Clinical Case Report

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Salmonella potsdam causing lumbar vertebral osteomyelitis

A case report

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Abstract

Rationale: Salmonella osteomyelitis is an uncommon complication of salmonella infection, especially the salmonella vertebral osteomyelitis (SVO).

Patient concerns: We reported a case of a 29-year-old female who presented with serious lower back pain and severe limitation of motion for 50 days with no obvious inducements. She once had a fever up to 39.5°C. Physical examination only revealed limited motion of lower back without neurological complications. The laboratory results revealed no specificity. MRI of the lumbar spine revealed a spondylodiscitis at L4-L5. She underwent anterior lateral approach debridement and percutaneous posterior instrumentation.

Diagnoses: Tissue and abscess culture grew showed Salmonella Potsdam infection.

Interventions: With susceptibility testing guidance, the patient was treated with intravenous levofloxacin and ceftazidime for a period of 3 weeks and another 3-week oral antibiotics therapy.

Outcomes: The patient recovered well with no neurological deficits during the follow-up time.

Lessons: SVO is really rare and it alerts us the importance to consider uncommon pathogens in the differential diagnosis in which the etiological evidences are crucial of healthy individuals.

Abbreviations: CRP = C-reactive protein, CT = computed tomography, ESR = erythrocyte sedimentation rate, MRI = magnetic resonance imaging, PCT = procalcitonin, SVO = salmonella vertebral osteomyelitis, TB = tuberculosis, WBC = white blood cell.

Keywords: diagnosis, salmonella, treatment, vertebral osteomyelitis

1. Introduction

Salmonella are known to cause 4 major clinical syndromes: enteric fever, acute gastroenteritis, bacteremia with or without metastatic infection, and the asymptomatic carrier state.[1] It is extremely rare that Salmonella, as an etiological agent, causes about 0.5% to 2% of all cases of osteomyelitis.[2,3] As far as salmonella osteomyelitis is uncommon, the salmonella vertebrae osteomyelitis (SVO) is reported extremely rare. SVO is always associated with haemoglobinopathies, such as sickle cell anemia or thalassemia, diabetes mellitus, a history of intravenous drug abuse, pulmonary diseases, renal deficiency requiring hemodialysis, human immunodeficiency virus, chronic immunocompromised states like systemic lupus erythematous, lymphoma, or on steroids. So far, in the majority of cases reported in the literature, SVO happened and a pre-existing history of intestinal infection is essential. In this article, a rare case of a 29-year-old female with Salmonella Potsdam lumbar vertebral osteomyelitis, without any pre-existing history of intestinal infection or other predisposing is admitted and finally cured through individualized operation and medication.

2. Case report

A 29-year-old female, with no past medical history, presented with serious lower back pain and severe limitation of motion for 50 days and no obvious inducements existed. No symptoms of radiculopathy were found when reception. She denied any history of fever, chilly, constitutional symptoms, ill contact, or recent travel. Systemic review was normal. She sought for medical help, as her lower back pain became worse after a series of unclear medication treatment. The symptoms were not obviously improved, while she caught a fever up to 39.5°C about 1 month before. The laboratory tests revealed that white blood cell (WBC) was counted as 10.07×10^9/L, with 69.5% neutrophils, and 16.4% leukocyte. C-reactive

Editor: N/A.

There is no funding received by this article.

Written informed consent was obtained from the patient for publication of this case report. A copy of the written consent is available for review by the editor of this journal.

Financial disclosure statements have been obtained, and no conflicts of interest have been reported by the authors or by any individuals in control of the content of this article.

