

# Spondylodiscitis After Vertebral Fracture in the Thoracic Spine

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**P**yoogenic spinal infections can be regarded as a spectrum of diseases and represent 2% to 4% of all cases of osteomyelitis.<sup>1,2</sup> Most are categorized as either spondylodiscitis or pyogenic osteomyelitis. Pure discitis has been challenged as an entity because there is evidence of spondylodiscitis in all cases with a pure radiographic diagnosis of discitis on magnetic resonance imaging (MRI).<sup>3,4</sup> Although granulomatous infections can begin as spondylitis,<sup>5</sup> pure pyogenic spondylitis has never been reported with certainty.<sup>6</sup> Spondylodiscitis, which consists of an inflammatory process involving the disc and adjacent vertebrae,<sup>2,7</sup> may occur spontaneously or after spinal surgery (usually lumbar discectomy). It has been proved that intervertebral disc-space infections and vertebral osteomyelitis are the same disease at different stages,<sup>6,8</sup> so the outlines of treatment are the same. Patients with diabetes and lung or systemic infections, patients undergoing dialysis or transplantations, and patients with depressed immune systems are more commonly affected.<sup>9</sup>

All previous case reports of spondylodiscitis after vertebral fracture involved the thoracolumbar and lumbar spine.<sup>10-15</sup> In this article, we describe the first case of spondylodiscitis after vertebral fracture in the thoracic spine. The authors have obtained the patient's written informed consent for print and electronic publication of the case report.

## CASE REPORT

Our patient was a 55-year-old man with a previous medical history of mild hypertension, type 2 diabetes, and chronic back pain. He underwent L4–L5 right-side discectomy and decompression for a herniated disc at this level. A low-grade fever was detected the first day after surgery. *Pseudomonas aeruginosa* was found in urine culture on clean catch, for which he received a full course of oral levofloxacin. The infection responded to treatment, and the patient was discharged without complication.

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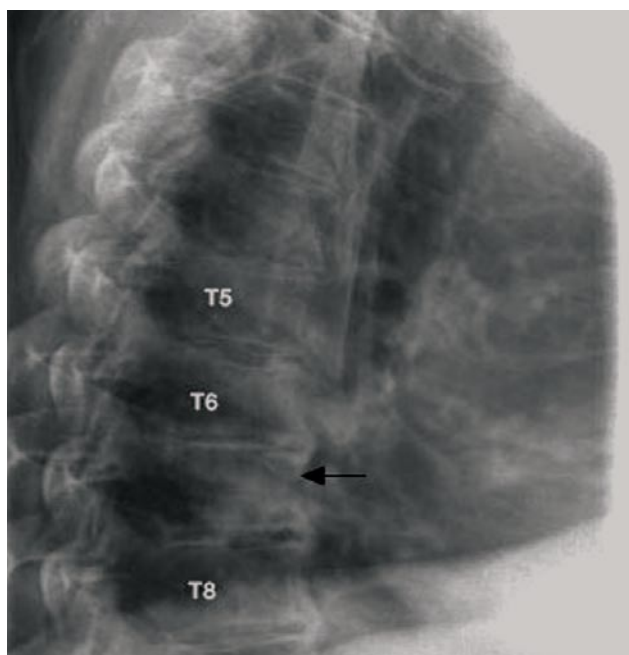
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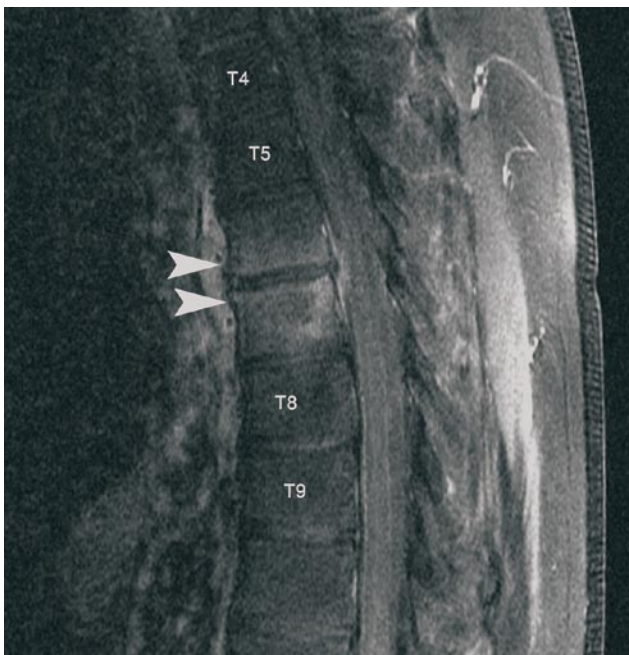
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Ten days after surgery, the patient tripped and hit his right side on the edge of a hard object. Presenting to the authors' clinic almost 2 weeks later, he complained of continuous upper back and right hemithorax pain. The wound site was well healed, and he did not complain of lower back pain. There was no radiation of pain to the lower limbs, and, except for diffuse tenderness from T4 to T10, physical and neurologic examinations were normal; the patient was not feverish or ill. Radiographs of the thoracic and lumbar spine showed degenerative changes in the lower thoracic spine with a suspicious compression fracture of T7 (Figure 1). Bone scan showed increased uptake in the T7 area and several parts of the ribs. Erythrocyte sedimentation rate (ESR) was 99 mm/h, C-reactive protein (CRP) was 11.8 mg/dL (>10 mg/dL suggests infection), and white blood cell (WBC) count was 6.3/mm<sup>3</sup>. Gallium scan, performed 5 days later, showed increased uptake at the T6–T7 level. MRI suggested mild spondylodiscitis at this level without epidural abscess, though it did not show the fracture (Figure 2). The patient was admitted the same day for further workup and treatment. Blood culture and urine culture on clean catch grew *P aeruginosa*, which was sensitive to all antibiotics tested.

