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Vermeulen, M.J.

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Chapter 9

Transient paresis associated with cat-scratch disease: Case report and literature review of vertebral osteomyelitis caused by *Bartonella henselae*

MJ Vermeulen
GJ Rutten
I Verhagen
MF Peeters
PJ van Dijken

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ABSTRACT

Cat-scratch disease (CSD) rarely presents as vertebral osteomyelitis. We describe a case with paresis of the arm with total recovery after antibiotic and neurosurgical therapy. We reviewed 20 other cases of CSD vertebral osteomyelitis in the literature. This diagnosis should be considered in patients with systemic symptoms, back pain, and cat contact. The prognosis is generally good.
INTRODUCTION

Cat-scratch disease (CSD) causes a benign lymphadenitis, but in 5-20% of cases an atypical presentation occurs [1-3]. After hematogenous, lymphatic, or contiguous spread of the Bartonella henselae bacteria, almost every organ system can be affected [1-3]. CSD can manifest as Parinaud oculoglandular syndrome, endocarditis, or granulomas in liver and spleen [1,2]. Neurologic involvement occurs in a small number of the cases, with encephalitis, optic neuritis, meningitis, or myelitis being most common [1,2,4]. Osteomyelitis is a rare manifestation, occurring in 0.2-0.3% of CSD patients [1,2]. It can affect any bone, including the vertebrae [3,5,6].

CASE REPORT

A 9-year-old girl presented with neck pain and a 3-day history of fever. According to her parents, the neck pain might have been related to a fall on her right shoulder 2 weeks earlier. On examination, there was fever (39.6 °C), torticollis, and limited flexion of the neck. There were no skin lesions or enlarged lymph nodes. Neurologic examination was normal.

Laboratory tests showed elevated serum C-reactive protein (CRP) of 72 mg/L and erythrocyte sedimentation rate (ESR) of 104 mm/h. The white blood cell count was 12.5 10⁹/L, with 55% neutrophils, 27% lymphocytes and 12% monocytes. The cerebrospinal fluid (CSF) showed no pleocytosis and normal glucose and protein. Bacterial cultures of blood and CSF were sterile. Viral studies were negative. Plain radiographs of the cervical spine were normal. In the absence of an identifiable focus of infection, it was decided to observe.

Two weeks after admission, the fever had subsided and the CRP and ESR had decreased to 18 mg/L and 50 mm/h, respectively. Three days later, the patient developed severe paresis of the proximal right arm muscles: biceps MRC (Medical Research Council Scale for Muscle strength) grade 2 (movement with gravity eliminated), triceps MRC grade 3 (movement against gravity), deltoid MRC grade 2. Biceps and triceps reflexes were absent on the right side, without sensory loss. A bone scan showed slight increase in uptake in the lower cervical region. Magnetic resonance imaging (MRI) demonstrated a cervical paravertebral mass that extended into the foramina of the C5 and C6 roots. Vertebral bodies C4, C5, and C6 had abnormal signal intensities consistent with osteomyelitis. The patient was referred to our secondary teaching hospital for further analysis and treatment.

To achieve material for diagnostic testing, the neurosurgeon performed an open biopsy by an anterior cervical approach. Purulent material found in the prevertebral lesion within a thick fibrous capsula was drained. Histopathologic analysis showed a nonspecific inflammatory reaction, with no evidence of a neoplasm. Gram and Ziehl-Neelsen staining and cultures (including mycobacterial cultures) of the surgically obtained material were negative. No diagnostic tests for B. henselae were performed at that time.
With the working diagnosis of vertebral osteomyelitis and paravertebral abscess of unknown etiology, the patient was given a stiff neck collar and amoxicillin/clavulanate intravenously for 3 weeks. During that period, the neck pain gradually disappeared, and the ESR and CRP normalized. Six weeks after her initial symptoms, the patient was discharged, with a persisting paresis of the arm that had only slightly recovered.

Three weeks after discharge, it became known that the family had bought a young kitten a few weeks before this episode started. The hypothesis that CSD was the cause of the osteomyelitis was then tested. Serologic testing by immunofluorescence assay (IFA) showed a raised titer of immunoglobulin M antibodies (1:32; cutoff, 1:8) against \textit{B. henselae}. The diagnosis of \textit{B. henselae} osteomyelitis was confirmed when the surgically obtained material tested positively for the presence of \textit{B. henselae} DNA by polymerase chain reaction (PCR). On a magnetic resonance imaging (MRI) scan 6 weeks after discharge, all abnormalities had disappeared. After 3 months, muscle strength of her arm had normalized.

