Case Report

SAGE Open Medical Case Reports

SAGE Open Medical Case Reports
Volume 8: 1–3

DOI: 10.1177/2050313X20949781
journals.sagepub.com/home/sco
SAGE

Vertebral osteomyelitis in an adolescent girl

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Abstract

We present a case of a 13-year-old girl with vertebral osteomyelitis. She had been experiencing lower back pain for 5 weeks, initially thought to be due to muscular causes. The blood culture showed no bacterial growth, and she was treated empirically only with antibiotics. She responded well to treatment and required no surgical intervention. Vertebral osteomyelitis should be in the differential diagnosis in an adolescent who complains of worsening lower back pain. Early diagnosis and treatment are essential in avoiding complications.

Keywords

Infectious diseases, orthopaedics/rehabilitation/occupational therapy, osteomyelitis, back pain

Date received: 25 March 2020; accepted: 20 July 2020

Introduction

Acute osteomyelitis in children usually results from a hematogenous spread of bacteria in the setting of transient bacteremia. The majority of cases occurs in the metaphyses of long bones in younger children. Vertebral osteomyelitis, on the contrary, accounts for only 1%–4 % of osteomyelitis cases and occurs more frequently in older children and adolescents.[1–4] The diagnosis of vertebral osteomyelitis is usually delayed due to non-specific symptoms including back pain, which can be mistakenly attributed to muscle strain, especially in an active child. Delays in diagnosis and treatment can result in the spreading of the infection to the spinal canal and devastating neurological complications.[3,5] Treatment usually includes 6–8 weeks of antibiotics.[3,6] The most common organism is *Staphylococcus aureus*, including methicillin-resistant *Staphylococcus aureus* (MRSA). Surgery is indicated in certain cases such as failure to respond to antibiotic treatment, abscess formation, and the development of neurological complications.[3,5]

Case presentation

A previously healthy 13-year-old girl was admitted to the hospital due to 5 weeks of worsening lower back pain. Her pain was exacerbated by any movement such as walking or bending over, and the pain had been waking her up during the night in the days leading up to admission. Her pain was initially attributed to muscle strain, as a result of which she was seen by a physical therapist. She had also been taking ibuprofen with minimal relief. There was no obvious trauma noted although the patient recalled a minor abrasion to her back which happened during soccer practice. She reported no fever, cough, night sweats, joint pain, skin rash, or weight loss. Her immunizations were up to date, and she had not recently travelled nor had any contact with cats. In the emergency room, the patient was afebrile and her vital signs were stable. Her physical examination was unremarkable with the exception of mild lower back tenderness. Her laboratories revealed normal white blood cell counts (WBCs) of $9.2 \times 10^3/mm^3$ with 58% neutrophils. She had elevated inflammatory markers; C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) were 1 mg/dL (normal is less than 0.3) and 52 mm/h (normal is less than 15), respectively. A plain radiograph of her back (Figure 1) showed bony irregularity at the inferior aspect of T11 and superior aspect of T12. A magnetic resonance imaging (MRI) of her spine was consistent with vertebral osteomyelitis and discitis of T11 and T12 (Figure 2). A blood culture was obtained and she was started on intravenous (IV) vancomycin and ceftriaxone empirically. The antibiotic regimen was changed in 2 days to IV ceftaroline fosamil 400 mg q 8 h. The possibility

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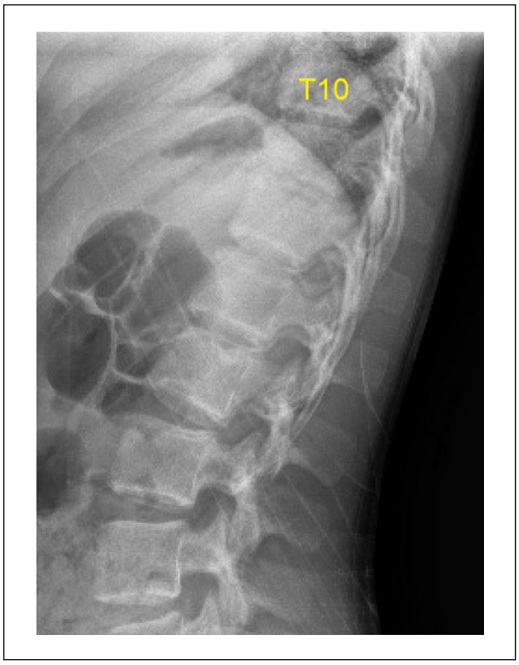

Figure 1. Spinal X-ray shows endplate irregularity is present at the inferior aspect of T11 and superior aspect of T12 with mild compression deformity of the anterior aspect of T11.

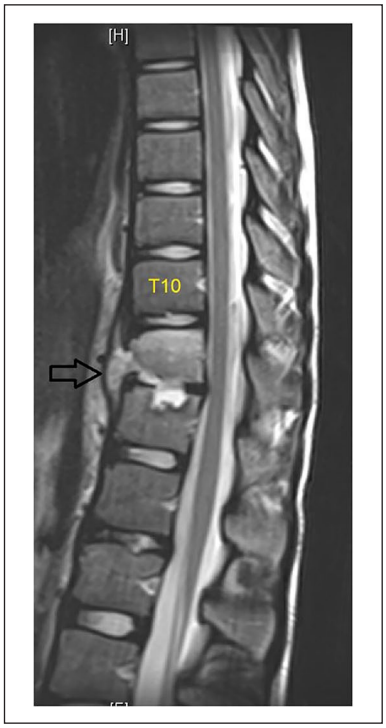

Figure 2. Sagittal MRI T2 shows abnormal signal and loss of the normal disc space at the T11–T12 level with destructive changes of the inferior endplate of T11 and the superior endplate of T12. In addition, there is fluid signal within the disc space extending anteriorly into the paraspinal space consistent with a tiny developing abscess (arrow).

