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Case Report
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Subacute Secondary Hematogenous Osteomyelitis Involving the Distal Fibular Epiphysis: A Case Report

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Abstract

Introduction: Hematogenous osteomyelitis usually occurs in children, causing the absorption and destruction of bone. It often involves the metaphysis of a long bone, such as the distal femur or proximal tibia. However, hematogenous osteomyelitis involving the epiphysis is rare. To our knowledge, no case of subacute secondary hematogenous osteomyelitis occurring at the distal fibular epiphysis has been reported yet.

Patient Concerns: A 6-year-old male patient presented with pain in his left ankle for a month without trauma. No respiratory or other infections were reported in the patient's recent medical history. There were no significant abnormalities in the Erythrocyte Sedimentation Rate (ESR) and C-Reactive Protein level (CRP).

Diagnoses: A plain radiograph of the left ankle joint showed an elliptical bone defect at the distal epiphyseal plate and epiphysis of the fibula of the left ankle joint. Computed Tomography (CT) of the left ankle joint showed a partial defect of the left fibular epiphyseal plate and lateral epiphysis with an osteosclerotic zone. The Magnetic Resonance Imaging (MRI) scan showed that the lesions had grown through the epiphyseal plate in the distal left fibula and involved the epiphysis.

Intervention: We performed curettage of the left lateral malleolus lesion and administered intravenous antibiotics to the patient for 3 weeks beginning on postoperative day 1.

Outcome: We followed up the child for 3 months, during which he underwent plain radiographic reexamination, which showed no signs of early fusion in the epiphyseal plate. He recovered well after surgery.

Lessons: When clinicians are diagnosing similar cases, they should first be aware of the fact that osteomyelitis may occur in relatively rare sites, and that an early MRI examination should be performed to avoid missed diagnosis and misdiagnosis.

Keywords: Child; Distal fibular epiphysis; Osteomyelitis; Epiphyseal plate; MRI

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Abbreviations

CT: Computed Tomography; MRI: Magnetic Resonance Imaging; CRP: C-Reactive Protein; ESR: Erythrocyte Sedimentation Rate; HU: Hounsfield Unit

Introduction

Hematogenous osteomyelitis usually occurs in children, mainly involving the absorption and destruction of bone. It often involves the metaphysis of a long bone, such as the distal femur or proximal tibia. However, hematogenous osteomyelitis involving the epiphysis is rare [1]. Kao et al. [2] reviewed 185 cases of acute hematogenous osteomyelitis in children, of which, only 3 cases were of hematogenous osteomyelitis involving the epiphysis. Hematogenous epiphyseal osteomyelitis can be divided into the primary and secondary types, and into the acute and subacute forms according to the course of the disease. Green et al. [3] suggested that primary epiphyseal osteomyelitis can be defined as a nidus confined only to the epiphysis. On plain radiographs, the epiphysis showed obvious solubility changes with no evidence of any connection to the metaphysis. The subacute form involves symptoms of pain in the affected area resulting in limping or resistance to active and passive motion due to severe pain during the course of the disease; however, these local symptoms occur without any typical systemic symptoms.

Previous reports of subacute hematogenous epiphyseal osteomyelitis mainly involved the distal femur and proximal tibia. Herein, we report a case of subacute secondary hematogenous osteomyelitis of the distal fibular epiphysis, which would facilitate clinicians in the early diagnosis and treatment of such cases.

Case Presentation

The patient's treatment process is shown in the Figure 1. A 6-year-old male patient presented with pain in his left ankle for a month without trauma. The pain was not relieved after medication. No respiratory or other infections had been reported in the recent history of the child. He came to our hospital due to obvious worsening of the pain in the left ankle during walking, and limitation of movement in recent days. The skin color of the patient's lateral malleolus was reddish, with slightly higher skin temperature and slight swelling. There was also obvious local tenderness.