**METHODS**

The literature for additional cases of vertebral osteomyelitis caused by \textit{B. henselae} was reviewed. A search of the literature in MEDLINE (1950 to December 2005) and in EMBASE (1966 to December 2005) was conducted to identify documented cases of vertebral osteomyelitis caused by \textit{B. henselae}. Search terms were \textit{Bartonella}, \textit{B. henselae}, osteomyelitis, spine, CSD, epidural abscess (Medical Subject Headings [MeSH] terms) and vertebral and paraspinal abscess (free terms). Titles and abstracts were screened for usefulness. An additional search was done of related articles to the reference lists.

To classify cases as definitive \textit{B. henselae} vertebral osteomyelitis, we required clinical or radiographic evidence of osteomyelitis, with involvement of one or more vertebrae and a diagnosis of \textit{B. henselae} infection based on the results of diagnostic methods considered clinically appropriate at that time.

We reviewed factors including age, sex, clinical presentation, cat contact, diagnostic tests (laboratory and radiologic results), location of osteomyelitis, therapeutic intervention and outcome.
RESULTS

The literature search identified 20 documented cases of vertebral osteomyelitis caused by *B. henselae*. Clinical characteristics of these 20 patients, as well as the case presented in this report, are shown in Table 1.

Patients
Most patients were children (14/21), with roughly equal numbers of male (12) and female (9). Nineteen of the 20 patients have a history of cat contact (of 1 patient, there were insufficient data on history). Only 1 patient was not immunocompetent because he was infected with the human immunodeficiency virus (HIV).

Clinical Features
Most patients presented with a fever (20/21), and 14 of these, with lymphadenopathy. Twenty patients presented with pain, mostly in the back (n = 12) and the neck (n = 4). Five patients, 4 of whom had paravertebral mass, had neurologic symptoms. These include walking problems (n = 2), paresthesia and numbness of the legs (n = 1), paresthesia and radiation of pain in both arms (n = 1) and temporary paralysis of the right arm (n = 1). Manifestation of CSD in other organs than bones or lymph nodes was reported in 8 patients, with clinically or radiologically determined lesions in the liver (n = 6) and spleen (n = 5) and with erythema nodosum in 1 patient.

Diagnostics
Consistent with the literature, skin tests and histology, as well as clinical criteria, were used to confirm the diagnosis of CSD until serology became available [7]. In all described cases of *B. henselae* vertebral osteomyelitis from 1996 to the present (n = 12), serologic testing for *B. henselae* antibodies was done to confirm the diagnosis CSD. PCR was performed on aspiration or biopsy material from bone of paravertebral masses in 38% of the cases.

Osteomyelitis was confirmed radiologically by several techniques, including roentgenogram (n = 7), computed tomography (CT) (n =17), bone scan (n = 13), MRI (n = 10) and single photon emission computed tomography (SPECT) scan (n = 1). The thoracic vertebrae were involved in 11 patients, the lumbar in 9 patients, the cervical in 2 patients and sacral in 1 patient. Paravertebral masses were reported in 8 cases and an epidural mass in 1 case.

Treatment
The treatment of *B. henselae* vertebral osteomyelitis in the published literature was varied and involved medical and surgical interventions. Only 1 patient was not medically treated, and in 1 report treatment was not mentioned. Nineteen patients were treated with antibiotics. The antibiotics used showed a wide variety, mostly reflecting the empiric start of antibiotics and a change in clinical management after the definite diagnosis of CSD. Surgical treatment was performed in 4 cases. A laminectomy, as well as laminotomy and pus drainage, was done in the first case. A diskectomy and arthrodesis was performed in the second case,
and a resection of an epidural mass was done in the third. In our patient, open biopsy was performed in combination with pus drainage of a paravertebral abscess.

**Outcome**

Prognosis of vertebral bone infections by *B. henselae* is generally good. No mortality was reported. In 2 reports, outcome was not mentioned. Regardless of antibiotic or surgical treatment, full recovery was reported in 16 patients (84%) after 2-24 months. Partial recovery was seen in 3 patients (16%) after a relatively short follow-up period (2-21 months). These patients showed persisting radiologically determined bone abnormalities of the spine.