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Medicine (2018) 97:18(e0682)

Received: 24 January 2018 / Accepted: 17 April 2018

http://dx.doi.org/10.1097/MD.0000000000010682

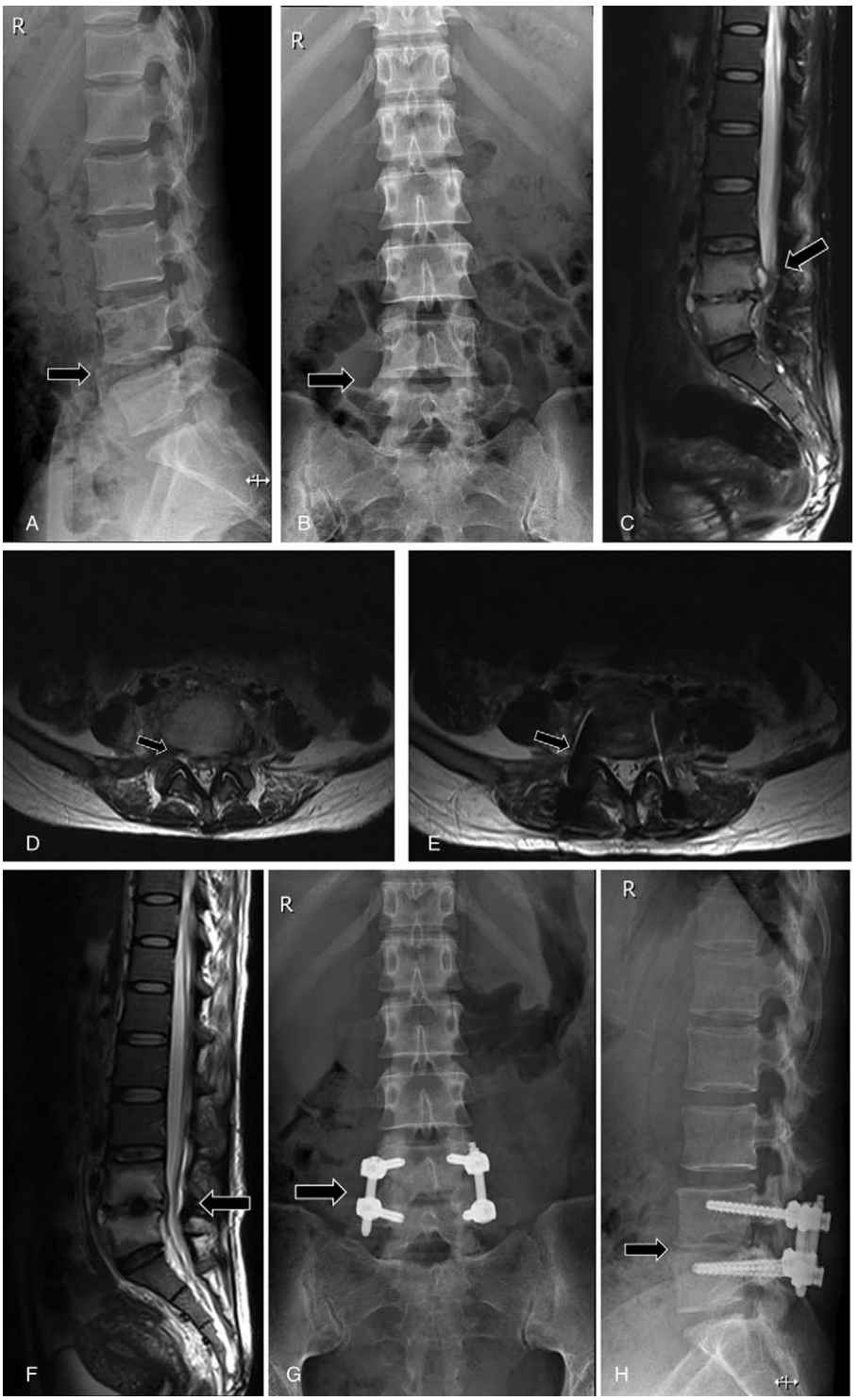

Figure 1. (A and B) Anterioposterior and lateral plain radiograph revealed osteoarthritic changes of the lumbar spine. There is a loss of lordosis on the lumbar spine by narrowing of the intervertebral disk space between the L4 and L5. (C and D) Magnetic resonance imaging (MRI) of the lumbar spine demonstrated spondylitis of the fourth and the fifth lumbar vertebrae, as well as destruction of intervertebral disk between them, where it is associated with paravertebral and epidural components with compression of the spinal cord. Swelling soft tissues paravertebral were also observed. (E and F) Postoperative magnetic resonance imaging (MRI) showed that abscess was drained and adjacent inflammatory tissues were removed, as well as swelling subsided. Compression of the spinal cord was relieved. (G and H) Postoperative 4 months, plain radiograph showed segmental instrumentation from L4 to L5 vertebrae. Appearances of edge sclerosis and L4/5 partly fusion were observed.