A plain radiograph of the left ankle joint showed a kind of elliptical bone defect at the distal epiphyseal plate and epiphysis of the fibula of the left ankle joint (Figure 2). The left ankle joint Computed Tomography (CT) showed partial defect of the left fibular epiphyseal plate and lateral epiphysis with an osteosclerotic zone (Figure 3). The CT value was about 21 Hounsfield Unit (HU) (Figure 3). The peripheral blood leukocyte level was 5.97 × 10^9/L (3.50-9.50), CRP 2.61 mg/L (0-3.5), and ESR 13 mm/h (0-15). There were no significant abnormalities in either the ESR or the CRP level. According to the imaging examination, the patient was initially suspected of having an infection of the distal fibula or bone tumor. In further examination of the left ankle, a Magnetic Resonance Imaging (MRI) showed that the lesions had grown through the epiphyseal plate in the distal left fibula and involved the epiphysis, where there was local bone destruction with bone marrow edema (Figure 4). There was a slight increase in fluid volume in the ankle joint cavity with swelling of the surrounding soft tissue, which manifested as infectious imaging findings (Figure 4). Therefore, the clinical findings suggested the patient had infectious lesions in the distal left fibula. It was suspected to be osteomyelitis of the distal left fibula, awaiting the exclusion of bone tumors.

To clarify the diagnosis further, curettage of the left lateral malleolus lesion was performed. After the anesthesia takes effect, the patient is placed in the supine position, and the surgical area is routinely disinfected with strong iodine and a sterile sheet is laid. With the lesion as the center, the skin and subcutaneous tissue were cut layer by layer along the outside of the left ankle, and the bleeding was stopped by electrocoagulation, fully exposing the lesion area. A small amount of purulent exudate could be seen in the incision during operation. Histopathological examination was performed on the obtained specimen, showing a large number of plasma cells and lobulated nuclear cells with bone tissue (Figure 5). The final pathological diagnosis was purulent inflammation. These pathological findings combined with the patient's clinical symptoms confirmed the diagnosis of subacute secondary hematogenous epiphyseal osteomyelitis at the distal left fibula.

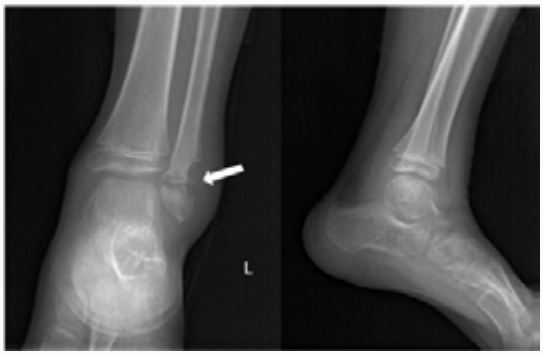


Figure 2: Plain radiographic examination of the patient 1 month after onset shows a prominent elliptical bone defect of the epiphyseal plate and epiphysis at the distal fibula.

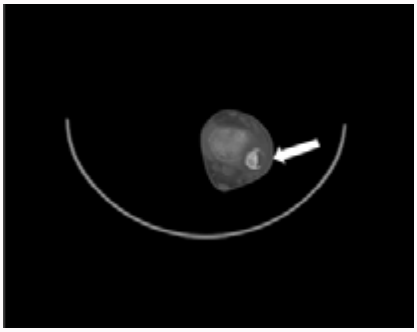


Figure 3: CT of the left ankle joint after admission shows the bone defect of the left fibular diaphysis and the lateral epiphyseal plate. The CT value is about 21 HU.

Combined with pathological diagnosis and clinical diagnosis, Ceftezole sodium for injection was selected to treat the patient according to clinical medication guidelines. The dosage of Ceftezole sodium is calculated based on the patient's body weight. The patient received 0.5 g of Ceftezole sodium intravenously twice a day for 3 weeks beginning postoperative day 1. Fever occurred on the first day

