Cat-scratch Disease in a Child With Unique Magnetic Resonance Imaging Findings

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Objective: To report a patient with cat-scratch disease and the associated radiological findings.

Patient: A previously health 10-year-old boy presenting with fever and joint pain.

Results: The presence of multiple abnormal foci in the bone marrow were noted by magnetic resonance imaging. There was no correlation with either radionuclide or conventional radiographic imaging findings. The patient’s condition was diagnosed as cat-scratch disease by the demonstration of elevated antibody titers to the causative organism, Bartonella (formerly Rochalimaea) henselae.

Conclusion: Magnetic resonance imaging may be more sensitive to the early bone marrow changes that can occur with cat-scratch disease than either radionuclide bone scan or computed tomography.


Cat-scratch disease (CSD) is believed to be a relatively common infection among children. Recently, the causative organism has been identified as Bartonella (formerly Rochalimaea) henselae. In most cases, CSD is a benign, self-limited illness characterized by distal regional lymphadenopathy occurring after a cat scratch or bite. More rarely, the initial presentation may be fever of unknown origin. We report a case of CSD presenting as prolonged fever and joint pain with unique radiologic findings.

PATIENT REPORT

A previously healthy 10-year-old boy was admitted to the hospital because of persistent fever (body temperature, 39.4°C-40°C) for 8 days, accompanied by chills, abdominal pain, headaches, sore throat, and joint pain. The joint pain initially involved his right shoulder and later involved his right knee. He had difficulty walking and was unable to bear any weight on his right leg. He also had several episodes of nonbloody, nonbilious emesis, and a rash had appeared on his chest. He had been seen by his physician on the day prior to admission and his condition was diagnosed as group A streptococcal pharyngitis on the basis of a rapid antigen detection test. He was then started on a regimen of amoxicillin.

Findings on initial physical examination revealed a white boy who looked ill but did not appear toxic. His temperature was 38.1°C; pulse rate, 102 beats/min; and blood pressure, 112/46 mm Hg. There was an erythematous macular rash on his trunk, extending from the neck down to the umbilicus. There were enlarged and tender bilateral anterior cervical lymph nodes, approximately 1 to 2 cm in diameter. Cardiac examination findings were notable for a nonradiating grade I/VI systolic ejection murmur heard best at the upper left sternal border. His right knee was diffusely tender without warmth, erythema, or swelling. There was limited range of motion of the knee secondary to pain. Findings from the remainder of the physical examination were unremarkable. Initial laboratory data included a white blood cell count of $13.0 \times 10^9/L$ with $0.12$ band forms, $0.69$ neutrophils, $0.20$ lymphocytes, $0.10$ monocytes, and $0.01$ basophils. The hematocrit was $0.32$ and the platelet count was $501 \times 10^9/L$. An erythrocyte sedimentation rate was $108 \text{ mm/h}$. Urinalysis results were unremarkable and findings from blood chemistries and coagulation studies were within acceptable limits. A blood culture was also obtained.

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On admission the patient was started on a regimen of penicillin for treatment of streptococcal pharyngitis. However, shortly after admission this was changed to oxacillin because the patient’s clinical condition worsened. A technetium Tc 99m bone scan revealed increased uptake in the right ischial pubic ramus. *Staphylococcus epidermidis* grew from the blood culture obtained at admission. A presumptive diagnosis of osteomyelitis was made and antibiotic therapy was changed to cefazolin. During this time the erythrocyte sedimentation rate remained elevated and the patient continued to complain of right knee pain as well as a new complaint of lower back pain. An orthopedic surgeon was consulted and a magnetic resonance imaging (MRI) study was done of the pelvis and spine. This revealed scattered small nodular regions of abnormal foci in the marrow of both iliac crests, left capital femoral epiphysis, left ischium, right inferior pubic ramus, and left pubis symphyses. An MRI scan of the thoracic spine showed multiple vertebral bodies with evidence of focal marrow replacement without compression or canal compromise. The possibility of malignancy was considered and a pediatric oncologist was consulted to perform a bone marrow biopsy. Aspirates and biopsy specimens from the right and left posterior iliac crests were taken and showed normal cellularity with no evidence of malignancy. However, because of the focal nature of the lesions and the possibility that the site of abnormal bone tissue could have been missed by the aspirate needle, plans were made to perform a computed tomography (CT)–guided bone marrow aspiration. A preliminary CT scan was done but failed to reveal any focal lytic or sclerotic lesions within the bone. Despite this, a repeated procedure was performed, targeting the lesions previously seen on the MRI scan. Biopsy specimens sent for bacterial and fungal cultures as well as acid-fast and Warthin-Starry silver stains were all negative for organisms. Pathologic studies of marrow tissue showed normal cells without evidence of malignancy. However, the cells were reported to be reactive with vacuoles in the monocytes.

