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**Zaid B. Al Jebaje, Andrew Zhao, Mohammed Samannodi,
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ABSTRACT

Introduction: Osteomyelitis caused by *Salmonella* is rare, especially in immunocompetent patients, as it typically occurs in patients with sickle cell anemia, HIV, corticosteroid use, or any other conditions that can compromise the immune system. The objective of this report is to establish *Salmonella* as a potential causative agent in the differential diagnosis of osteomyelitis for clinicians.

Case Report: We report a 25-year-old male who does not have any history of sickle cell anemia, corticosteroid use, or HIV who presented with back pain and constitutional symptoms suggestive of an ongoing infection. Laboratory workup, X-ray, magnetic resonance imaging, and fluoroscopic biopsy of the affected area helped establish the diagnosis and guide treatment options. The condition of patient improved after extended course of antibiotics.

Conclusion: Patients with *Salmonella* spondylitis typically present with back pain and fever. Initial diagnostic workup should include complete blood count (CBC), C-reactive protein (CRP), and erythrocyte sedimentation rate (ESR) levels. X-ray can be used for initial imaging but MRI will better visualize the full extent of the infection while guided needle biopsy with cultures will distinguish the organism and its antimicrobial susceptibilities. Extended antibiotic coverage for 6–12 weeks is often needed and recommended.

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CASE REPORT

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diagnostic workup should include complete blood count (CBC), C-reactive protein (CRP), and erythrocyte sedimentation rate (ESR) levels. X-ray can be used for initial imaging but MRI will better visualize the full extent of the infection while guided needle biopsy with cultures will distinguish the organism and its antimicrobial susceptibilities. Extended antibiotic coverage for 6–12 weeks is often needed and recommended.

Keywords: Immunocompetent, Osteomyelitis, *Salmonella*, Spondylitis

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INTRODUCTION

Salmonella is a gram-negative bacillus that is most commonly associated with gastrointestinal infections worldwide and typhoid/paratyphoid fevers in less developed countries. In addition, *Salmonella* can also rarely cause spondylitis, defined as osteomyelitis of the spine with destruction of the vertebral bodies, but it is associated with only 0.5% of all osteomyelitis cases [1]. The majority of said cases are frequently associated with patients with immunocompromised states, such as malignancies, long-term corticosteroid use, and sickle cell anemia. We report a case of a 25-year-old

immunocompetent non-sickle cell African-American male with chronic lower back pain diagnosed as *Salmonella* non-typhoidal spondylitis.

CASE REPORT

A 25-year-old African-American male presented to the Sisters of Charity hospital with complaints of progressively worsening lower back pain for six months. The pain started as mild back ache that did not have significant effect on the man's daily activities but gradually worsened, causing the patient to seek medical help. He visited multiple local healthcare facilities where he was diagnosed with muscle strain and treated with non-steroidal anti-inflammatory drugs (NSAIDs) and muscle relaxants.

During the course of his progressive pain, the man started to notice increasing back stiffness and difficulty in walking. Two days prior to presentation, he also started experiencing fever, chills and generalized tiredness. The patient denied any recent trauma, weight loss, nausea, vomiting or diarrhea, or urinary symptoms. He also denied consumption of unpasteurized milk or undercooked poultry. Patient denies recently interacting with any known sick contacts. He had a negative past medical and surgical history and any history of illicit drug use or owning pet animals.

On examination, the patient had a temperature of 39.0°C, pulse rate 98 BPM, blood pressure 125/80 mmHg and respiratory rate 16 breaths/minute. On musculoskeletal examination, he had mild midline lumbar spine and para-spinal tenderness. Spinal range of movement examination revealed mild pain and stiffness on flexion. Hips were stable and straight leg raising test was negative bilaterally. Neurological examination and remainder of physical examination was unremarkable in its entirety.

Initial laboratory blood work were drawn and results returned as followed: hemoglobin 12.1 g/dL, hematocrit 37.1%, white blood cells count $8.6 \times 10^3/\text{ul}$, platelets $157 \times 10^3/\text{ul}$, C-reactive protein 108 mg/L and erythrocyte sedimentation rate 66 mm/hr. Renal and liver function tests were unremarkable, coagulation profile within normal range, and sickle cell screen negative. Hemoglobin electrophoresis was also normal. Cultures of blood, stool and midstream urine later returned negative. Serum anti-nuclear antibody (ANA), perinuclear anti-neutrophil cytoplasmic antibodies (pANCA) and cytoplasmic anti-neutrophil cytoplasmic antibodies (cANCA) were all negative. HIV testing results returned negative as well and CD4 count was within normal limits.

X-ray of the lumbar spine was negative for any bony erosion or soft tissue abnormality. Magnetic resonance imaging (MRI) scan of the lumbar spine showed enhanced abnormal signal involving L4 and L5 anteriorly with thickening of anterior longitudinal ligament and sparing

of disc space a picture likely consistent with infectious spondylitis (Figure 1).

The patient underwent a fluoroscopy guided needle aspiration and biopsy of L4/L5 space and received intravenous ceftriaxone 2 g daily. The biopsy results returned positive for *Salmonella* non-typhoid group, sensitive to ceftriaxone and ciprofloxacin.

