CASE REPORT

Bilateral Hip Pain Caused by Adductor Pyomyositis as the Initial Presentation of Chronic Myeloid Leukemia in a 17-Year-Old Child

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Pyomyositis is a pyogenic muscular tissue infection mainly occurring in immunocompromised patients. Chronic myeloid leukemia (CML) accounts for only 2–3% of cases of childhood leukemia. Herein, we report on a 17-year-old male with bilateral hip pain caused by adductor pyomyositis before beginning the treatment course of CML. CML was diagnosed by bone marrow chromosome study and was treated initially with imatinib but switched to hydroxyurea 5 days later because of poor cytoreduction response. Subsequently, white blood cell counts decreased gradually; however, the hyperleukocytosis condition resolved very slowly again until we switched back to imatinib use on the 40th day of hospitalization. Pyomyositis was diagnosed by magnetic resonance imaging. Oxacillin was administered to cover Staphylococcus aureus, the most common pathogen of pyomyositis. Bilateral hip pain improved within 72 hours after antibiotic usage, but follow-up magnetic resonance imaging after 15 days of treatment revealed well-defined abscess and osteomyelitis of both femoral heads. Abscess incision and drainage were performed, and cultures of the drained pus grew no microorganisms. The patient completed 5 weeks of oxacillin treatment after the operation and recovered with a full range of motion of both hips. There was no residual disability. This is the first report of bilateral hip pain caused by pyomyositis as the initial presentation of CML. Pyomyositis needs to be considered in the differential diagnosis of hip pain in pediatric patients.

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1. Introduction

Pyomyositis is a rare, subacute, deep pyogenic infection of the muscle tissue.1 The disease occurs most commonly in immunocompromised patients with underlying hematologic malignancy.2 It commonly presents as a local abscess, but it can also manifest as a diffuse inflammatory or rapidly progressing myonecrotic process.3 Without early treatment, pyomyositis can cause significant morbidity and mortality in immunocompromised patients.3,4 Staphylococcus aureus is the most common causative pathogen of pyomyositis.3 In the early stage of pyomyositis, treatment with antibiotics alone can be effective for local infection control. However, if abscess formation has begun, combined surgical drainage and medical intervention is the treatment of choice.3,4

Chronic myeloid leukemia (CML) accounts for 15–20% of all cases of leukemia in adults but only 2–3% of cases of childhood leukemia.5 Among patients with hematologic malignancy, pyomyositis is most commonly seen as the initial presentation in acute lymphoblastic leukemia or during the treatment course.2 Only one patient with CML in the blastic phase had right femoris pyomyositis in current literature review.2,6 Pyomyositis involving muscles in the groin area can mimic septic arthritis and other irritable hip syndromes in children.7,8 Magnetic resonance imaging (MRI) is the best imaging modality for early diagnosis of this rare but potentially complicated disease.4,7,9,10

2. Case Report

A 17-year-old male athlete with a 2-month history of cycling 32 km daily presented with a 1-week history of progressive bilateral groin pain. He had fallen off of his bicycle and landed on his right hip, resulting in right hip pain 18 days before admission. Pelvic plain radiographs at that time revealed no bone fracture or hip dislocation. Diclofenac was administered, and his right hip pain gradually improved. Two weeks later, however, the patient presented with progressive left hip and thigh pain accompanied by abdominal distension and fullness for 1 week. The patient denied any episodes of fever, chills, body weight loss, or bleeding. He was admitted because of the progressive hip pain rendering him unable to walk.