Antibiotic therapy was started with parenteral cefepime, and a thoracolumbosacral orthosis was applied. A central



**Figure 1.** Lateral radiograph of thoracic spine shows degenerative changes and suspicious compression fracture of T7 caused by decreased height (black arrow).

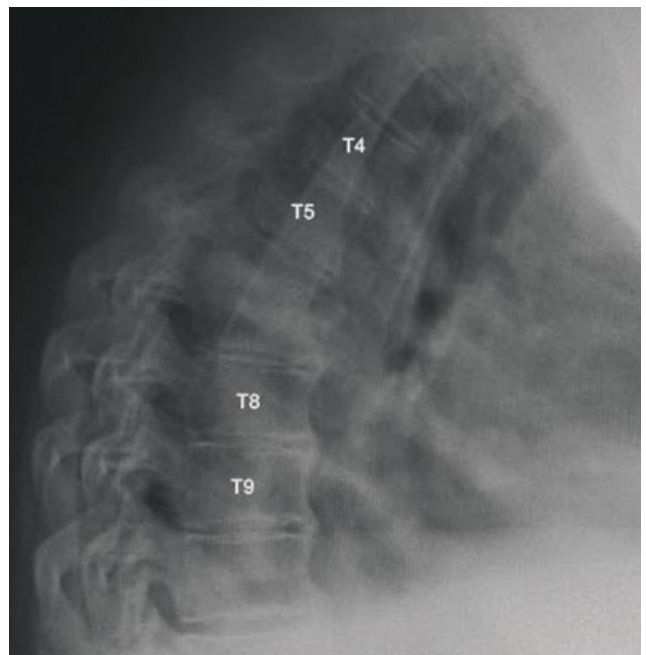


**Figure 2.** Sagittal magnetic resonance imaging of lumbar spine after gadolinium injection shows increased density of T6 and T7 endplates (white arrowheads) caused by spondylodiscitis. There is no canal compromise.

venous line was inserted, and 3 days later the patient was discharged from the hospital to continue the intravenous (IV) antibiotics for 4 weeks. At the follow-up visit 4 weeks after starting antibiotics, he complained of worsening thoracic spine pain without fever. Physical examination was unchanged, and radiographs showed erosive changes at the T6–T7 level. Increased destruction of thoracic vertebral bodies was noted on MRI. ESR was 99 mm/h, and CRP was 11 mg/dL.

We proceeded to transpedicular biopsy and isolated *P aeruginosa*. A 6-week course of triple antibiotic therapy (IV cefepime, vancomycin, gentamicin) was started. The patient stayed in the hospital for 2 weeks.

