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Septic Shock Following Chickenpox in Pediatrics: A Case Report and Review of Literature

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Abstract

Background: Chickenpox is a viral disease that is benign and self-limiting, known for its skin rash appearance. Musculoskeletal complications, such as septic arthritis and osteomyelitis, are uncommon. Clinicians must be aware of bone pain complaints throughout the disease progression and pay attention to potential manifestations of septic arthritis. Timely diagnosis and appropriate antibiotic prescription can be crucial in preventing surgical interventions and reducing risks.

Case Presentation: A 6-year-old boy with varicella zoster was referred to the hospital due to swelling, pain, and redness in his right groin. The patient was unable to stand. Over the past 9 days, papulovesicular lesions had spread across his body, and when he went to the hospital, all the lesions had crusted over. Pain, swelling of the joint, limited hip joint movement, examination of synovial fluid, and increased inflammatory markers like Erythrocyte Sedimentation Rate (ESR), C-reactive protein (CRP), and leukocytosis led to the diagnosis of septic arthritis. In this case, septic arthritis and cellulitis of the thigh, both presenting as septic shock, occurred simultaneously.

Conclusion: In cases of chicken pox-associated arthritis, even in immunocompetent individuals, severe septic arthritis should be considered as a possible complication. To prevent severe complications associated with septic arthritis, early diagnosis and timely initiation of appropriate management are crucial.

Key Words: Chickenpox, Pediatrics, Pneumonia, Septic arthritis.

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1- INTRODUCTION

The varicella zoster virus (VZV), which causes varicella (chickenpox), is a highly contagious infectious disease with a global prevalence. The Word Health Organization (WHO) estimates its global burden at about 140 million cases, of which 4.2 million have severe complications and 4,200 cases result in death. Varicella has an incubation period of 14-16 days and can be spread through both air droplets and skin lesions. In the absence of varicella vaccination, most infections occur in childhood. The age at which varicella starts differs across various geographic regions. Chickenpox is most common in children under 5 years of age in Europe, while varicella is more likely to affect adults in tropical regions of the world (1).

Varicella is often associated with complications that have widespread and systemic manifestations (2). These complications are more prevalent among adults and individuals with compromised immune systems, who experience a more severe form of the disease (3). Research conducted in various European nations indicates that bacterial skin infections, pneumonia, febrile convulsions and encephalitis are prevalent complications in adults. The incidence and severity of these complications are believed to correlate with advancing age (4). Meanwhile, children experiencing complicated cases of chickenpox report a rise in neurological and respiratory issues, accompanied by a significant increase in hospitalization rates (5).

Chickenpox is a benign disease in children characterized by fever and a vesicular rash. Although it is a self-limiting disease, it can sometimes cause serious complications (6,7). Relatively common complications include cerebellar ataxia, encephalitis, hepatitis, thrombocytopenia, and pneumonia (8,9). Musculoskeletal complications such as septic arthritis and osteomyelitis are rarely seen in chicken pox patients (10).

Septic arthritis or acute joint infection is one of the dangerous infections of childhood. The incidence of septic arthritis is two to seven and three to four per 100,000 children in Europe and the United States, respectively. It is most common in children aged zero to four. The most common joints affected in septic arthritis are the hip and knee. Septic arthritis manifests as swelling of the thigh and buttock, limited movement, and redness (11). Blood cultures can be negative in 60% of cases and synovial fluid cultures can be negative in 40-50% of cases (12).

If septic arthritis of the hip occurs, a failure to promptly diagnose or intervene may result in irreversible joint damage. Therefore, timely and precise diagnosis is crucial in preventing complications, including joint deterioration, the spread of infection that could result in osteomyelitis, or the development of nerve lesions (13).

Here, we report an unusual case of chickenpox complicated by septic arthritis in a 6-year-old male patient.