On physical examination, the patient kept his hips in midflexion for external rotation because of severe pain. His body temperature was 37.2°C, pulse rate was 144/min, respiratory rate was 22/min, and blood pressure was 117/72 mmHg. There was no facial pallor, but pale conjunctivae were noted. Physical examination of the chest was normal. Palpation and percussion of the abdomen revealed an enlarged firm spleen extending 8 cm below the umbilicus. Local musculoskeletal examination revealed bilateral adductor muscle group tenderness to palpation, which was worse on the left side, with mild increase in local temperature but no swelling. Simple movements, such as internal rotation or extension of bilateral hip joints, elicited pain. Plain radiographs of bilateral hips showed normal findings. Routine laboratory examination on admission showed marked hyperleukocytosis [white blood cell (WBC): 543,510/μL, neutrophil bands: 29%, segs: 22.5%, basophiles: 4.5%, blasts: 4.5%], anemia (hemoglobin: 6.3 g/dL), thrombocytosis (platelets: 1,247,000/μL), elevated lactate dehydrogenase (LDH, 981 IU/L), and a leukocyte alkaline phosphatase score of 4 (normal range: 67–127). C-reactive protein (CRP, 0.33 mg/dL) and glutamic oxaloacetic transaminase (GOT, 27 IU/L) levels were within the normal range, but myoglobin (87.5 ng/mL, normal range: 16–76 ng/mL) and uric acid (11.7 mg/dL) levels were mildly elevated. Blood culture specimens on admission were sterile. Adequate intravenous fluid hydration and allopurinol were administered to decrease hyperuricemia and hyperuricemia, respectively, and analgesics (diclofenac and codeine) were administered for pain control.

Examination of specimens from bone marrow biopsy and aspiration showed severe hypercellular marrow with myeloid hyperplasia. Cyto genetic analysis revealed the presence of the Philadelphia chromosome t(9,22), and reverse transcription-polymerase chain reaction of bone marrow aspirate was positive for BCR-ABL transcript variant b3a2(M). Flow cytometric analysis of bone marrow aspirate showed 3% abnormal myeloblasts, left shift maturing neutrophils, markedly increased basophils, and decreased lymphocytes and monocytes, findings consistent with CML in the chronic phase. The CML was initially treated with imatinib but changed to hydroxyurea on the 5th day of hospitalization, with the WBC counts 538,260/μL at that time, because of unsatisfactory cytoreduction response. Leukocyte counts decreased after administration of hydroxyurea. Unfortunately, WBC counts maintained between 150,000/μL to 200,000/μL for 2 weeks, therefore we switched back to imatinib use. WBC counts then gradually decreased to 4900/μL after the patient had been on imatinib for 5 weeks (Figure 1). Follow-up peripheral blood reverse transcription-polymerase chain reaction 3 months later after imatinib use revealed 2.7-log reduction of BCR-ABL transcription level.

Although the patient was still being treated with analgesics for pain control, severe bilateral hip pain continued to progress during the first 6 days of hospitalization. MRI of bilateral hips was performed to rule out avascular necrosis (AVN) and septic arthritis. MRI revealed abscess formation in the bilateral adductor minimus, adductor brevis, and adductor magnus muscles (Figure 2). There was no evidence of the femoral head AVN, septic arthritis, osteomyelitis, or groin lymphadenopathy. CRP levels were mildly elevated (CRP: 1.66 mg/dL) and WBC count was 406,850/μL on the 7th day of hospitalization. Pyomyositis was diagnosed, but the patient refused to undergo abscess drainage. Blood culture was drawn, and the patient was started on intravenous oxacillin 2000 mg every 4 hours on the 8th day of hospitalization. Pyomyositis was diagnosed, but the patient refused to undergo abscess drainage. Blood culture was drawn, and the patient was started on intravenous oxacillin 2000 mg every 4 hours on the 8th day of hospitalization. Pyomyositis was diagnosed, but the patient refused to undergo abscess drainage. Blood culture was drawn, and the patient was started on intravenous oxacillin 2000 mg every 4 hours on the 8th day of hospitalization. Pyomyositis was diagnosed, but the patient refused to undergo abscess drainage. Blood culture was drawn, and the patient was started on intravenous oxacillin 2000 mg every 4 hours on the 8th day of hospitalization.

After 15 days of oxacillin treatment, follow-up MRI of the hips was performed. In addition to the well-defined abscesses in the bilateral adductor muscles seen on the first MRI study, there were new low-signal changes and enhancement of both femoral heads on T1-weighted image, with the left being more prominent than the right, features that were consistent with osteomyelitis (Figure 3).
Laboratory examination at that time showed still hyperleukocytosis (WBC: 251,750/μL, neutrophil bands: 17.5%, segs: 43%, basophiles: 1.5%, blasts: 0.5%). On the 27th day of hospitalization, bilateral abscess drainage was performed. The adductor muscles were edematous and pale in color. Cultures of the drained pus grew no microorganisms. Oxacillin treatment for osteomyelitis was continued for 5 weeks after the abscess drainage of pyomyositis (62nd day of hospitalization). WBC = white blood cell.

