

CASE REPORT

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Vertebral osteomyelitis presenting as locally invasive lung cancer

Matthew L Cloutier, Justin A White, Alan P Mautz

ABSTRACT

Introduction: Vertebral osteomyelitis is a spinal infection that most commonly presents with insidious back pain, sometimes accompanied by other non-specific signs and symptoms. It most commonly results from hematogenous seeding of *Staphylococcus aureus*. Due to its frequently non-specific presentation, diagnosis is often delayed until the disease is advanced or neurologic sequelae have developed.

Case Report: A 54-year-old male presented to the hospital with three days of worsening pain in his upper back and an approximate 30-pound weight loss. He was afebrile and his physical exam was unremarkable aside from diffuse tenderness to palpation. Computed tomography scans showed a compression fracture of T4 without disc involvement or endplate destruction. An associated mass-like consolidation in the apical segment of the left lung appeared to be invading the chest wall posteromedially with lytic destruction of the fourth rib at the costovertebral junction. Patient history in conjunction with imaging findings was highly suggestive of locally invasive lung cancer. A biopsy was done, which yielded no evidence of malignancy. Cultures were sent after repeat biopsy and grew methicillin-sensitive *S. aureus*, yielding a presumptive diagnosis of vertebral osteomyelitis. Destruction of the patient's thoracic spine progressed despite intravenous (IV) oxacillin and eventually required surgical intervention.

Conclusion: The indistinct presentation of vertebral osteomyelitis often poses a diagnostic challenge, particularly when characteristic imaging findings are not present. Due to the consequences of delayed diagnosis, vertebral osteomyelitis should be considered with a high index of suspicion when a patient presents with back pain.

Keywords: Lung cancer, Vertebral osteomyelitis

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INTRODUCTION

Vertebral osteomyelitis (VO) typically presents with non-specific signs and symptoms including insidious back pain, sometimes associated with fever and neurologic sequelae [1]. Because of its vague presentation, diagnosis and treatment are frequently delayed [2]. Seeding of the vertebrae occurs most commonly via hematogenous dissemination, but can also be iatrogenic, occur by distant inoculation, or in rare cases by contiguous spread from adjacent tissues. *Staphylococcus aureus* is the most common etiologic agent, particularly in the setting of hematogenous spread [3]. Magnetic resonance imaging (MRI) is the most sensitive imaging test, but VO is often detected on computed tomography (CT) and plain radiographs [4]. Diagnosis can be confirmed using CT-guided needle biopsy, and the treatment course typically includes an antibiotic regimen for six or more weeks [3]. The main indications for surgical intervention include the presence of an epidural abscess, neurologic deficits,

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current or impending cord compression, and disease refractory to antibiotics [3].

CASE REPORT

A 54-year-old male with a past medical history of polysubstance abuse and insulin-dependent type II diabetes mellitus sought treatment in the emergency department with three days of upper back pain. He reported that the pain was primarily along his scapulae with radiation into the anterior chest. He admitted to an approximate 30-pound unintentional weight loss over preceding few months, but denied fevers, chills, cough, or dyspnea. He was hemodynamically stable and afebrile. He was diffusely tender to light palpation of his upper back throughout, otherwise, the physical examination was unremarkable without neurologic compromise.

Laboratory data showed mild hyponatremia (Sodium of 132 mEq/L) and anemia (hemoglobin of 10.3 g/dL) and total white blood cell (WBC) count was within normal limits (10.2 Th/uL). On non-contrast CT, the patient was found to have a T4 superior endplate compression fracture with sparing of the intervertebral disc and lytic foci of the left fourth rib medially, with associated mass-like consolidation in the upper lobe of the left lung (Figures 1 and 2). Computed tomography with contrast confirmed the presence of a lung mass in the apical segment of the left lung, invading the chest wall posteromedially with lytic destruction of the fourth rib adjacent to the costovertebral junction, highly suggestive of a locally invasive lung neoplasm. Left-sided pyelonephritis was found incidentally on CT of the abdomen and pelvis. He was admitted to the hospital for treatment of pyelonephritis and adequate pain control. The patient remained stable with persistent hyponatremia throughout his six-day hospital course. His hyponatremia was attributed to potential paraneoplastic syndrome of inappropriate antidiuretic hormone secretion (SIADH) considering his radiographically apparent lung malignancy, smoking history, and significant weight loss. Recommendation was made for percutaneous biopsy of the mass as an outpatient, and he was subsequently discharged. The patient returned to the emergency room once more before biopsy due to intractable pain and repeat CT of the chest showed worsening compression fracture of the T4 vertebral body without disc involvement (Figures 3 and 4).