Basing the working diagnosis on spondylitis secondary to a *Salmonella* non-typhoid infection, our decision was to continue the patient on intravenous

Figure 1: Magnetic resonance imaging scan showing (A) sagittal, and (B) axial sections of the lumbar spine with 15 cc of ProHance. The disc spaces do not show any narrowing while L4/L5 junction shows morrow edema with enhancement of anterior endplates and thickening of anterior longitudinal ligament; overall picture is suggestive of disc sparing infectious spondylitis.

ceftriaxone for six weeks, followed by another six weeks of oral ciprofloxacin. During his recovery, he also wore a thoracolumbar brace for spinal immobilization. His clinical presentation and inflammatory markers started improving within several days. The patient was discharged to a physical rehabilitation facility with a peripherally inserted central line in place for intravenous antibiotic treatment. After three weeks of antibiotic therapy, his ESR was down to 14 mm/hr and CRP 2.2 mg/L. To date, he has finished his antimicrobial course and has remained asymptomatic.

DISCUSSION

Salmonella has been most commonly associated with gastrointestinal infections but it also holds the distinction of causing osteomyelitis in immunocompromised patients. Sick cell disease (SSD) particularly stands out as the increased risk of *Salmonella* osteomyelitis in SSD patients has been well documented in medical literature. The accepted explanation of the underlying pathophysiology involves intravascular sickling of the bowel leading to ischemic infarction and development of vulnerable areas in the bowel for bacterial entry. This is then amplified by SSD patients' susceptibility for hyposplenism at a young age, causing a sub-functional immune system, and microvascular occlusions, leading to bone infarcts and necrosis [2, 3]. However, as demonstrated in this case, immunocompetent individuals can still rarely suffer from *Salmonella* osteomyelitis. Clinicians should strive for earlier diagnosis, stabilization, and medical/surgical intervention in these cases because of the mortality in patients with vertebral osteomyelitis [4].

The patient involved in this report suffered from progressive lower back pain, back stiffness, difficulty walking, and constitutional symptoms (fever, chills, and fatigue) later on. In the review by Santos and Sapico, fever and back pain were the main complaints in patients with *Salmonella* vertebral osteomyelitis, with fever present in 87% of cases and back pain 92% [5]. Review of current literature also supports this finding as an overwhelming majority of case reports also mention back pain and recurrent fevers as their patients' chief complaints [1, 4, 6–8]. At the same time, patients commonly did not recall any previous history of typhoid fever or gastroenteritis (as several weeks may have passed).

Clinicians are also recommended to pay close attention to the laboratory results of any patients presenting with lower back pain and fever because reliance on the white blood cell count alone might not be as helpful in diagnosis of *Salmonella* spondylitis. The patient involved in this report himself did not have an elevated white cell count but did show elevated C-reactive protein and erythrocyte sedimentation rate levels, which is once again consistent with past cases [1, 4–9]. However, a complete blood cell

count should still be ordered in concurrence with ESR and CRP levels as patients can have other underlying conditions that require medical attention.

In terms of imaging modalities, the initial X-ray of thoracic/lumbar spine can help establish the presence of any abnormalities in the bone and soft tissue. Common findings in spondylitis include osteolysis, end plate erosions, and narrowing of the disk space. However, MRI scan provides better visualization of the spread of the infection and involvement of the soft tissues, neural column, and bone structure. Afterwards, patients should undergo needle biopsy, either fluoroscopic or computed tomography guided, in order to definitively diagnose the involving organism prior to starting antibiotics. This step is paramount as treatment options can vary widely with different suspecting organisms, Amritanand reported a patient that was started on antituberculous therapy because her biopsy did not yield enough tissue but her condition continued to worsen [7].

As stated above, antibiotic therapy should be initiated based on the organism and susceptibilities identified via cultures. Various studies have advocated different lengths of the treatment courses, ranging from 4–12 weeks [2–9]. A literature review by Grados demonstrated recurrence rates that were two to three times higher in patients who received antibiotics for four to eight weeks when compared to those who were treated for 12 weeks or longer [10]. The presented patient underwent a total of 12 weeks with ceftriaxone during the initial six weeks and then ciprofloxacin for the remainder. Given the significant mortality associated with this condition, an extended antibiotic course of at least six to eight weeks should be considered along with close monitoring of both symptoms and inflammatory markers and a low threshold to reevaluate and restart therapy if symptoms return.

CONCLUSION

Although *Salmonella* osteomyelitis is extremely rare in immunocompetent patients, it should still be part of the differential diagnosis for patients with spondylitis. Patients presenting with fever and back pain should be evaluated for spondylitis. Initial blood work should include complete blood count (but anticipate that white blood cell count might not be elevated, C-reactive protein, and erythrocyte sedimentation rate. Diagnostic modalities include the initial spinal X-ray followed by spinal magnetic resonance imaging if indicated. Fluoroscopy or computed tomography guided needle aspiration with subsequent culture should be performed for definitive diagnosis. Patients with *Salmonella* spondylitis should receive antibiotics for at least six weeks with recommendations for 12 weeks or more.

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Author Contributions

Zaid B. Al Jebaje – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Andrew Zhao – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Mohammed Sammanodi – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

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Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

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