Figure 1  Serial follow-up of peripheral WBC counts after the treatment of chronic myeloid leukemia and pyomyositis. Chronic myeloid leukemia was initially treated with imatinib but switched to hydroxyurea on the 5th day of hospitalization because of poor cytoreduction response. However, the hyperleukocytosis condition was resolving slowly until we switched back to imatinib use on the 40th day of hospitalization. Oxacillin for treatment of pyomyositis was started on the 8th day of hospitalization and bilateral abscess drainage was arranged on the 27th day of hospitalization. Oxacillin was continued for 5 weeks after the abscess drainage of pyomyositis (62nd day of hospitalization). WBC = white blood cell.

Figure 2  Magnetic resonance imaging on the 7th day of hospitalization. Axial section of upper thigh level, fat-saturated T1-weighted with Gd-DTPA showed strongly enhanced multilocular but ill-defined lesions replaced by bilateral adductor muscles (arrow), compatible with a diagnosis of pyomyositis or abscess. Note the swollen bilateral thigh soft tissue. Bilateral femoral heads appeared normal in the present study.

Figure 3  Magnetic resonance imaging on the 27th day of hospitalization. Coronal section of the thighs through the lesion, fat-saturated T1-weighted with gadolinium-diethylenetriamine pentaacetic acid showed persistent but smaller size of abscesses in bilateral adductor muscles. The abscesses had a more locular appearance in the coronal images. The swelling of the soft tissue had diminished. Enhancement in the bilateral femoral proximal femurs, with the left being more extensive, consistent with osteomyelitis (arrow head) is seen.
home with full range of motion of both hip joints. Follow-up MRI 4 months after operation revealed no apparent radiological sign of osteomyelitis and pyomyositis, compatible with complete remission of both previous hip infection (Figure 4).

3. Discussion

CML is a malignant clonal disorder of hemopoietic stem cells characterized by abnormal proliferation and accumulation of immature granulocytes. It accounts for only 2–3% of cases of childhood leukemia. The clinical symptoms of CML are nonspecific and can include fever, weight loss, and fatigue. Bone pain caused by malignant cells expanding into the bone marrow is common in many types of pediatric hematological malignancies. In CML, however, bone pain tends to involve the lower sternum. Hip pain is very rare. Physical examination often reveals splenomegaly and left upper quadrant abdominal tenderness. Initial CBC data in our patient showed hyperleukocytosis with basophilia, mild anemia, and thrombocytosis. Cyto genetic studies of bone marrow specimens revealed the presence of the Philadelphia chromosome and the BCR-ABL fusion gene.

Pyomyositis is a rare, subacute pyogenic infection of the muscle. It predominantly affects muscles of the lower extremities, with quadriceps being most commonly involved, followed by the gluteal muscles. When it involves muscles around the hip joint, it mimics septic arthritis and other irritable hip syndromes in children. Pyomyositis has a male predominance, with a male:female ratio ranging from 2:1 to 3:1. Diagnosis is almost always delayed because of lack of awareness of the disease and because the symptoms can be veiled if the affected muscle is deeply situated.

Immunocompromised hematologic patients are prone to suffer from pyomyositis. Falagas et al studied 44 patients with hematological neoplastic diseases associated with pyomyositis and found that pyomyositis was most commonly seen in patients with acute lymphoblastic leukemia. Only one patient with CML in the blastic phase has been reported to have right femoris pyomyositis. Pyomyositis in patients with hematologic disease normally develops after high-dose chemotherapy, and most of those patients are neutropenic. Pyomyositis in hematologic patients most commonly involves the muscles of the thigh, and unilateral muscle involvement is more common than bilateral involvement (75% vs. 14%).

S aureus is responsible for 50–95% of all cases of pyomyositis. Other causative pathogens include gram-negative enteric organisms, anaerobes, and fungi. Local abscess is the most common initial presentation of pyomyositis; however, in immunocompromised patients, the infection can progress to a diffuse inflammatory or rapid myonecrotic response.