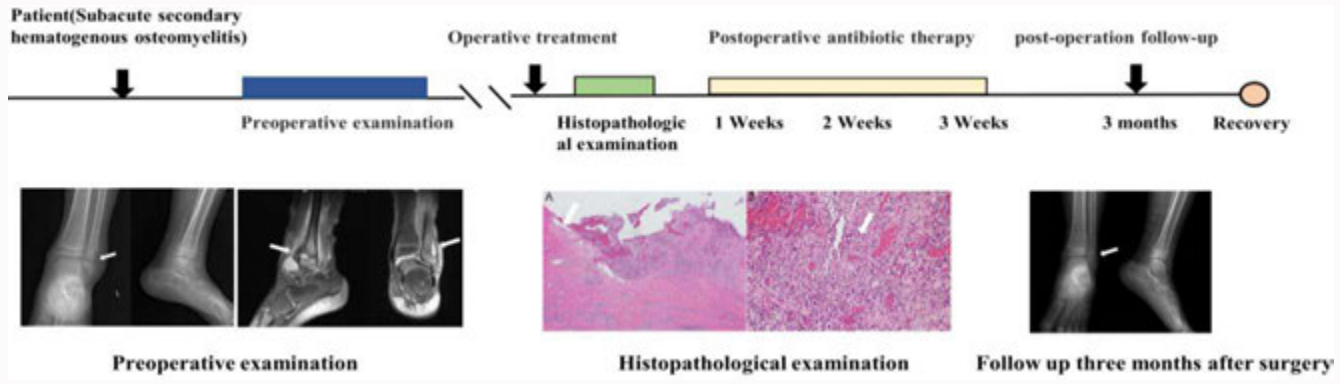


Figure 1: Diagnosis, treatment and follow-up of the patient.

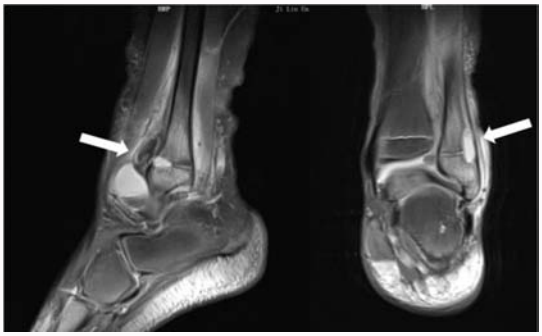


Figure 4: MRI of the patient's left ankle joint shows the local bone defect of the epiphyseal plate and epiphysis at the distal end of the fibula.

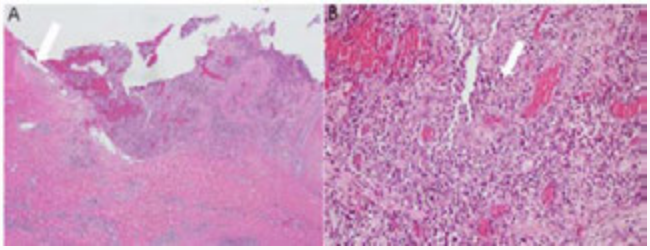
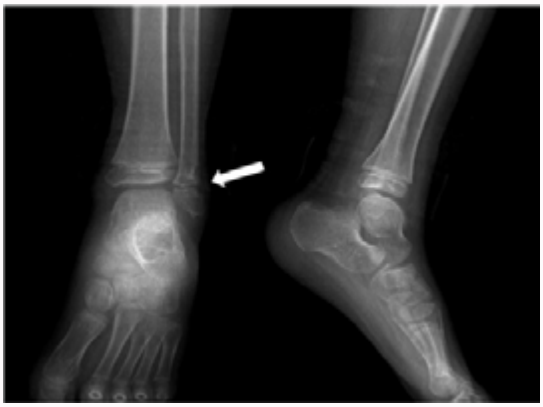


Figure 5: The pathological findings of the lesion tissue showed that the epiphyseal cartilage was damaged by erosion at (A), and a large amount of neutrophil infiltration was observed at (B), suggesting purulent inflammation.



Supplementary Figure 1: Plain radiographic examination of the patient 3 months after surgery. No signs of early fusion of the epiphyseal plate were observed at the distal fibula.

after the operation. At the first week postoperatively, the peripheral blood leukocyte level was 4.04×10^9/L (3.50-9.50), CRP 2.23 mg/L (0-3.5), and ESR 24 mm/h (0-15). At the second week postoperatively, the peripheral blood leukocyte level was 5.5×10^9/L (3.50-9.50), while CRP and ESR decreased to 2.0 mg/L (0-3.5) and 17 mm/h (0-15), respectively. At the third week postoperatively, the peripheral blood leukocyte level was 8.99×10^9/L (3.50-9.50), CRP 3.13 mg/L (0-3.5), and ESR 8 mm/h (0-15). All three criteria had decreased to the normal range. At this time, the child could walk normally with no apparent pain.