Biopsy was performed the following week and the patient underwent urgent simulation for radiation treatment. The pathology report noted fibrous and granulation tissue with mixed lymphoplasmacytic and neutrophil inflammatory cell infiltrate with scattered multinucleated giant cells and eosinophils, with no evidence of neoplasm, indicating a reactive process. Given these findings, biopsy was repeated, and tissue culture was obtained. The pathology report for the second biopsy was nearly identical to the first except for the tissue culture, which on preliminary report, grew methicillin-

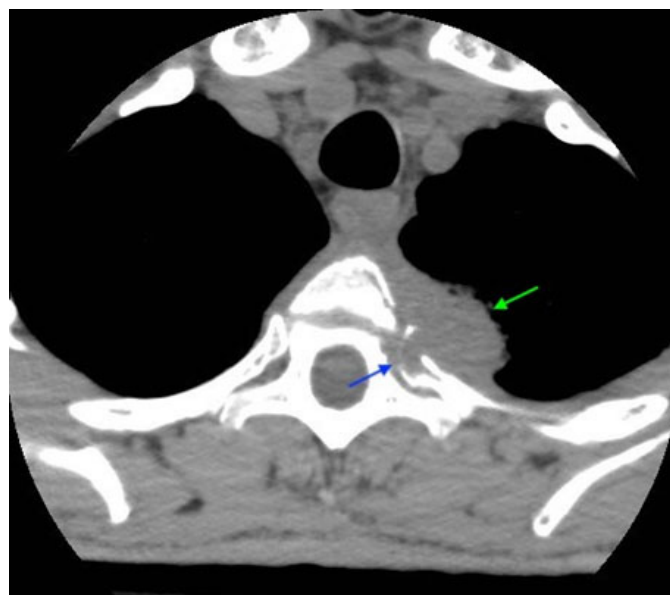


Figure 1: Axial computed tomography scan without contrast. Lytic destruction of left fourth rib (blue arrow) can be seen with adjacent mass-like consolidation (green arrow) in apical segment of left lung.



Figure 2: Sagittal computed tomography scan without contrast. Superior endplate fracture of T4 vertebral body (green arrow) without notable disc involvement.

sensitive *Staphylococcus aureus* (MSSA). The patient was readmitted with a presumed diagnosis of vertebral osteomyelitis.

Neurosurgery and infectious disease were consulted, the result being six weeks of oxacillin therapy before

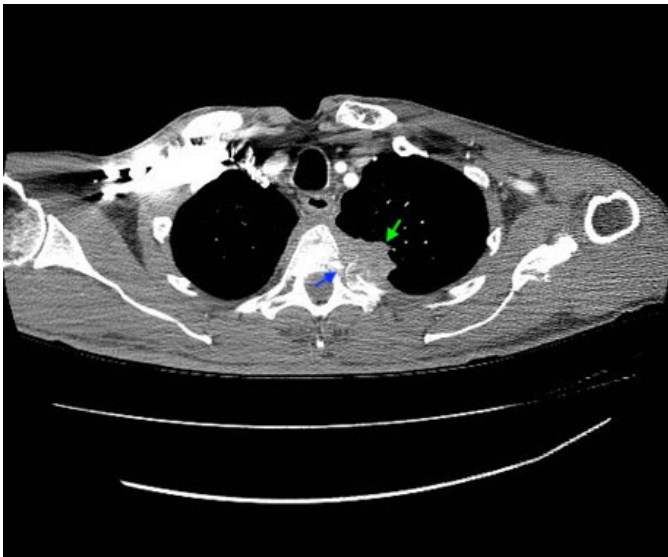


Figure 3: Axial computed tomography scan with IV contrast. The pleural mass measuring 3.2 cm (green arrow) can be seen invading the left fourth costochondral junction and vertebral body (blue arrow).



Figure 4: Sagittal computed tomography scan with IV contrast. Worsening vertebral compression fracture of T4 (green arrow) without obvious intervertebral disc involvement.

determining the necessity for surgical intervention. After five weeks of antibiotic therapy, a CT scan was obtained due to worsening back and chest discomfort. This showed worsening compression fracture of T4 with increased retropulsion and subsequent canal stenosis, accompanied by endplate destruction of T3. Notably, a follow-up MRI showed spinal cord compression secondary to newfound T3 retropulsion, prompting arrangements

for urgent surgery. The next day, the patient underwent T3–T4 laminectomy with T1–T7 posterior pedicle screw instrumentation for spinal cord decompression with no complications. Despite progression of disease through five weeks of appropriate antibiotic treatment, intraoperative cultures were taken and were negative. The patient was discharged ten days later after rehabilitation with physical therapy/occupational therapy and completion of IV antibiotics. He continues to follow with palliative care for pain management.