2- CASE PRESENTATION

A 6-year-old boy suffering from Varicella Zoster with swelling, pain, and redness in the right groin was referred to Akbar Hospital in Mashhad, Iran. The patient was unable to stand. Over the past 9 days, he had papulovesicular lesions spread over his body, which were all crusted when he went to the hospital. The patient had swelling and stiffness in the thigh area of the right leg in the last 4 days. This child was the second child in the family, and the other child was infected with chickenpox lesions in the last seven days. He had tachypnea and respiratory distress. On presentation, the patient's temperature was 37.5°C, heart rate 165/min, respiratory rate 48/min, blood pressure 100/50 mmHg, and SpO2 91%. The patient presented with no prior history

of illness or immunodeficiency. Immunologically, CD marker evaluation tests were performed and immunoglobulin levels were examined, but no pathological findings were identified. In light of the patient's development of arthritis associated with varicella, coupled with a strong clinical suspicion of a gram-positive infection, as well as a diagnosis of septic shock and a deteriorating general condition, it was determined to initiate treatment with meropenem at a dosage of 40 mg/kg every 8 hours, vancomycin at 15 mg/kg every 8 hours, acyclovir at 20 mg/kg every 8 hours, and intravenous immunoglobulin (IVIG) at 1 g/kg. During the patient's hospitalization, due to the severity of the complications, acyclovir treatment was started from the beginning. Vancomycin was anti-staphylococcal MRSA treatment, which is the treatment of choice in life-threatening cases. Medications were selected according to infectious disease consultation. The injectable antibiotic regimen was prescribed for a duration of 14 days, followed by a 4-week course of oral clindamycin.

A blood culture was performed utilizing the Bactec method, yielding a negative result. Additionally, a synovial fluid culture was sent for Bactec analysis, which also returned negative. The Gram stain smears were similarly negative. The patient received treatment based on a diagnosis of sepsis; however, no positive bacterial growth was identified in the cultures.

A chest X-ray revealed a mild pleural effusion in the left hemithorax, accompanied by consolidation in the lower lobe of the lung, predominantly on the left side (Figure 1). Subsequently, a lung High-Resolution Computed Tomography (HRCT) was performed (Figure 2). The findings included segmental ground-glass opacities, which were occasionally confluent, along with the presence of ground-glass and consolidation patches, potentially indicative of bacterial pneumonia.

A Doppler ultrasound of the right lower limb was ordered because of significant swelling in the right leg, which made it impossible to evaluate the vascular condition through physical examination. The findings indicated normal venous flow in both the right and left femoral and iliac arteries, with no evidence of thrombosis.

Considering that numerous patients experiencing varicella-related septic shock exhibit compromised cardiac function and that dilatation of the cardiac chambers has been documented, we opted to request a cardiac echocardiography to assess cardiac performance. A cardiac evaluation was also advised due to the potential risk of septic thrombosis associated with concurrent pulmonary complications. The echocardiographic assessment revealed normal cardiac function (EF: 55%). Additionally, the condition and functionality of the heart valves were reported as normal, with no pathological lesions identified within the heart.

The ultrasound examination of the right hip joint revealed a slight thickening of the hip synovium with a maximum diameter of 1 mm Anti-Phospholipid Syndrome (APS). There was evidence of synovial hyperplasia in the right hip joint. The synovium was observed to be 3 mm thick in this area. Additionally, fluid accumulation was noted around the right hip joint, with a thickness of 5 mm and the presence of debris within the joint space.

The ultrasound examination of the left hip joint revealed an effusion of 6 mm depth in the left hip joint. Additionally, a minor thickening of the synovial membrane was observed in the left hip.

The patient was first evaluated by an orthopedic surgeon who recommended fluid drainage of the left hip joint based on his assessment. The results of synovial

fluid analysis are presented in Table 1. Subsequently, hip MRI was conducted (Figure 3), revealing the following findings: The scan indicates an inflammatory process in the right hip joint, along with avascular necrosis (AVN) of the right femoral head and neck.

Table-1. The results of synovial fluid analysis of left hip.

Suger (mg/dL)	48
Protein (g/dL)	6.6
LDH	2925.8
WBC (/mm3)	15680
Polynuclear (%)	80
Mononuclear (%)	20

A hip arthrotomy was performed due to the discovery of a 6mm fusion in the candidate's left hip joint. Three days later, significant fluid accumulation in the right hip joint and pronounced clinical swelling led to the determination that a right hip arthrotomy was necessary. The orthopedic surgeon chose to perform drainage before the arthrotomy. Following the procedure, no traction was observed.

