (axial cut) showing considerable joint effusion with synovial enhancement associated with periarticular soft-tissue edema and diffuse subcutaneous edema. Relative enhancement was noted at the radial head epiphysis as well as the metaphysis together with relative widening and fluid signal noted at the physis, suggesting septic arthritis vs. osteomyelitis

Hence, the patient was diagnosed with left-elbow osteomyelitis and was admitted for further management. Surgical intervention through incision and drainage was then performed, excreting frank pus. Subsequently, samples of this discharge were collected for culture and sensitivity analysis.

Necessary laboratory examinations were also performed, and infectious disease consultation was arranged. On the first postoperative day, the patient appeared well, his temperature decreased, and the pain subsided significantly. The wound was kept open for drainage (Figure 3). His dressings were changed every other day, and repeated X-ray was performed (Figure 4).



Figure 3: Clinical picture of the left elbow postoperatively, showing a surgical wound sutured with an opening kept for draining.



Figure 4: Postoperative X-ray of the left elbow: **A:** Anteroposterior and **B:** lateral view showing improved soft-tissue edema around the elbow compared with previous preoperative X-ray.

After a few days, the patient was discharged from the hospital on oral antibiotics (amoxicillin/clavulanate potassium [Augmentin]) and subsequently followed up as an outpatient. After 2 days, the patient appeared better, given that the pain significantly lowered and the left-elbow range of motion gradually improved. The microbiology result revealed the presence of methicillin-resistant *Staphylococcus aureus* (MRSA). Thus, the antibiotic was changed to linezolid according to the drug sensitivity result.

In another follow-up, the X-ray of the left elbow revealed apparent changes, including periosteal reaction suggestive of suspected osteomyelitis. Therefore, the patient was readmitted. Bone drilling and culture were performed. Despite the intake of linezolid, microbiological examination still showed MRSA. Nonetheless, with hospital care, the patient's condition markedly improved clinically. Eventually, the patient was discharged with oral linezolid therapy.

After 2–3 days, patient's condition was uneventful, with no complaint of recurrent fever. No tenderness, swelling, redness, nor hotness was also noted on the affected area, except for a limited range of motion caused by stiffness. He was advised to undergo physiotherapy to regain his full range of motion.

DISCUSSION

Acute osteomyelitis is a severe bone infection occurring predominantly in children. Generally, the pathogen reaches the bone through the hematogenous route. Subacute or chronic osteomyelitis commonly occurs in adults and generally develops around damaged soft tissue after an open bone injury. *S. aureus* is most common in patients with acute hematogenous osteomyelitis. Other organisms that usually cause chronic osteomyelitis are *Staphylococcus epidermidis*, *Pseudomonas aeruginosa*, *Serratia marcescens*, and *Escherichia coli* [14]. In our case osteomyelitis develop followed by trauma. In children, multiple organisms can be identified, most commonly *S. aureus*. In neonates, group B *Streptococcus* is the most common isolate, followed by *Kingella kingae*. [15].

Any bone can be affected by any category of osteomyelitis, resulting in either acute or chronic osteomyelitis. Thus, a multidisciplinary approach by various specialties, such as orthopedics, infectious diseases, and vascular surgery, is needed [16].

Osteomyelitis may show multiple clinical presentations depending on the etiology, especially in children, making the diagnosis challenging. Local symptoms such as redness and swelling with a dull pain at the involved site may be the presenting symptoms, which may be accompanied by constitutional symptoms including fever and chills. The area may be warm to touch, and the range of motion of the nearby joints may be affected. These symptoms may present first within 2

days of infection and then gradually evolve into a full-fledged manifestation of acute osteomyelitis within 2 weeks [7]. Acute osteomyelitis may be further complicated by septic arthritis, especially when the infective foci are near to a joint. Septic arthritis particularly affects the elbow, shoulder, and hip joints after an infection in the proximal radius, humerus, and femur [8]. Thus, a thorough clinical history, detailed physical examination, and a high index of suspicion are imperative to early diagnose this disease [7]. In subacute osteomyelitis, the presentations may be more gradual, reaching over several weeks. Patients may have generalized malaise, mild pain, and slight fever [8]. Our patient presented with pain in the left elbow, fever & inability to move the joint. Local examination revealed a hot and red left elbow with tenderness at the anterior aspect of the proximal forearm with a restricted range of motion due to pain.

Chronic osteomyelitis presents over an even longer duration of time. Local symptoms are the same as acute osteomyelitis. During the physical examination, sensory function and peripheral vasculature must be assessed. A radiological imaging study of the affected bone and histopathological and microbiological examinations of the affected tissue may also be required for guiding therapeutic decision-making [8].

Many risk factors increase one's vulnerability to osteomyelitis. Diabetes is an important risk factor, considering the significant defect in wound healing. Other autoimmune diseases such as rheumatoid arthritis, systemic lupus erythematosus, peripheral vascular disease, and peripheral neuropathy [1]. In our case, no history of the above diseases was seen.

