

## CASE REPORT

# *Bartonella henselae* vertebral osteomyelitis in a pediatric patient: A case report

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## Abstract

*Bartonella henselae* is an unusual and rarely suspected osteomyelitis etiologic agent. We present a case of low back-pain in a 10-year-old female which lead to a challenging diagnostic work-up due to subtle imaging findings. The diagnosis was *Bartonella henselae* vertebral osteomyelitis mimicking bone tumor.

## KEYWORDS

back pain, *Bartonella henselae*, bone lesion, magnetic resonance imaging, vertebral osteomyelitis

## 1 | INTRODUCTION

Back pain in childhood is a frequently reported symptom. Even though the majority of the cases are due to mechanical factors, back pain could be the initial presentation of serious pathologies, including vertebral infections and neoplasia. As several clinical findings may be similar in both of the abovementioned conditions, a correct diagnostic workup may be challenging for pediatricians.

The infectious agent most frequently involved in vertebral osteomyelitis (VO) is *Staphylococcus aureus*, while

in one-third of cases the etiology is unknown. *Bartonella henselae*, a Gram-negative bacterium isolated both from humans and animals, is the causative agent of cat scratch disease (CSD). The wide spectrum of CSD ranges from asymptomatic cases, local lymphadenopathy, fever, hepatosplenic localization, to neuroretinitis, encephalopathy, endocarditis, and osteomyelitis. In this regard, *Bartonella* osteomyelitis is a rare complication with a predilection for the vertebral column and pelvic girdle. Back pain and fever are the main complained symptoms.<sup>1</sup> Therefore, pediatric back pain is a common clinical problem which could hide

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unusual presentation of CSD spectrum. Here, we present a case of *B. henselae* VO mimicking bone tumor due to its clinical and radiological characteristics.

## 2 | CASE REPORT

A 10-year-old female patient with mild cognitive impairment was admitted to a peripheral pediatric hospital with a 2-week history of persistent lumbosacral pain radiating to the left leg. She complained about pain worsening at night and partial relief to nonsteroidal anti-inflammatory drugs. She had low-grade fever (37.2°C), weight loss in few days; no night sweats were reported. The patient lived in suburban Florence, and she denied recent travel, trauma, or lesions in the painful area. Her exposure history was notable for four cats, although no scratch has been referred. On clinical examination, she had scoliotic posture with limitation in lumbar spine range of motion. Routine blood investigations revealed elevated erythrocyte sedimentation rate (ESR) 70 mm/h (normal value 0–30 mm/h) and C-reactive protein (CRP) 2.72 mg/dl (normal value <0.5 mg/dl), and mild hyperuricemia (4.9 mg/dl; normal value 1.7–4.7 mg/dl). Chest and hip X-rays, and abdominal ultrasonography were unrevealing. A lumbar spine magnetic resonance imaging (MRI) disclosed an area of abnormal signal intensity on L3 vertebral body, suggesting a neoplastic tissue replacement. Only analgesic therapy was administered. The patient was finally transferred to our hospital. Extensive infectious diagnostic workup including serology for

*Lysteria*, *Borrelia*, *Tularemia*, and *Bartonella*, genome research of *Kingella*, *Pseudomonas*, *Staphylococcus aureus*, *S. pyogenes*, *Salmonella*, and *E. coli* by Polymerase Chain Reaction (PCR) test and blood cultures, was performed. Mantoux and QuantiFERON test were negative. On Day 2 of hospitalization, due to nasal swab positivity for *S. aureus*, intravenous cefazolin therapy was administered. No fever was reported and blood examinations on Day 5 showed negative CRP level and decreased ESR (41 mm/h). Lumbar computed tomography (CT) and whole spine MRI revealed an irregular lytic lesion (20 mm × 6 mm) disrupting L3 posterior and left walls with pathologic tissue extension from bone into paravertebral and epidural space (Figures 1 and 2). A neoplastic lesion was firstly suspected; therefore, tumor markers ( $\beta$  Human chorionic gonadotropin, Cancer Antigen 125, Ca19-9 and urinary vanillylmandelic acid), peripheral blood smear, and bone marrow aspiration were performed, which were all unremarkable. In order to reach the definitive diagnosis, a CT-guided percutaneous biopsy specimen was obtained, without complication. Histological examination excluded neoplastic entity, showing intense inflammatory infiltrate containing macrophages and plasma B cells. On Day 7 of hospitalization, *Bartonella henselae* serology was strongly positive for IgM and IgG (IgG ratio 1:640) through immunofluorescence assay, while all other infectious tests were unrevealing. Furthermore, PCR testing of bone lesion revealed *Bartonella* DNA positivity. Based on these findings, the diagnosis of *Bordetella henselae* VO was established. Therefore, the combination of doxycycline (150 mg daily)