protein (CRP) level was higher than 160 mg/L and erythrocyte sedimentation rate (ESR) was 98 mm/h. Procalcitonin (PCT) was 0.414 ng/mL. Both hemoculture and tuberculosis (TB) antibody colloidal gold diagnostic tests were negative.

Anterioposterior and lateral plain radiograph revealed a loss of lordosis on the lumbar spine by narrowing of the intervertebral disk space between the fourth (L4) and the fifth lumbar (L5) vertebrae (Fig. 1A, B). In addition, magnetic resonance imaging

(MRI) of the lumbar spine demonstrated spondylitis of the fourth and the fifth lumbar vertebrae as well as destruction of intervertebral disk between them, well-defined paraspinal abnormal signal and paraspinal abscess with thin and smooth wall (Fig. 1C, D), which is in parallel with tuberculous spondylitis manifestations.[4,5]

The patient was empirically diagnosed TB lumbar spondylitis and underwent anti-TB therapy with oral rifampicin. However, there is no improvement in clinical symptoms after 1-month chemotherapy for TB. Repeated laboratory tests revealed that WBC was 8.5×10^9/L, with 69.6% of neutrophils and 20% of leukocyte, while CRP was 29 mg/L and ESR 57 mm/h. PCT was 0.113 ng/mL. Widal–Wright and T-Spot tests were within normal limits, so that TB might not be the primary pathogen because of the limited response of anti-TB therapy and specific evidence. An exploration of the L4/5 through the anterior lateral approach was recommended to evaluate the germ and debridement, and percutaneous posterior instrumentation was performed from L4 to L5 segmental. Hypertrophic and edematous prevertebral fascia was observed during the surgery. Between the surface of iliopsoas and L4/5 vertebrae, an abscess was drained and sent for culture. Adjacent inflammatory tissues were removed, and the L4/5 disc and its adjacent vertebral endplates were eliminated. Frozen pathological section examinations of the specimen tissues revealed infiltration of neutrophils. No evidences of TB, such as epithelioid cell hyperplasia and Langhan cell, or malignancy were detected. The percutaneous posterior L4/5 segmental instrumentation was then performed.

Culture of tissue and abscess contents obtained during surgery confirmed infection by Salmonella Potsdam. She was finally diagnosed as lumbar spondylitis, lumbar interstitial infection caused by S. Potsdam. On the basis of drug sensitivity test, levofloxacin and ceftazidime were administrated through intravenous injection for 3 weeks, which followed by oral antibiotic for another 3 weeks. At the 4-month follow-up, her previous back pain almost disappeared. MRI showed swelling subsided (Fig. 1E, F) and radiography appearances of edge sclerosis and L4/5 partly fusion were observed (Fig. 1G, H).

3. Discussion

Spondylitis makes up approximately 1% to 7% of all osteomyelitis.[6,7] It is rare that Salmonella, as an etiological agent, causes about 0.5% to 2% of all cases of osteomyelitis.[2,3] The diaphysis of long bones, especially the femur and humerus, is vulnerable by salmonella infection, following the lumbar vertebrae, tibia, radius, and ulna.[8] As salmonella osteomyelitis is uncommon, the SVO report is extremely rare. There appears to be an increasing occurrence of salmonella spinal infections in recent years, which can be attributed to the aged tendency of population and increasing prevalence of immunocompromised individuals. Patients with hemoglobinopathies, such as sickle cell anemia or thalassemia, diabetes mellitus, a history of intravenous drug abuse, pulmonary diseases, renal deficiency requiring hemodialysis, human immunodeficiency virus, chronic immunocompromised states such as systemic lupus erythematous, lymphoma, or on steroids are particularly susceptible to SVO. SVO mostly occurs due to salmonella infection by hematogenous route,[9] which could cause remote salmonella infection anywhere in the body. Moreover, contiguous spread from adjacent infected tissues is more rare. Contamination after invasive diagnostic or therapeutic procedures is also an unignorable cause.

