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## Acute osteomyelitis and varicella-zoster infection: Is there a relation?

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### Abstract

Varicella zoster is the virus responsible for the common pediatric illness known as chickenpox. Although it has a benign course in most children, complications are possible. Musculoskeletal complications are extremely rare but very dangerous, since they can question the viability of the limb or even be life threatening. In this case report we present a clinical case of a young girl who develops acute osteomyelitis on the ulna after the onset of varicella zoster infection.

**Keywords:** Acute osteomyelitis, varicella zoster, pediatric infection, antibiotherapy, group A beta-hemolytic streptococci

### Introduction

Chickenpox is a common pediatric disease, whose etiology originates from the Varicella zoster virus, with a benign course in most cases [1].

It often occurs before the age of 10 and almost everyone recovers without sequelae [1, 2]. Only 2 to 6% of patients with varicella infection require hospitalization [3].

Complications typically occur in immunosuppressed patients and include secondary bacterial infections, particularly of the skin and soft tissues, lower respiratory tract, myocarditis, pericarditis and encephalitis. Musculoskeletal complications are extremely rare, comprising only 2% and include abscesses, pyomyositis, necrotizing fasciitis, septic arthritis and osteomyelitis [1, 2, 4, 5, 6].

Acute osteomyelitis secondary to chickenpox is uncommon and constitutes 0.02% of all complications secondary to Varicella zoster infection [9]. The most common pathogen in these particular cases is group A Streptococcus [7].

Between 1935 and 1989, only 11 cases of osteomyelitis secondary to varicella were described in the literature [4].

### Case Report

A 5-year-old girl presented in the emergency department with pain, edema and erythema of the right forearm with functional limitation. Good peripheral perfusion of the right upper limb was observed. Four days ago, she had a fever and generalized vesicles, and was diagnosed with chickenpox.

The blood tests revealed no leukocytosis and an increase in c-reactive protein of 26.58 mg/dL and erythrocyte sedimentation rate of 109 mm/hour. An echocardiogram was done and ruled out endocarditis. A soft tissue ultrasound identified diffuse tissue edema without abscesses or collections.

An empiric antibiotic scheme with ceftriaxone 78 mg/kg/day, clindamycin 43 mg/kg/day and acyclovir 1500 mg/m<sup>2</sup> was started.

Apyrexia, clinical and analytical improvement was found at the eighth day of antibiotic therapy. The radiological study was negative.

After two weeks of antibiotics, the clinical condition worsened again, with swelling on the ulnar aspect of the forearm. A soft tissue ultrasound revealed a collection measuring 15 cm by 8 cm and the magnetic resonance imaging showed an exuberant subcortical abscess with

cortical rarefaction in the context of an acute osteomyelitis extending to the ulna. The X-ray revealed cortical rarefactions of the diaphysis of the ulna, suggestive of osteomyelitis.

She was transferred to our hospital; at the time the analytical parameters showed a sedimentation rate of 106 mm/hour and c-reactive protein of 0.19 mg/dL. An urgent surgical debridement of the ulna and cast immobilization was performed.

Group A Beta-Hemolytic Streptococci were isolated in blood cultures and a new course of intravenous antibiotic therapy with sodium and potassium penicillin 380,000 U/kg/day was initiated. During hospitalization, she improved clinically and analytically although a pathologic fracture of the distal metaphysis of the ulna was diagnosed.

She was discharged with no leukocytosis, a sedimentation rate of 34 mm/h and c-reactive protein of 0.58 mg/dL. She completed a four-week course of intravenous antibiotic therapy and four weeks of oral amoxicillin 100 mg/kg/day.

Regarding the pathological fracture, consolidation was observed at ten weeks of cast immobilization.

She maintained a follow up in the outpatient clinic for 11 years with a favorable clinical evolution with normal range of motion.

The X-ray revealed an initial malunion which remodeled totally during the years.

## Discussion

This clinical case presents a rare musculoskeletal complication, namely acute osteomyelitis of the ulna secondary to a viral infection by Varicella zoster.

Varicella zoster is a viral infection that activates a subset of T-cells that increase in response and subsequently suppress the immune system, with children under the age of 5 being more vulnerable, coinciding with the age of the patient in question [1].

The main pathogen described in the literature for acute osteomyelitis secondary to chickenpox is Group A Beta-hemolytic streptococcus [1, 10]. This is considered an unusual etiological agent, isolated in only 2.6% of cases of acute osteomyelitis [4, 10].