Respiratory assistance led to an enhancement in the patient's lung condition. The individual was administered oxygen therapy via a face mask equipped with a reservoir bag, delivering a flow rate of 8 to 10 liters per minute.

Over the duration of the hospitalization, the patient's overall condition showed gradual improvement. Because immobilization was necessary, limb physiotherapy could not be conducted during the stay in the Pediatric Intensive Care Unit and was deferred until just prior to discharge. The patient was released in the third week of treatment, exhibiting a favorable general condition and stable vital signs, and continued with outpatient care.

The patient’s laboratory results during hospitalization are presented in Table 2. The tests indicated that the patient experienced metabolic acidosis, which was subsequently corrected.

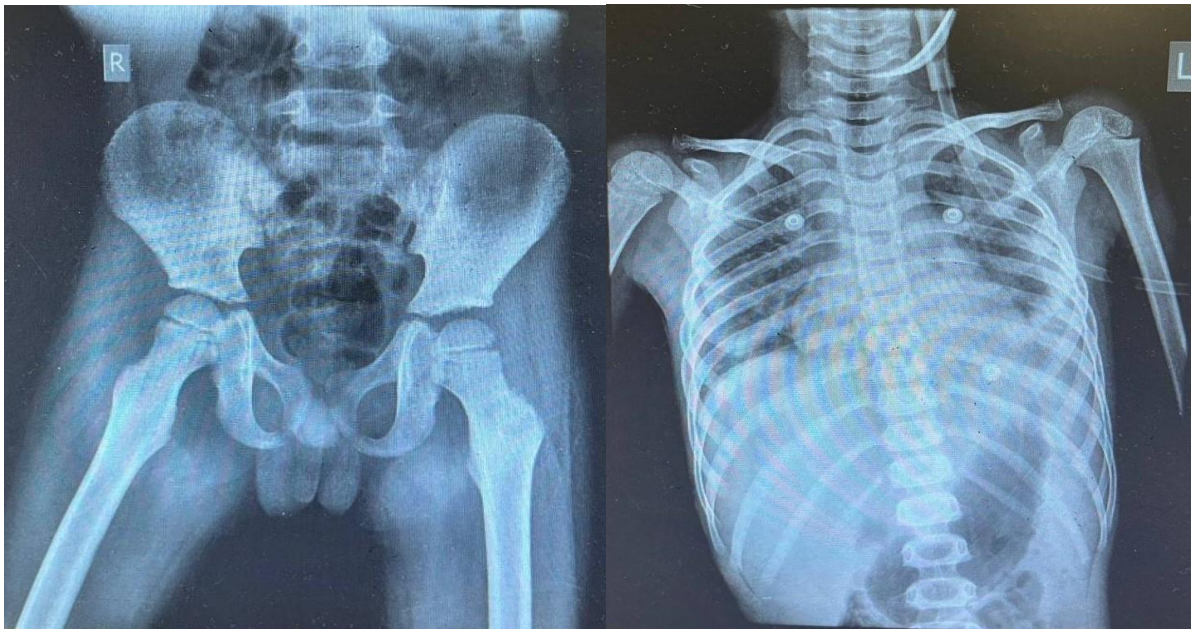

Figure-1: X-ray (Radiography) of the patient's chest and pelvis.

Figure-2: Lung HRCT of the 6-year-old boy suffering from Varicella Zoster.

Table-2. Laboratory indicators of the patient during hospitalization.

WBC (103)	12400	19400	14700	5400
PMN (%)	78	51	60	51
MN (%)	19	45	35	42
Hgb (gr/dl)	10.1	8.4	8.4	6.3
PLT (103)	90000	222000	450000	239000
AST (U/L)	74	70	29	19
ALT (U/L)	59	81	35	10
Ca (mg/dl)	6.9	7.2	7.6	7.7
Albumin (g/dl)	2.7	3	-	-
ESR (mm/h)	60	80	88	-
K (meq/L)	4.5	4.8	-	-
Na (meq/L)	132	132	136	-
PT (Sec)	14	-	-	-
PTT (Sec)	55	-	-	-
INR (U)	1.13	-	-	-
PCR (SARS coronavirus)	Negative	-	-	-
Ferritin (ng/ml)	464	514	-	-
D-dimer (ng/ml)	1189	1787	-	-
CRP (mg/l)	175			

Figure-3: Hip MRI suggesting an inflammatory process in the right hip joint.