DISCUSSION

Vertebral osteomyelitis most commonly presents with insidious back pain, inconsistently accompanied by fever (35–60% of cases), and neurologic sequelae (33% of cases) [5]. In many cases (such as this one), non-specificity or lack of symptoms altogether can lead to delayed diagnosis and treatment. In a study done by Nolla et al. [2] in which they examined data from 64 microbiologically confirmed cases of VO, the mean duration of symptoms before hospital admission was found to be 48 days. In a 2014 study conducted by Gupta et al. [6], the mean duration of symptoms before diagnosis was 32.5 days. A statistically significant difference in rates of treatment failure was seen with longer duration of symptoms before diagnosis. They report that their relative decreased time to diagnosis as compared to other studies may be due to extensive use of MRI (88%) in their cohort. Additionally, increased time to diagnosis was associated with poorer long-term outcomes, highlighting the importance of prompt diagnosis and treatment.

Inflammatory markers including erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) are commonly ordered in cases of suspected VO. They are also frequently trended to follow treatment response. Although these markers are relatively non-specific, sensitivities ranging from 94% to 100% have been cited across different studies [7, 8]. Erythrocyte sedimentation rate and CRP were not obtained upon presentation in this case as there was not strong clinical suspicion for VO. Leukocytosis has been found to be a poor indicator for spinal infection and WBC counts can be normal in up to 40% of cases as it was in this patient [8, 9].

Magnetic resonance imaging is the imaging modality of choice in suspected cases of VO. Due to the segmental blood supply to the vertebral bodies, VO often presents with the involvement of two adjacent vertebral bodies and their shared intervertebral disc [10]. Disc involvement is almost always present and is classically seen in radiographically evident VO. In a study conducted by Dajirmanjian et al. [11], abnormal disc signal was seen on MRI with >95% sensitivity in cases of VO. Further, destruction of the vertebral endplates is considered a hallmark finding of VO and was not seen on initial presentation in this case [11, 12]. Although this patient did not receive an MRI initially, lack of disc involvement

or endplate destruction seen on CT scans accompanied by lytic rib foci, particularly in the setting of the invading lung mass, favored a diagnosis of malignant invasion. There have been rare case reports of VO presenting without disc involvement, and as in the case of this patient, have resulted in delayed or misdiagnosis [1, 13].

Complications of VO are often debilitating and can be permanent. As noted above, neurologic complications are seen in just under a third of patients. One systematic review reported a 32% incidence of neurological sequelae and a 32% rate of disease relapse. Furthermore, mortality was noted to be 6% [14]. Morbidity and mortality may be increased in patients who require surgery. A 2016 retrospective cohort study examined the outcomes of VO patients requiring surgery and found that at one year, 10% had died, 26% underwent further surgical intervention, and 42% suffered from neurologic complications [15]. Although this patient did not suffer from neurological complications, his pain management may have been more favorable with prompt diagnosis and treatment.

CONCLUSION

Osteomyelitis often presents with non-specific signs and symptoms and can rapidly progress to cause significant complications. Because of the debilitating consequences of delayed diagnosis including chronic pain and neurologic sequelae, VO should be routinely considered in the differential diagnosis of intractable back pain, including when there is high clinical suspicion for malignancy.

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Author Contributions

Matthew L Cloutier – Conception of the work, Design of the work, Acquisition of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Justin A White – Design of the work, Acquisition of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Alan P Mautz – Design of the work, Acquisition of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Guarantor of Submission

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Written informed consent was obtained from the patient for publication of this article.

Conflict of Interest

Authors declare no conflict of interest.

Data Availability

All relevant data are within the paper and its Supporting Information files.

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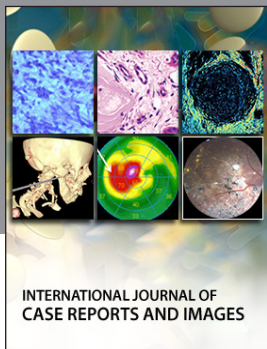
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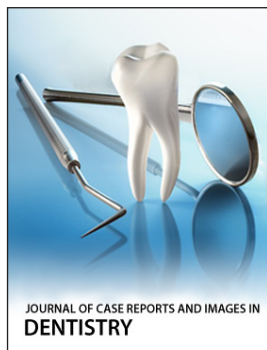
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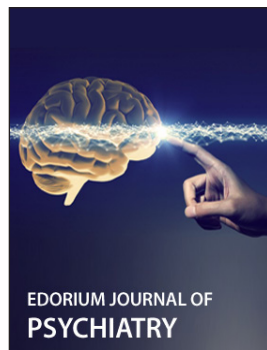
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