**DISCUSSION**

This is the first case report of proven CSD vertebral osteomyelitis causing severe transient paresis. The few other patients described in the literature as presenting with neurologic symptoms showed sensory problems or unspecified walking problems [8-10]. In most cases, neurologic symptoms could be explained by nerve or root compression by a paravertebral mass [8-10]. The evidence suggests that CSD is difficult to diagnose, in particular when typical symptoms such as lymphadenopathy and skin lesions are lacking.

Vertebral bone infections by *B. henselae* are uncommon. Two recent reviews of osteomyelitis by this bacterium described together only 17 cases of osteomyelitis, with 8 cases of vertebral involvement in the published literature [5]. Our review of the literature from 1950 to 2005 revealed 20 previously reported cases of vertebral osteomyelitis caused by *B. henselae* infection. Analysis of these cases elicits that fever (95%) and back pain (57%) were the most common clinical features. Only 1 reported patient was immunocompromised [11]. This is low, given that atypical manifestations of CSD are more likely in immunodeficient patients [3].

We did include 1 case (patient number 8 in Table 1) that presented with symptoms of CSD but had negative *B. henselae* PCR and positive *Afipia felis* PCR. In 1994, it was still controversial whether *B. henselae* (formerly *Rochalimaea henselae*) or *A. felis* was the causative agent of CSD [7,12,13]. Because the role of *A. felis* in CSD is still not fully understood, we consider these diagnostics as adequate for that time.

In the most recently described cases, serology and PCR were used to confirm infection with *B. henselae*. Confirmation of osteomyelitis with vertebral involvement was done by CT scan in most cases (80%).

In the reported cases, the treatment involved mainly medical interventions, but we found no clear evidence for the benefit of antibiotic treatment. Antibiotics are not recommended in typical CSD cases with only regional lymphadenitis [14,15]. Despite some reported improvement after the use of antibiotics in patients with atypical CSD, antibiotic therapy
B. henselae vertebral osteomyelitis has not been adequately investigated in cases of osteomyelitis. Given the lack of uniformity in therapy, as well as the low number of patients in this review, it remains difficult to advise about antibiotic strategy. It is unclear whether the high recovery rate in the reviewed cases reflects the self-limiting nature of CSD rather than the correct choice of antibiotics. In the 21 described cases, surgical treatment was considered clinically necessary in only 20% of the cases [8-10]. The prognosis of B. henselae vertebral osteomyelitis is generally good, with 84% of the patients being fully recovered within 2 years.
Table 1.
Clinical characteristics of 21 patients with *B. henselae* vertebral osteomyelitis reported in the literature including our patient.