The patient's back pain was improving at follow-up visits, and, at the end of the course of antibiotics, ESR was 45 mm/h, CRP was 0.8 mg/dL, and WBC count was 5.4/mm<sup>3</sup>. Four weeks later, the patient presented to the emergency room and was again admitted for exacerbation of pain with possible diagnosis of recurrence of spondylodiscitis. Parenteral cefepime, vancomycin, and aztreonam were started through a peripherally inserted central catheter (PICC) line—the switch to aztreonam was made because of an episode of acute renal failure induced by gentamicin—and continued for 7 months. The patient improved slowly during this period. Fifteen months after his fall, he was pain free in the thoracic spine without any neurologic deterioration. ESR was 31 mm/h, and WBC count was 4.8/mm<sup>3</sup>. Several MRI scans performed during the 15-month follow-up period did not show any epidural abscess. The patient could walk unaided, though he had slight kyphosis in the thoracic spine with no functional disability (Figure 3).



**Figure 3.** Lateral radiograph of thoracic spine shows kyphosis 4 months after injury.

## DISCUSSION

Spondylodiscitis after compression fracture of a vertebra is rare. There are 6 case reports in the literature (Table).<sup>10-15</sup> Spondylodiscitis is usually caused by hematogenous spread of bacteria from an infectious focus at some distance from the spine. Direct spread from a focus is also possible, but less frequent.<sup>16</sup>

*Staphylococcus aureus* is the most common causative pathogen, followed in frequency by *Streptococcus* species and gram-negative bacilli.<sup>1,6,14</sup> Of the 7 cases of spondylodiscitis after vertebral fracture (including ours), 2 involved *S aureus*, and 2 involved *P aeruginosa*. The lumbar spine was the most common site of involvement, followed by the thoracic spine, which is compatible with the trend of spontaneous spondylodiscitis.<sup>6</sup> Spondylodiscitis may have a long latent period (2-8 weeks) between symptom onset and appearance of radiologic changes.<sup>9</sup>

Diabetes increases the risk for urinary tract infections (UTIs), as occurred in our patient's case.<sup>17</sup> Immunosuppressant therapy, history of malignancy, male sex, cigarette use in past 5 years, number of hospital days before bacteriuria, and diabetes mellitus in patients younger than 70 increase the risk for bacteremia in patients with hospital-acquired bacteriuria.<sup>18</sup>

Patient age, immune status, infection location, and pathogen virulence determine the particular characteristics of clinical presentation.<sup>19,20</sup> Patients with diabetes often have increased complications of UTI, and unusual organisms may be found (eg, gram-negative pathogens other than *Escherichia coli*).<sup>21</sup> Nearly half of affected individuals do not have fever at presentation,<sup>7,19</sup> but ESR is almost always elevated at diagnosis.<sup>19,20</sup> For spondylodiscitis after vertebral fracture, back pain and tenderness are the most frequent symptoms at presentation, followed by fever and neurologic symptoms (Table).

**Table. Summary of Previously Reported Spondylodiscitis After Vertebral Fracture<sup>a</sup>**

Author, Year	Age (y)	Signs/Symptoms	Underlying Disease	ESR (mm/h)	Radiologic Study	Level	Organism	Isolation Method	Treatment	Outcome <sup>b</sup> , Follow-Up
Present case	55	Back pain, tenderness, afebrile	Type 2 diabetes	99	Magnetic, resonance imaging, bone scan, gallium scan	T6–T7	<i>Pseudomonas aeruginosa</i>	Transpedicular biopsy, urine	IV cefepime (4 wk); IV cefepime, vancomycin, gentamicin (6 wk); then cefepime, vancomycin, aztreonam (7 mo)	Good, 15 months
Lowe et al, <sup>13</sup> 1989	40	Fever, chills, paraplegia, loss of anal tone	—	?	—	L2	<i>Serratia marcescens</i>	Blood, urine	Urgent anterior decompression/stabilization; posterior stabilization	Good, 3 months
Fellmeth et al, <sup>15</sup> 1988	57	Back pain, fever	—	?	Indium-111 leukocyte scan	T12	<i>Staphylococcus aureus</i>	Blood, urine	IV nafcillin (6 wk)	Good, 10 months
Govender et al, <sup>14</sup> 1988	38	Weakness of both lower limbs, inability to walk, afebrile, loss of sensation below L2	—	18	Roentgenogram	T12–L1	<i>Mycobacterium tuberculosis</i>	Left transthoracic biopsy	Antituberculosis medications	Good, 4 months
Eismont et al, <sup>11</sup> 1987	62	Afebrile, back pain, inability to walk	Chronic lymphocytic leukemia	6	Computed tomography, myelogram	L1	<i>P aeruginosa</i>	Needle biopsy	IV tobramycin-ticarcillin +(10 wk); IV piperacillin after anterior fusion of T11–T12	Good, 3 years
Milgram & Romine, <sup>12</sup> 1982	52	Tender midlumbar prominence	Type 2 diabetes	Increased	Roentgenogram	L3	<i>S aureus</i>	Urine	IV nafcillin (1 mo), then oral antibiotics (3.5 mo)	Fair, 3 years
Atsatt, <sup>10</sup> 1939	60	Fever, chills, back pain	—	?	Roentgenogram	L2	$\beta$ -hemolytic streptococci	Postmortem examination	Sulfanilamide	Poor

Abbreviations: ESR, erythrocyte sedimentation rate; IV, intravenous.