One hypothesis for the invasive pathophysiological mechanism refers to infection by Group A Beta-hemolytic Streptococcus through the skin vesicles secondary to chickenpox, which are a protein-rich environment and promote bacterial proliferation, acting as a gateway for the microorganism, along with the ability to produce extracellular toxins and proteolytic enzymes (Hyaluronidase, proteases, streptolysin) that allow it to cross fascial planes and spread hematogenously [4, 9].

Eight days is the average time interval described in literature between the development of primary chickenpox infection and the musculoskeletal complication [5]. The usual time interval for varicella inoculation is on average 10 to 14 days.

Acute osteomyelitis is mainly located in the metaphysis of long bones, such as femur and tibia, due to the extensive vascularization and turbulent blood flow in the metaphyseal vessels. The ulna accounts for only 2% of all cases of acute osteomyelitis described in the literature [8, 9].

Patients often present pain, fever and limping gait or refusal to walk in cases of osteomyelitis of the lower limb. Localized inflammatory signs may or may not be present, such as edema, redness and warmth [8]. The upper limb may show focal inflammatory signs and functional impairment, as described in the clinical case.

In addition to the clinical findings, there are also analytical alterations such as leukocytosis over 12,000 cells/mL,

erythrocyte sedimentation rate superior to 40 mm/h, C-reactive protein over 10.5 mg/dL and positive blood cultures, which were present in this particular case, except for leukocytosis which the patient never presented [8].

Although soft tissue edema is present within 48 hours, it is only possible to see bone destruction radiographically after 10 to 14 days [9]. Findings include lytic or sclerotic metaphyseal bone lesions, osteopenia, calcifications and periosteal elevation [8]. In this case, changes such as cortical rarefaction of the distal metaphysis of the ulna were identified.

Ultrasound is beneficial in younger children who may not cooperate during computed tomography or magnetic resonance scans. It detects soft tissue edema, a periosteal reaction and subperiosteal collections [4, 9].

Magnetic resonance is the exam with the highest sensitivity (98%) and specificity (92%) [9]. Changes can be detected within 24 to 48 hours of the onset of symptoms. The absence of soft tissue or bone changes rule out the diagnosis of osteomyelitis [1, 2]. In this clinical case, it revealed a subperiosteal abscess of the ulna.

Children under eighteen months of age have transphyseal vascularization, which allows a pathogen to reach the epiphysis and ultimately the joint, causing irreversible epiphyseal damage and septic arthritis [8].

Treatment can include directed antibiotic regimen or a dual approach with antibiotic therapy and surgical debridement [1]. Treatment includes intravenous and oral regimens which, in most cases, are followed for a duration of 6 to 8 weeks, as was the case in this particular instance. Surgical debridement is used in the absence of clinical improvement with antibiotic therapy and/or in the presence of a subperiosteal collection, which were the reasons for surgery in this particular clinical case [9].

The antibiotic most mentioned in literature is penicillin, as it has an excellent response to osteomyelitis secondary to chickenpox caused by group A beta-hemolytic streptococci. Even so, the empirical use of a first-generation cephalosporin is recommended at an early stage, an association used in this patient.

A cast immobilization can be used in the postoperative period to help reduce inflammation and pain [8]. In this case, a long arm splint was maintained for 10 weeks, initially to help with pain and inflammation and later due to the pathological fracture of the distal metaphysis of the ulna, which remodeled anatomically after initial malunion.

The prognosis of osteomyelitis depends on numerous factors, including the virulence of the pathogenic organism, the patient's immune system, the course of antibiotic therapy and its effectiveness, the site of infection, the duration of treatment and the time elapsed between the onset of symptoms and treatment [1].



**Fig 1:** Patient diagnosed with pathological fracture of the distal metaphysis of the ulna.



**Fig 2:** Immobilization with a brachipalmar splint.



**Fig 3:** Malunion of pathological fracture of the ulna, at 10 weeks after removal of splint.



**Fig 4:** Control radiographs at one year post operatively.



**Fig 5:** Control radiographs at ten years post operatively - complete anatomical remodelling,

## Conclusion

Varicella zoster is a viral infection that affects mostly healthy pre-school children. Although it usually has a benign course without sequelae, serious complications can arise, although rarely of a musculoskeletal nature. Acute osteomyelitis is a perfect example of a potential complication that carries a serious risk to the viability of the affected limb and the life of the patient, so it is of the utmost importance to present this rare clinical case to help other colleagues with early diagnosis and treatment.

Although only forty-two cases of acute osteomyelitis secondary to varicella zoster infection have been reported in the literature up to 2011, suspicion should be raised when a

child presents with pain, fever and a limp or refusal to walk. A recent history of varicella zoster infection should always be considered.

## Conflict of Interest

Not available

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Not available

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