<table>
<thead>
<tr>
<th>Case Year</th>
<th>Age / Sex</th>
<th>Clinical features</th>
<th>Cat contact</th>
<th>Diagnostic test *</th>
<th>Location of lesion (radiological technique)</th>
<th>Treatment</th>
<th>Outcome (follow up period)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985 [16]</td>
<td>18/M</td>
<td>Fever, night sweats, back pain, rib and wrist pain and weight loss for 3 weeks, cervicallymphadenopathy</td>
<td>Cat contact</td>
<td>Skin test+ Histology (LN)</td>
<td>T9 (X-ray, CT, BS)</td>
<td>Penicillin</td>
<td>CR (6 weeks)</td>
</tr>
<tr>
<td>1986 [17]</td>
<td>25/M</td>
<td>Three weeks fever, anorexia, weight loss, infrascapular pain, inguinal lymphadenopathy</td>
<td>Cat scratch</td>
<td>Skintest+ Histology (LN)</td>
<td>T10, paravertebral mass (X-ray, CT, BS)</td>
<td>Tetracycline</td>
<td>CR (6 months)</td>
</tr>
<tr>
<td>1989 [18]</td>
<td>11/M</td>
<td>Two weeks low grade fever, lower back pain, axillary lymphadenopathy</td>
<td>Cat scratches, papule on chest</td>
<td>Skintest+</td>
<td>L4 (CT, BS)</td>
<td>Cloxacillin</td>
<td>CR (20 months)</td>
</tr>
<tr>
<td>1990 [19]</td>
<td>8/F</td>
<td>Fever for 1 week, back pain, submandibular and preauricular lymphadenopathy (Parinaud syndrome)</td>
<td>Cat scratches</td>
<td>Skintest+ Histology (LN)</td>
<td>T5, paravertebral mass (X-ray, CT, BS)</td>
<td>None</td>
<td>IC: osteolytic lesions persisting (21 months)</td>
</tr>
<tr>
<td>1992 [20]</td>
<td>9/M</td>
<td>Vomiting, fotophobia, myalgia, severe headache, fever, anorexia and weight loss, cervical lymphadenopathy</td>
<td>No cat contact before symptoms</td>
<td>Skintest+ Histology (liver biopsy)</td>
<td>T12, L4, liver, skull (CT, BS)</td>
<td>Cephalexin, Erythromycin, Gentamicin</td>
<td>CR (2.5 months)</td>
</tr>
<tr>
<td>1992 [21]</td>
<td>10/M</td>
<td>Four weeks of low grade fever and cervical lymphadenopathy, lumbar back pain, erythema nodosum</td>
<td>Cat scratches, papules</td>
<td>Clinical diagnosis, skin papule present</td>
<td>L4 (CT, BS)</td>
<td>Rocephin, Oxacillin</td>
<td>NR</td>
</tr>
<tr>
<td>1993 [22]</td>
<td>12/M</td>
<td>High spiking fever for 3 weeks, painful torticollis, cervical and axillary lymphadenopathy</td>
<td>Cat scratches, papule</td>
<td>Clinical diagnosis, Histology (LN)</td>
<td>T5 (X-ray, CT, BS), liver and spleen lesions (US)</td>
<td>Amoxicillin, Cefaclor, Cefotaxim.</td>
<td>IC: still narrowing of T5-6 intervertebral space (2 months)</td>
</tr>
<tr>
<td>1994 [8]</td>
<td>5/F</td>
<td>Two weeks back pain, mild fever, paresthesias and numbness both legs, paravertebral fullness</td>
<td>Multiple cat scratches</td>
<td>Histology and PCR+ for <em>A. felis</em>, not <em>B. henselae</em> (paravertebral lesion)</td>
<td>T8 -10, paravertebral mass (X-ray, CT, BS)</td>
<td>Surgical laminectomy T9 and laminotomy T8-10, Nafcillin, Ceftriaxon</td>
<td>CR (2 years)</td>
</tr>
<tr>
<td>1995 [23]</td>
<td>30/F</td>
<td>Two weeks low-grade fever, night sweats, midthoracic pain, axillary lymphadenopathy</td>
<td>Cat contact</td>
<td>Histology (LN)</td>
<td>T6, T8 (MRI, CT)</td>
<td>Cefoxitin</td>
<td>CR (2 months)</td>
</tr>
<tr>
<td>1996 [24]</td>
<td>6/M</td>
<td>Fever, back pain</td>
<td>NR</td>
<td>Serology (technique NR)</td>
<td>L2 (BS) retropharyngeal node (CT)</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>1999 [6]</td>
<td>9/F</td>
<td>Six weeks of high intermittent fever, weight loss, abdominal pain, inguinal lymphadenitis.</td>
<td>Cat scratches</td>
<td>PCR+ (paravertebral aspirate), IgM+ and IgG+ (IFA)</td>
<td>T8-10, paravertebral mass (X-ray, CT, BS, MRI)</td>
<td>Gentamicin, Flucloxacillin, Cephalexin, Trimethoprim-sulfamethoxazole, Rifampin</td>
<td>CR (1 year)</td>
</tr>
<tr>
<td>Age</td>
<td>Sex</td>
<td>Clinical Features</td>
<td>Cat contact</td>
<td>Diagnostic tests</td>