<sup>a</sup>All the patients were men.

<sup>b</sup>Outcomes: good (recovery complete, walks without assistance), fair (neurologic deficit improved, continent of bowel and bladder, unable to walk independently), poor (deterioration, incontinent, paraplegic or quadriplegic).

Bone scan is very sensitive in the early stage but is scarcely specific; in addition, it does not provide a good definition of the extension of the lesion.<sup>22–24</sup> MRI is the imaging method of choice in spondylodiscitis diagnosis, especially in the very early stages, when other investigations yield negative results. MRI has some advantages, including high sensitivity in the early stages and better definition of the paravertebral and epidural extension.<sup>9,25</sup> IV administration of gadolinium-DTPA (diethylenetriamine pentaacetic acid) allows for better definition of the spinal inflammatory lesions.<sup>26,27</sup> In acute pyogenic spondylodiscitis, the lesions are visible with homogeneous contrast enhancement of the disc and the vertebral bodies.<sup>9</sup>

Which antibiotic therapy to use depends on the organism involved. Despite advances in antibiotic therapy, *P aeruginosa* is still responsible for considerable morbidity and mortality through involvement of different body parts. As this pathogen has multiple resistance mechanisms, antibiotic treatment is extremely difficult.<sup>28</sup>

A 1998–2001 surveillance study of 65 laboratories in the United States found more than 90% of *P aeruginosa* isolates from hospitalized patients to be susceptible to amikacin and piperacillin-tazobactam; 80% to 90% of isolates to be susceptible to cefepime, ceftazidime, imipenem, and meropenem; and 70% to 80% of isolates to be susceptible

to ciprofloxacin, gentamicin, levofloxacin, and ticarcillin-clavulanate. From 1998 to 2001, decreases in antimicrobial susceptibility (percentages) among non-intensive-care-unit inpatients were largest for ciprofloxacin and levofloxacin.<sup>29</sup>

Length of antimicrobial therapy depends on the relative virulence and drug susceptibility of the pathogen, host immune status, and presence of foreign bodies.<sup>29</sup> Long-term (6- to 9-month) antibiotic therapy with appropriate antibiotics (IV or oral) for *P aeruginosa* osteomyelitis is described in several reports.<sup>30–33</sup> In our patient's case, the PICC line was used for the duration of IV antibiotic therapy. Couch and colleagues<sup>34</sup> used the Hickman catheter for a mean of 66 days in patients with osteomyelitis. Treatment can be monitored by ESR and CRP levels.<sup>15,27</sup>

In the present case, given the refractory nature of our patient's infection to 2 courses of antibiotic therapy, we continued IV antibiotics for 7 months through the PICC line. The PICC line is proven safe and effective for long-term antibiotic therapy in patients with osteomyelitis, and its use reduces the need for long-term hospital admission.<sup>34</sup>

In cases of spondylodiscitis without neurologic deficit and distinct substance loss, conservative treatment with immobilization by orthosis has been successful.<sup>30</sup> In cases without instability and severe deformity, ventral débridement and spondylodesis have been suggested.<sup>30</sup> Other

indications for surgery are sepsis unresponsive to antibiotic therapy and abscess formation.

In our patient's case, the possibility that spondylodiscitis developed after his first UTI, which may have resulted in decreased resilience of the bone and vertebra fracture, seems unlikely given the absence of back pain before his fall.

Spondylodiscitis after fracture has been reported in the lumbar and thoracolumbar area. Our patient's case of such infection in the thoracic spine is the first to be reported. Spondylodiscitis should be considered one of the possible causes of persistent pain or deteriorating neurologic condition after vertebral trauma. The insidious clinical course of this infection delays its diagnosis. In this clinical setting, blood inflammatory markers plus MRI and bone scan can provide an invaluable guide to diagnosis.

### AUTHORS' DISCLOSURE STATEMENT

The authors report no actual or potential conflict of interest in relation to this article.

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