Fever and back or neck pain remain the main symptoms of SVO patients on presentation. More than a half patients suffer salmonella osteomyelitis catch prodromal gastrointestinal disorders such as enteric fever or acute gastroenteritis,[10] without specificity. Back and neck pain are also universal initial complaints in SVO as well as in other suppurative or nonsuppurative vertebral osteomyelitis. These cardinal symptoms are too common to lead to misdiagnosis and delay in diagnosis. SVO preference occurred in patients those who are immunocompromised such as systemic lupus erythematous, lymphoma, and patients on steroids. It is another reason that patients with none of these predisposing factors tend to be misdiagnosed. The present case occurred in an immunocompetent youth-age female from nonendemic areas without awareness of primary salmonella infections, prodromal gastrointestinal disorders, or other direct inoculation, which set us difficulties in definite diagnosis at the very first.

Laboratory markers, including WBC count, ESR, and CRP level, are of a certain extent sensitive in the early detection of patients who were suspected of suffering a salmonella spinal infection, especially without initial positive neuroimaging performance. The ESR was elevated in 70% to 100% of all spinal infection cases, compared with 13% to 60% of all spinal infection cases in which the leukocyte count is elevated. The CRP is also a sensitive indicator of spinal infection, such as the ESR test. Nevertheless, neither of these tests is specific enough in revealing the pathogens of spinal infection.

Radiographs by X-ray plain films can reveal the changes, including end plate erosion, loss of the intervertebral disk space, paravertebral soft-tissue edema, or even the collapse of vertebral not until 2 to 4 weeks after the onset of infection. Computed tomography (CT) scans with 3-dimensional reconstruction can further demonstrate destruction of vertebral and the compression of spinal cord. However, MRI, as the gold standard in the diagnosis of SVO, is the best available imaging modality for detecting early osteomyelitis, as early as 1 to 2 days after the onset of infection, owing to its high sensitivity, excellent anatomical detail, and superior soft tissue resolution.[11] But the MRI is still limited in differentiating the pathogens. It is easy to be confused with tuberculous spondylitis in radiologic characteristics. Recent surveys suggest that tuberculous spondylitis tends to perform like well-defined paraspinal abnormal signal, paraspinal or intraspinal abscess with thin and smooth wall, and thoracic spine involvement.[5] In this case, the patient was misdiagnosed as TB spondylitis empirically on the first admission due to the similar radiologic and clinical performances. In addition, we could not exclude the possibility of TB infection because of the nonstandard anti-TB therapy, which also increased the risk of anti-TB drug resistance. The key to diagnosis is confirmed with a focus on specimens to determine the causative organism, as only approximately 20% to 60% of patients with spinal infection show positive results by the blood culture, and the urine culture is not reliable either. The percutaneous aspiration biopsy and culture and histopathologic examination of lesion position are the gold standard for diagnosis.[6] If the causative organism cannot be figured out by repeated closed aspiration biopsy successfully, open biopsy methods with a lower false-negative rate may be required. Besides, specimens of lesion position for the histopathologic examination can be obtained at the same time to further confirm the causative organism result.