of tuberculosis was ruled out by a negative interferon-gamma release assay. The orthopaedic surgeon was consulted and did not recommend surgical intervention. The patient's back pain improved, her blood culture showed no bacterial growth, and she was discharged home after 3 days of hospital stay. She had a central venous catheter placed, and she completed a total of 2 weeks of IV antibiotics and 6 weeks of oral antibiotics, sulfamethoxazole/trimethoprim and cefdinir, to empirically cover for *S. aureus* and *Streptococcus* species, respectively. She followed up with the infectious disease clinic which monitored her condition closely and followed her CRP, which normalized in 3 weeks. The patient had a full recovery, and she returned to her normal daily activities.

Discussion

Acute osteomyelitis in children usually results from a hematogenous spread of bacteria in the setting of transient bacteremia. A recent history of a minor trauma has been reported in some cases. The majority of osteomyelitis cases occurs in the metaphyses of long bones due to their vascular characteristic of sluggish-flow tortuous capillaries, which facilities the aggregation of bacteria.[1,2] More than half of osteomyelitis cases occurs in children less than 5 years of age, and lower extremities are affected more than upper extremities.[1,2,7] Vertebral osteomyelitis, on the contrary, accounts for only 1%–4% of cases and occurs more commonly in older children and adolescents. The lumbar spine is most commonly affected.[3,5,7] The diagnosis is usually delayed due to non-specific symptoms of back pain, which can be attributed to muscle strain in an active child, as we saw in this case. Blood cultures show no bacterial growth in the majority of osteomyelitis cases including vertebral osteomyelitis. The proposed mechanism in these cases is an occult bacteremia from a distant focus of infection such as otitis media or pharyngitis.[1] When bacteria are isolated, *S. aureus* is the most common pathogen followed by group A *Streptococcus*. *Bartonella henselae* infection should be in the differential diagnosis in patients with cat exposure, and mycobacterial infection should be considered in endemic areas.[1–5,7]

WBCs are usually mildly elevated or normal, but inflammatory markers are usually elevated similar to this case. CRP and ESR are helpful in monitoring the response to appropriate treatment.[3,4] A plain X-ray is usually the first step in imaging evaluation in order to rule out other causes of musculoskeletal pain such as fracture or neoplasms. It takes 2–3 weeks before bone changes can be seen on an X-ray. An MRI is considered the imaging modality of choice.[5] The MRI findings in Figure 2 are consistent with vertebral osteomyelitis of T11 and T12 and intervertebral discitis (i.e. spondylodiscitis). The infection likely originated first in the vertebral bone tissues and then subsequently extended to the intervertebral disc. This is in contrast to spondylodiscitis in young children in which the infection usually starts in the intervertebral disc due to its vascular supply. As children get older, the blood vessels in the

disc are obliterated.[8] Historically, osteomyelitis has been treated with a prolonged course of IV antibiotics (4–6 weeks) due to the risk of recurrence and treatment failure in shorter courses of IV antibiotics.[9] This usually requires central venous catheter placement, which results in complications including deep venous thrombosis, central venous catheter infection or displacement, and re-admission to the hospital.[2] Recently, more studies support early transition (within 3–5 days) to oral antibiotics in uncomplicated cases of osteomyelitis guided by clinical and laboratory improvement (e.g. the absence of a fever, the ability to bear weight, pain improvement, and a decrease in inflammatory markers).[6,10] We extended the IV antibiotic course in our patient to 2 weeks due to vertebral involvement.[3,11] Had our patient had femur or tibial osteomyelitis, for example, we could have switched to oral antibiotics within a few days provided there was an improvement in clinical condition and laboratory values, as mentioned above. Our patient was started empirically on vancomycin and ceftriaxone and was switched in 2 days to IV ceftaroline fosamil to complete her 2-week IV course. Ceftaroline has good bone penetration, does not require drug level monitoring, is active against MRSA, and generally tolerable. Its success rate in treating osteomyelitis is reported to be above 90%.[12,13] Surgery is usually reserved for cases complicated by drainable abscess formation, neurological signs and spinal cord compression, or the failure to respond to antibiotics alone.[3] Cases complicated by severe vertebral bodies' destruction might result in spinal deformities such as kyphosis, and patients would then benefit from long-term follow-up with orthopaedic surgeon.

Conclusion

Vertebral osteomyelitis is a rare condition in children and accounts for only 1%–4 % of all osteomyelitis cases. Signs and symptoms are non-specific including chronic back pain. Laboratory values such as inflammatory markers are more helpful in following up and monitoring response to treatment, whereas an MRI is essential for diagnosis. Health care professionals should maintain a high index of suspicion for the diagnosis of vertebral osteomyelitis, especially when they encounter an adolescent patient with chronic back pain combined with elevated inflammatory markers. Early recognition and treatment with antibiotics is associated with a good outcome and avoidance of complications.

Declaration of conflicting interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

Our institution does not require ethical approval for reporting individual cases or case series.

Funding

The author received no financial support for the research, authorship, and/or publication of this article.

Informed consent

Written informed consent was obtained from a legally authorized representative(s) for anonymized patient information to be published in this article.

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