Intra-articular osteomyelitis and septic arthritis are most common in children below 2 years of age. In younger patients, the joint capsule extends beyond the epiphyseal plate, allowing a direct route of spread from the metaphysis to the joint space. The transphyseal vessels may also permit a direct hematogenous route. Although any bone can be affected, the metaphysis of long bones, such as femur, tibia, and humerus, is particularly common, whereas the radius and ulna are rarely affected in children (<3%). Septic arthritis can occur in association with osteomyelitis, making the diagnosis and management even more challenging [9]. Clinically our case presented with features of septic arthritis but on MRI examination showed an abscess around the joint capsule which in not involve the joint.

Septic arthritis presents with swelling and pain on the movement of the affected joint along with effusion in the joint space. If the source of bacteremia by *S. aureus* is unknown, intra-articular osteomyelitis should be considered and searched. Intra-articular osteomyelitis and septic arthritis caused by MRSA are more severe and aggressive [9,10]. Early diagnosis and treatment with proper antibiotics are essential to prevent disease spread and complications. Moreover, MRSA-induced intra-articular

osteomyelitis may require prompt surgical intervention for proper management ^[11]. Antimicrobial therapy combined with surgical debridement of the necrotic tissue and drainage of pus forms the mainstay of treatment in osteomyelitis and septic arthritis. If treatment is delayed or inadequate, chronic osteomyelitis or permanent destruction of involved joints may ensue ^[9].

The use of sensitive MRI techniques suggested that the incidence of intra-articular osteomyelitis associated with septic arthritis in children below 2 years old is 37%, which is higher than that in 10-year-old children (17%), as in our case ^[12]. Until proven otherwise, septic arthritis should only be presumed in any patient with metaphyseal osteomyelitis having joint effusion on radiology because the reaction may not be clearly distinguished from pyogenic joint effusions through radiological findings only ^[13].

In 2014, the incidence of intra-articular osteomyelitis had been reported to have increased in the past 20 years, but this increment can be explained by the improvement of diagnostic methods. Early MRI investigations are now widespread, and molecular biology techniques have dramatically reduced 50% of the number of suspected cases of intra-articular osteomyelitis ^[14,15].

The incidence of osteomyelitis during the growing stage is approximately 2.9 per 100,000 children, with declining values in industrialized countries. The incidence rate peaks between 5 and 15 years of age ^[16]. In Riyadh, 75 patients aged between 9 days and 12 years were investigated from January 1997 to December 2006, with male children accounting for 67%. In this previous study, the highest incidence rate of osteomyelitis was during the first year of life, and *S. aureus* was the most common etiological pathogen. Radiographic abnormalities were found in 54% of patients, and MRI was conclusive in all osteomyelitis cases. Furthermore, lower-limb bones were involved in 76% of cases. These data from Saudi Arabia are well in accordance with the worldwide data ^[17]. Severe acute osteomyelitis is extremely prevalent in sickle cell disease, and the predominant causative agent is *Salmonella* species in children. However, in adult patients with sickle cell disease, other organisms should be covered when treating acute osteomyelitis ^[18].

Chronic osteomyelitis of the ankle involving the distal tibia and talar dome was observed in an immunocompromised patient on hemodialysis ^[19]. Furthermore, acute osteomyelitis of the patella was found in a 10-year-old female complaining of knee pain ^[17]. Recently, **Stanson** presented a case of osteomyelitis with septic arthritis in the left ankle in a 13-year-old male with a history of fever and pain for 6 days; they treated the patient with antimicrobials and surgical intervention ^[20]. A 22-year-old paraplegic man developed recurrent osteomyelitis of the right elbow, necessitating extensive

bony debridement by the orthopedic surgery team. A successful free muscle flap arthroplasty was performed and it was successful ^[21]. A case osteomyelitis of the olecranon process was reported in acquired immune deficiency syndrome (AIDS) patient, who developed swelling of the left elbow four weeks after *Staphylococcus aureus* septicemia ^[22].

Our case presents the typical clinical features of septic arthritis of the elbow. The patient had a fever and painful restricted movement of the elbow joint. The hematological examination detected leukocytosis and elevated C-reactive protein level, indicating infection. However, MRI revealed that the abscess was present outside the joint and that the elbow joint was not involved; thus, the diagnosis of septic arthritis was excluded. A diagnosis of osteomyelitis was made according to the clinical presentation and investigatory findings, although it presented with the atypical site of involvement.

CONCLUSION

Intra-articular osteomyelitis could be missed due to its rarity and confused as septic arthritis. Careful suspicion is required to manage it correctly as early as it is supposed to be, MRI is a sensitive tool to make the diagnosis, a physician should be familiar with intraarticular osteomyelitis as one of the differential diagnoses of swelling around the joint.

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