During the course of his hospitalization, the patient continued to have daily temperature spikes to 40°C. He gradually defervesced and his arthralgias resolved. He was treated with a 14-day course of parenteral antibiotics and all repeated blood cultures remained negative for organisms. In addition, results of a purified protein derivative test were negative. Results of titers for *Borrelia burgdorferi* (Lyme disease), antinuclear antibody titers, and rheumatoid factor titers were also negative.

Additional history revealed that there were several cats and kittens in the home and that the patient had been scratched by a kitten 3 days prior to the onset of his symptoms. Indirect fluorescent antibody titers for *B henselae* were obtained (Laboratory Corp of America, Raritan, NJ) and found to be elevated. Levels for IgG were greater than 1:1024 (upper limit of normal, <1:64) and IgM levels were 1:80 (upper limit of normal, <1:20). At 1 week following discharge the patient was no longer complaining of knee or back pain. A repeated MRI scan done 3 months later revealed a marked decrease in size and decrease in number of lesions seen in the pelvis.

Infection with the major etiologic agent of CSD, *B henselae*, most commonly presents as lymphadenitis of 1 or more nodes. This can be accompanied by systemic symptoms such as low-grade fever, headache, sore throat, and malaise. Other clinical manifestations of *B henselae* infection include cat-scratch encephalitis, Parinaud oculoglandular syndrome, hepatic and splenic granulomas, fever of unknown origin, osteomyelitis, bacillary angiomatosis and peliosis, endocarditis, pneumonia, bacteremia, and sepsis.1 The incubation period from the time of the cat scratch to the appearance of lymphadenopathy varies from 12 to 62 days.2 This suggests that the kitten scratch that occurred 3 days prior to the onset of our patient’s symptoms was not directly related to his illness. It is possible that he may have had previously unrecalled scratches from other cats in the home. Osteolytic lesions have been reported in association with CSD as early as 1954.3 Since then, several published articles have reported similar findings.4-7 However, in these cases all of the bone lesions were imaged via radiography or CT scan. Reports of patients having bone lesions in association with CSD detected by MRI or radionuclide bone scan are fewer still.8,9 Wilson and Castillo8 described a patient with CSD in whom vertebral bone marrow abnormalities were detected by MRI. However, these abnormalities correlated with those demonstrated on a subsequent radionuclide bone scan. In our patient there was no correlation between the bone lesions demonstrated by MRI and by radionuclide bone scan. In addition, CT failed to reveal any bone abnormalities in our patient. It is possible that MRI is more sensitive to the early bone marrow changes that can occur with CSD than either radionuclide bone scan or CT. Further studies to determine this may be indicated.

Presently, the diagnosis of CSD can be made by the demonstration of elevated titers of IgG and IgM to *B henselae* by either enzyme-linked immunosorbent assay or the indirect fluorescent antibody test.10,11 Less than 5% of the population without clinical CSD demonstrate elevated antibody titers to *B henselae*.1 The organism itself can also be isolated and cultured on special media,12 providing another means of establishing the diagnosis. Histopathologic tissue examination remains useful in the diagnostic workup for possible CSD. The presence of noncaseating granulomas is suggestive of CSD, and organisms may be demonstrated by Warthin-Starry silver staining.1 The use of cat-scratch skin testing is no longer indicated.

Treatment for CSD is still controversial. The American Academy of Pediatrics Committee on Infectious Diseases recommends antibiotic therapy only for those patients who are acutely or severely ill with systemic symptoms, particularly those with hepatosplenomegaly.2 Our patient had received a course of parenteral antimicrobial therapy for a presumed bacterial osteomyelitis. It is unlikely that his clinical course would have been different without this therapy. Musso and colleagues13 reported that only aminoglycosides were effective against *B henselae*.1
The clinician needs to consider CSD in the differential diagnosis of patients presenting with prolonged fever and joint pain when a history of contact with cats or kittens is obtained. The very sensitive and highly specific immunologic testing now available readily confirms the diagnosis. Magnetic resonance imaging may prove to become the imaging procedure of choice when bone involvement is a possibility.

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REFERENCES