Discussion

Hematogenous osteomyelitis mostly occurs at the metaphysis of a long bone, such as the distal femur and proximal tibia. Sorensen et al. [4] reviewed 24 cases of hematogenous osteomyelitis involving the epiphysis, of which the epiphysis of the distal femur was involved in 16 cases, and that of the proximal tibia was involved in 5 cases. Hematogenous osteomyelitis has also occurred in relatively rare sites, which can cause great difficulty in diagnosis in the clinical setting. Hwang et al. [5] and Andrew et al. [6] reported cases of hematogenous osteomyelitis involving the epiphysis of the distal tibia. Yum et al. [7] reported a case of acute hematogenous osteomyelitis in the radial shaft. King et al. [8] reported a case of subacute hematogenous osteomyelitis in the calcaneus and the spine. Herein, we have reported the first case of subacute secondary hematogenous osteomyelitis occurring at the distal fibular epiphysis. Therefore, clinicians should fully consider the fact that osteomyelitis may occur in relatively rare sites during their diagnosis of related/ cases in order to reduce the rate of misdiagnosis.

Although subacute osteomyelitis is uncommon, it is not rare. The small number of documented cases is mainly due to the occurrence of atypical symptoms during the course of the disease. The presence of such atypical symptoms causes great difficulty securing an early diagnosis, which leads to missed diagnosis and misdiagnosis. Roberts et al. [9] examined 18 children with subacute symptoms, of whom only two were diagnosed with osteomyelitis. To avoid initial missed diagnosis and misdiagnosis, early diagnosis should be performed with imaging examinations. Plain radiographic examination within 14 days after onset often does not show abnormal manifestations. Moreover, plain radiographic examination can only show bone destruction at the lesion site after half a month; thus, this examination is not suitable for early diagnosis. Based on abnormal signals in the MRI images, it is possible to detect some early inflammatory lesions that are confined to the bone, to observe the extent of the lesion, to identify the degree of inflammatory edema in the lesion, and to confirm whether there is abscess formation. Therefore, MRI has early diagnostic value to a certain extent.

The main treatment for children with subacute osteomyelitis is surgical curettage of the lesion site and postoperative antibiotic therapy to control infection. The present case was characterized by the erosion of the epiphysis through the epiphyseal plate at the distal fibula. While ensuring the complete removal of the lesion, it was difficult to avoid damage to the epiphyseal plate during the operation. According to previous reports, Saisu et al. [10], Hiddema et al. [11], and Ohtera et al. [12] reviewed a total of 4 children with osteomyelitis involving the epiphyseal plate. The epiphyseal plates involved in the lesions were damaged to various degrees during the operation. During the postoperative follow-up, it was found that the children's epiphyseal plate had recovered well, the epiphyseal plate did not fuse too early, and there was no growth or developmental disorder in the children. The epiphyseal plate has a strong tolerance to damage caused by infection and surgical curettage, as well as a strong potential for recovery and regeneration. In this case, we also performed postoperative follow-up of the child. Three months after the operation, the child underwent plain radiographic reexamination, which showed no signs of early fusion in the epiphyseal plate, and the child recovered well after surgery (Supplementary Figure 1). Although patients seldom show growth and developmental disorders after the operation, long-term follow-up is still necessary.

Conclusion

We reported a case of subacute secondary hematogenous osteomyelitis occurring at the distal fibular epiphysis. When clinicians are diagnosing related cases, they should first be aware of the fact that osteomyelitis may occur in relatively rare sites, and that an early

MRI examination should be performed to avoid missed diagnosis and misdiagnosis. In addition, the child should be followed after surgical curettage is performed on the lesion to determine whether the growth and development of the child are affected by the damage to the epiphyseal plate.

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