Pyomyositis involving muscles in the hip area can mimic septic arthritis. The yield rate from pus or blood culture of pyomyositis is low. Patients with hip pain and prominent signs of infection but in whom aspiration or arthrogram reveal negative findings should undergo MRI studies to exclude osteomyelitis and pyomyositis. This is especially important in hematologic patients because the infection-induced elevation in WBC counts can be masked by the underlying hyperleukocytosis. In addition, analgesics, such as acetaminophen and nonsteroidal anti-inflammatory drugs, have antipyretic or anti-inflammatory effects, which can mask fever episodes and inflammatory signs normally induced by infection. Delayed treatment in immunocompromised patients can lead to severe systemic involvement and cause significant mortality and morbidity. Ultrasonography- or computed tomography-guided fluid aspiration followed by microbiological testing of the aspirate should be performed to guide antibiotic treatment.

Pyomyositis can be classified to three stages. In Stage 1, pyomyositis presents as an progressive muscle dull pain and low-grade fever. In Stage 2, muscle abscess formation with a local tender, swollen, erythematous soft tissue mass is occasionally associated with septicemia. In Stage 3, signs of severe local infection and sepsis are present. Our patient likely had Stage 1 pyomyositis initially and then developed into Stage 2 pyomyositis, which was confirmed by the MRI study showing diffuse hyperintense signals in the involved muscles on fat-suppressed T2-weighted images. The lesion and nearby fascia were strongly enhanced by contrast medium. These findings are compatible with the diagnosis of pyomyositis. Although no obvious trauma was noted after our patient fell from his bicycle, his rigorous training program could have caused mild trauma to some extent. Transient
bacteremia because of minor trauma may have resulted in pyomyositis in our patient.16,17

In the early stage of pyomyositis, treatment with antibiotics alone can be effective for local infection control. Combined surgical drainage and medical intervention is the treatment of choice if abscess formation has occurred.3,4 Our patient refused to undergo abscess aspiration; therefore, we used oxacillin to cover S. aureus infection. Although clinical condition was improving after antibiotic usage initially, follow-up MRI showed enhancement of both proximal femurs, which was probably because of the extension of the pyomyositis into surrounding bony structures. Osteomyelitis of the adjacent bone is a known complication of pyomyositis and may progress to functional impairment of the joint and scarring of the involved muscle.4 We switched imatinib to hydroxyurea in the early phase of CML treatment because of poor cytoreduction response. However, persistent hyperleukocytosis without reaching hematologic remission status suggested poor response to hydroxyurea treatment. Impaired neutrophil function may cause pyomyositis progression even under antibiotic usage. Abscess drainage cultures did not grow any microorganisms. Prior antibiotic therapy may explain the low bacterial yield. Regular laboratory examination revealed that WBC counts decreased gradually after imatinib use. Neutrophil function recovery because of CML remission, adequate antibiotic treatment, and abscess drainage in time may lead to the successful treatment of pyomyositis without sequela.

The differential diagnosis of hip tenderness in pediatric hematologic malignancy patients includes femoral fracture, slipped capital femoral epiphysis, AVN of the femoral head, septic arthritis, osteomyelitis, leukemia/lymphoma, and other malignant tumor cell invasion.9 Anteroposterior and lateral radiographs of both hips exclude femoral fracture and slipped capital femoral epiphysis. MRI, including magnetic resonance angiography, may demonstrate signal changes in bone and vascular structures and can reveal intraosseous and extraosseous changes of the joint and surrounding soft tissue in hematologic patients. Plain radiograph and MRI imaging in our patient excluded the above-mentioned disease entities.

In conclusion, CML is a rare hematologic malignancy in pediatric patients, and hip pain is a rare initial presenting symptom. Pyomyositis should be considered in the differential diagnosis in children with malignancy who present with hip joint or groin muscle pain. MRI is the best imaging modality for identifying pyomyositis and for differentiating bony from soft tissue infection. Once a diagnosis of pyomyositis is established, an underlying hematologic malignancy needs to be considered.

References