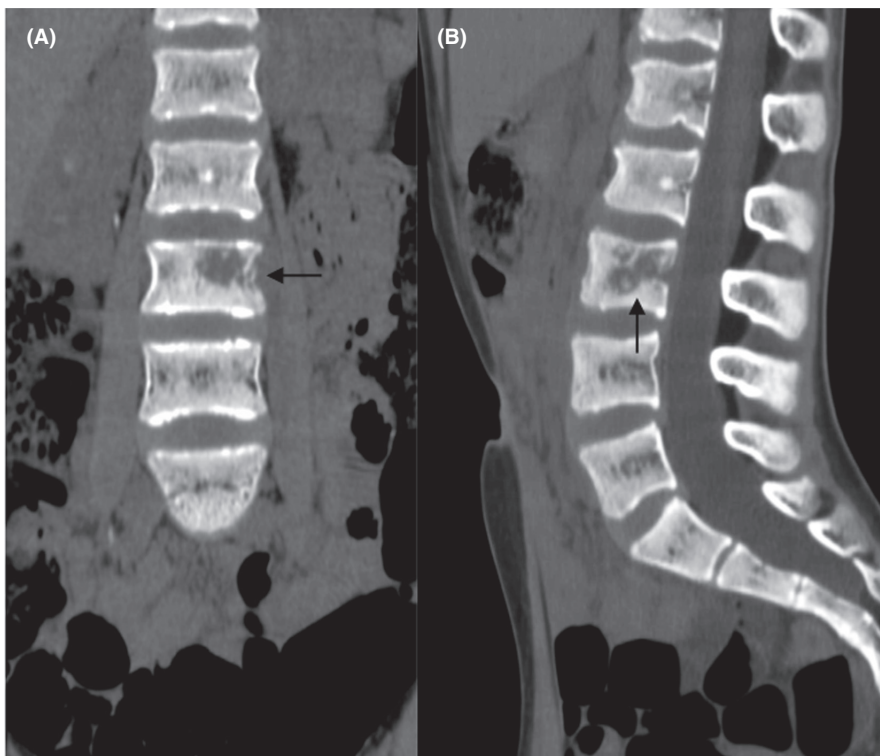
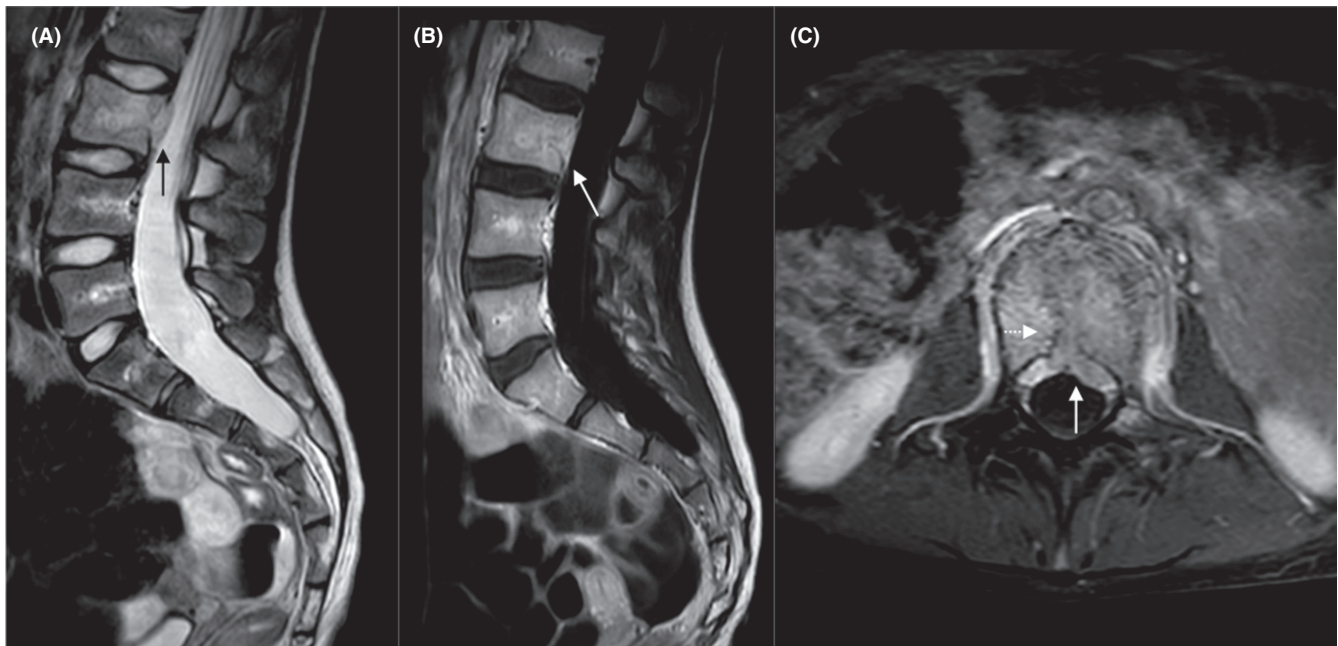


FIGURE 1 (A,B) Coronal and sagittal MPR CT scan, osteolytic lesion of the left hemisome of L3 with interruption of the lateral and posterior walls (black arrows).