<td>Location of lesion (radiological technique)</td>
<td>Treatment</td>
<td>Outcome</td>
</tr>
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<tr>
<td>12. 1999</td>
<td>10/F</td>
<td>Low grade fever, night sweats, midthoracic pain, axillary lymphadenopathy</td>
<td>Cat scratches</td>
<td>PCR+ (LN), IgM+ and IgG+ (ELISA)</td>
<td>T5, paravertebral mass (CT, MRI), liver and spleen lesions (CT)</td>
<td>Rifampin, Ciprofloxacin</td>
<td>CR (9 months)</td>
</tr>
<tr>
<td>13. 2002</td>
<td>12/M</td>
<td>Fever, lower back, axillary lymphadenopathy for 15 days</td>
<td>Multiple cat scratches</td>
<td>IgG+ (IFA)</td>
<td>Tg (X-ray, SPECT, MRI)</td>
<td>Erythromycin</td>
<td>CR (9 months)</td>
</tr>
<tr>
<td>14. 2002</td>
<td>2/F</td>
<td>Fever, inability to walk</td>
<td>Multiple cat scratches</td>
<td>IgM+, rise of IgG (ELISA)</td>
<td>L4-5, paravertebral mass (CT, MRI)</td>
<td>Antimycobacterial drugs; Ceftriaxone, Cephradine, Azithromycin</td>
<td>CR (2 years)</td>
</tr>
<tr>
<td>15. 2002</td>
<td>2/F</td>
<td>Lower back pain, wide base gait</td>
<td>Cat contact</td>
<td>IgM+ and IgG+ (ELISA)</td>
<td>L2-3 (MRI)</td>
<td>Teicoplanin, Ceftriaxon, Cefaclor</td>
<td>CR (1 year)</td>
</tr>
<tr>
<td>16. 2002</td>
<td>28/M</td>
<td>Fever, abdominal pain, splenomegaly</td>
<td>Cat contact</td>
<td>PCR+ ([3], aspirate), IgM+ and IgG+ (IFA)</td>
<td>L1 (CT, bone scan, MRI), liver lesions (CT)</td>
<td>Ciprofloxacin, Amikacin</td>
<td>CR (3 months)</td>
</tr>
<tr>
<td>17. 2002</td>
<td>30/M</td>
<td>HIV positivity (anti-retroviral therapy), fever, back pain, myalgia, hepatomegaly</td>
<td>Cat scratches</td>
<td>PCR+ (T12 biopsy), rise in IgG (IFA)</td>
<td>T12, S1 (CT, MRI)</td>
<td>Ethambutol, Isoniazide, Pyrazinamide</td>
<td>CR (2 years)</td>
</tr>
<tr>
<td>18. 2003</td>
<td>62/F</td>
<td>Intermittent fever, neck pain, cervical lymphadenopathy, radiation of pain and paresthesia in both arms</td>
<td>Cat contact</td>
<td>Histology and PCR+ (bone C6 and LN), IgM+ and IgG+ (IFA)</td>
<td>C5-6, paravertebral mass (US, CT, MRI)</td>
<td>Surgical disectomy C5-6 and arthrodesis, anti-mycotic; Ofloxacin, Clindamycin</td>
<td>CR (9 months)</td>
</tr>
<tr>
<td>19. 2003</td>
<td>30/M</td>
<td>Axillary lymphadenopathy, lower back pain for 1 month</td>
<td>Frequent cat contact</td>
<td>IgM+ and IgG+ (IFA), PCR+ (bone and LN/pus)</td>
<td>L3, spleen, nodules (CT, MRI)</td>
<td>Doxycycline, Roxithromycin, Ciprofloxacin, Clarithromycin, Amikacin</td>
<td>CR (3 months)</td>
</tr>
<tr>
<td>20. 2005</td>
<td>5/M</td>
<td>Three weeks of spiking fever, headache, abdominal pain, torticollis, stiff neck</td>
<td>Cat contact</td>
<td>Histology, IgM- IgG+ (IFA?)</td>
<td>T5, epidural abscess T4-T7 (BS, MRI), liver and spleen lesions (CT)</td>
<td>Surgical resection of epidural mass, Clarithromycin, Trimetoprim-sulfamethazole</td>
<td>CR (8 weeks)</td>
</tr>
<tr>
<td>21. 2006†</td>
<td>9/F</td>
<td>Fever, neck pain, right arm paralysis</td>
<td>Cat scratch</td>
<td>Histology and PCR+ (mass), IgG+ and IgM+ (IFA)</td>
<td>C4-6, paravertebral mass (BS, MRI)</td>
<td>Open biopsy and pus drainage, Amoxicillin-Clavulanate</td>
<td>CR (3 months)</td>
</tr>
</tbody>
</table>

* Noted are diagnostic methods that were positive for cat-scratch disease; † The patient, as described in this report BS indicates bone scan (including Gallium scan), C, cervical vertebra; CR, complete recovery; CT, X-ray Computed Tomography; ELISA, Enzyme linked Immuno Sorbent Assay; female; IC, incomplete recovery; IFA, Indirect Fluorescence Assay; IgG, Immunoglobulin G; IgM, Immunoglobulin M; L, lumbar vertebra; LN, lymph node; M, male; MRI, Magnetic Resonance Imaging; NR, not reported; S, sacral vertebra; SPECT, Single Photon Emission Computed Tomography; T, thoracic vertebra; US, ultrasonography; + indicates positive.
REFERENCES