SVO has been treated successfully by conservative treatment consisting of antibiotics therapy and external immobilization, or surgical method based on treatment along with prolonged

treatment with antibiotic drugs.[2] Although there is no standardized antibacterial therapy guide, chloramphenicol, third-generation cephalosporins, and fluoroquinolones are commonly accepted in dealing with the SVO.[1,10] Antibiotics therapy should be continued for at least 6 weeks in case of the associated relapses and failure occurrence due to insufficient duration.[3] Antibiotics therapy that lasts less than 4 weeks is associated with maximum 25% recurrence rate. The ESR level can reduce to one half to two-thirds of pretreatment levels when the treatment is effective. External immobilization should be used for at least 3 months to alleviate pain and to prevent deformity and neurological deficits exacerbation. The indications for surgical treatment are neurologic complications, failure of conservative treatment, and mechanical instability of the spine. Attempts to establish a diagnosis is also an indication for surgery. The major principles of surgical treatments in lumbar spinal osteomyelitis are thorough removal of infected tissues, recovery of neurological function, and restoration of sagittal and coronal plane alignment by providing spinal stability to prevent further kyphotic deformity, pain, or neurological deficits. It is generally admitted that the anterior approach is mainly used for relieving compression of the spinal cord caused by ventral lesions, while the posterior approach is mainly used for dorsal problems. The anterior approach has been widely used to solve infections of spine, which are situated anterior to the spinal cord, as it provides direct access to debride infected tissues and excellent decompression of the spinal cord. Nevertheless, the adequate stability of spine cannot be assured because of the normal curvature. Thus, the combination of posterior fusion and internal fixation with pedicle screw system is needed to enhance the spinal stabilization. In setting of spinal infection, the use of metallic implants and bone graft anteriorly may raise the risk of recurrence. Delayed secondary infection has been reported more than 1 year postoperative after surgical debridement and internal fixation.[12] There comes up a controversy whether surgeon should insert the implants as soon as the lesions are debrided or wait until the infection has been completely controlled. The traditional view is that only 1-stage therapy and internal fixation may lead to poor stability, low fusion rates, and losses of height of vertebrae after the lesion materials and adjacent inflammatory tissues have been mostly removed, which may cause vertebral space remaining.[13] While different opinions suggest that 1-stage operation is safe as long as the lesions have been completely eliminated and antibiotic therapy is sufficient.[12,14] Authors recommend that surgeons should not ignore the advantages of single-stage decompression and fixation, as it continues to be successful, including short hospitalization, lower risk of anesthesia or surgery, and conductive to recovery. In the present case, we performed the anterior lateral approach debridement to remove the lesions as completely as possible and percutaneous minimal invasively posterior instrumentation for the advantages of better stabilization, more tiny surgical incision, and better avoiding direct connection with the site of infection. Then, levofloxacin and ceftazidime were intravenously injected for 3 weeks, followed by oral antibiotic for another 3 weeks. The young lady received favorable spinal mechanical stabilization and her back pain almost vanished during the 4-month follow-up. The review of laboratory tests and radiologic characteristics also improved significantly.

4. Conclusion

SVO is an extremely rare diagnosis that should be paid special attention to, especially when patients have the corresponding risks and symptoms above. It is necessary to combine predisposing factors, clinical manifestations, laboratory examinations, and imaging findings together to avoid misdiagnosis. MRI is the best available imaging modality for early detection and the evidence of etiology of the lesion position is essential for confirming the diagnosis. Conservative treatment alone is appropriate when there are no neurologic complications and mechanical instability existed. Surgical debridement, decompression, and stabilization are the primary purposes once surgery has been performed. Etiologic and pathologic tests of tissue and abscess contents culture obtained during surgery are meaningful for an accurate diagnosis; however, more rapid diagnostic procedures and more individualized treatment procedures are in urgent need to benefit more patients.

Acknowledgment

The authors acknowledge the written consent for publication obtained from the patients featured in the manuscript.

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Writing – review & editing: Weike Cheng, Kejian Lian, Dasheng Lin, Tongtao Li.

Weike Cheng and Kejian Lian collected the clinical materials and retrieved literature, conceived of the study, and participated in its design and coordination and drafted the manuscript. Deqing Luo, Dasheng Lin, and Wanqiang Feng retrieved data, participated in design, and drafting of the manuscript. Hang Xian and Tongtao Li supervised design, coordination, and drafting of the manuscript, and revised the final edition of the manuscript for important professional content. All authors read and approved the final manuscript.

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