3- DISCUSSION AND CONCLUSION

In our exploration of related studies, we identified a case involving a 15-year-old male who was diagnosed with chickenpox and subsequently began treatment with acyclovir following the emergence of a distinctive rash. After a period of ten days, the patient presented to the emergency department with intense pain in the right hip joint, accompanied by fever and restricted mobility. Further investigations confirmed the diagnosis of septic arthritis based on inflammatory markers, joint fluid accumulation, and MRI results (8). Additionally, Lim and Huntley reported two instances of pediatric musculoskeletal complications arising from varicella. The first case involved a 16-month-old boy who was referred for treatment ten days after the onset of varicella, exhibiting symptoms such as generalized edema, fever, respiratory distress, and anuria. He ultimately developed pyomyositis in the thigh and septic arthritis in the hip. The second case concerned a two-year-seven-month-old girl who was admitted due to a febrile convulsion. She presented with lethargy, a high fever, and a lack of appetite or fluid intake, ultimately diagnosed with septic arthritis affecting both the hip and knee (14).

One of the early signs of chickenpox is a pronounced itchy blister rash. Although uncommon, serious complications associated with chickenpox can include encephalitis, pneumonia, and widespread infection. Musculoskeletal issues, such as septic arthritis, osteomyelitis, and pyomyositis, are infrequent and are estimated to occur in approximately 1 out of every 10,000 cases of varicella (8-10).

A systematic review and meta-analysis performed by Shah et al. on complications associated with varicella revealed that the most prevalent complications included severe varicella, skin-related issues, and infections, respectively. Conversely, the musculoskeletal group exhibited the fewest adverse effects. Furthermore, complications were observed to be more frequent among children and hospitalized patients than in adults and outpatients (1).

Hip septic arthritis represents a serious medical condition in pediatric patients. While Staphylococcus aureus is the most

frequent causative agent, it is essential to consider other pathogens depending on the patient's age and overall health status. The diagnosis of septic arthritis relies on a comprehensive assessment that includes the patient's medical history, physical examination, laboratory tests, arthrocentesis, and imaging studies such as radiography or ultrasound (15).

Septic arthritis may result in a destructive inflammatory response within the joint, causing considerable morbidity and mortality. The development of septic arthritis associated with varicella infection can be characterized by the direct transmission of bacteria from the compromised skin barrier of varicella lesions, the infection of a prior aseptic effusion, or the dissemination of bacteria from secondary infected skin lesions related to chickenpox (15,16).

The available information regarding septic arthritis of the hip as a complication arising from varicella infection is somewhat limited. Research indicates that around 50% of septic hip arthritis cases are found in children younger than two years old (17). Clinicians should be aware of septic arthritis as a possible diagnosis for extremity pain that occurs after varicella infection, and they should maintain a heightened level of clinical suspicion.

In previous studies, complications arising from chickenpox were predominantly observed in immunocompromised individuals (18). However, recent studies indicate that the incidence of chickenpox complications in patients without pre-existing conditions has also been considerable (19,20). A meta-analysis revealed that neurological and dermatological complications were more frequently reported in immunocompetent patients than in their immunocompromised counterparts (1). Studies have also shown that immunocompromised patients have a lower rate of skin and neurological complications (4).

Accordingly, severe septic arthritis must be regarded as a potential diagnosis in instances of arthritis associated with chickenpox, even among immunocompetent individuals. This highlights the critical need for early diagnosis and the prompt commencement of suitable treatment to avert serious complications linked to septic arthritis.

4- FUNDING

We received no funding for this case report.

5- CONFLICT OF INTEREST STATEMENT

The authors declare that they have no conflicts of interest.

6- COMPLIANCE WITH ETHICAL GUIDELINES

Conscious written consent was obtained from the patient's parents to write and publish the child's case report.

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