**FIGURE 2** (A) Sagittal T2-weighted image of lumbar spine with retrospinal hyperintense signal indicating inflammatory tissue (black arrow) at level L3 with anterior dural compression. (B,C) Sagittal and axial contrast-enhanced T1-weighted showing abnormal enhancement indicating osteomyelitis of the vertebral somatic body (white arrows) with interruption of the posterior wall (dotted arrow) and extension into the anterior epidural space.

and rifampin (600 mg daily) was preferred for the treatment. After starting antibiotic therapy, the patient had a rapid clinical improvement and her hematological alterations normalized. On Day 10 of hospitalization, the patient was discharged on oral antibiotics to complete a 6-week course.

### 3 | DISCUSSION

Non-traumatic back pain in childhood is far more common than previously believed: its incidence increases with age, rising to around 25% during adolescence. While low back pain in childhood is typically benign and self-limiting, according to American College of Radiology appropriateness criteria<sup>2</sup> the presence of constant, radicular, or night back pain lasting more than 4 weeks, abnormal neurologic examination—alone or in combination—represent clinical red flags that should prompt further blood tests and imaging evaluation. In particular, clinical findings of pain worsening at night and low-grade temperature, as our patient complained, suggest an infectious or oncological etiology with the need of a timely and proper diagnostic workup. Discriminating between VO and neoplastic bone process can be challenging owing to subtle imaging findings. MRI is the most sensitive radiographic technique to define bone lesion characteristics and extension from bone into surrounding tissues without radiation exposure. However, sometimes, MRI features such as

signal hyperintensity on T2 and short-tau inversion recovery sequences may not necessarily differentiate VO from neoplasm. In our case, radiological investigations (CT, MRI) showed a focal non-specific lesion which mimicked the neoplastic process, and thus, the biopsy of the lesion was mandatory. Currently, in case of suggestive clinical manifestations of osteomyelitis, invasive procedures are not routinely performed, but they are reserved only in selected doubtful cases.

Osteomyelitis is rare clinical entity in childhood which likely occurs as acute hematogenous pyogenic osteomyelitis, with estimated incidence of 1.94–13 per 100,000 children/year in high-income countries.<sup>3</sup> Vertebral osteomyelitis, instead, accounts for only 1–4% of cases and occurs more commonly in older children and adolescents, often affecting the lumbar spine. Because its subtle and non-specific presentation, VO may not be early suspected, resulting in diagnosis and treatment delay. Although *S. aureus* is referred to as the most commonly isolated pathogen in both children and adults with VO, *B. henselae* has also been reported as an atypical agent, especially in childhood. When it occurs, the infection is usually localized in a single bone, with a predilection for the axial skeleton.<sup>1</sup> Establishing a definitive diagnosis of *Bartonella* osteomyelitis is challenging because of blood tests limitation. Blood culture methods have very low sensitivity diagnosing *Bartonella*, and even when culture is performed on a tissue sample, it requires 2–6 weeks, and it is commonly negative. Blood PCR assay is similarly ineffective due to

the absence of bacteremia in most cases. Conversely, *PCR* performed on tissue allows the direct and specific detection of *Bartonella*'s genome, at the cost of invasive procedure.<sup>4</sup> Currently, serological confirmation represents the most frequently used test in presumptive diagnosis of *Bartonella* infections, despite the inter-laboratory variability and the bias of antibodies prevalence in the general population. A gold standard test for definitive diagnosis of CSD has yet to be established, whereas taking into account both serology and *PCR* results can lead to a more accurate diagnosis.<sup>5</sup> Notably, as reported by Mazur-Melewska et al.,<sup>4</sup> a systemic infectious disease with remarkable blood test could mask a neoplastic process, determining delay in diagnosis. Therefore, a multidisciplinary approach with complete laboratory workup is mandatory.

## 4 | CONCLUSIONS

Pediatric back pain is a common clinical problem which may be the initial presentation of serious pathologies, including vertebral infections and neoplasia. Even though MRI is the most sensitive radiographic technique to define bone lesion characteristics, sometimes discriminating between VO and neoplasm can be challenging; thus, the biopsy of the lesion is mandatory.

Especially if there is a history of exposure to cats, *Bartonella* infection should always be included in the differential diagnosis of back pain associated with fever in childhood, even in the absence of specific clinical manifestation or other systemic dissemination signs of CSD.

The combination of biopsied tissue *PCR* test and serology can lead to a more accurate diagnosis in suspicion of cat scratch disease.

## AUTHOR CONTRIBUTIONS

SAR wrote the manuscript and made substantial contributions to conception and acquisition of data. GB supervised the manuscript as regarding the orthopedic details. MDM performed instrumental investigations and contributed to the imaging interpretation. GI revised the manuscript critically for important intellectual content. ST made contribution on design and final approbation. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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None.

## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

## CONSENT

Written informed consent for publication of their clinical details and/or clinical images was obtained from the parent of the patient. A copy of the consent form is available for review by the Editor of this journal.

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