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Fatal Holospinal Epidural Abscess: A Case Report

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Case Report

Keywords: Spinal Epidural Abscess, Extramedullary Spinal Cord Compression, Methicillin-Resistant Staphylococcus aureus

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Additional Declarations:
No competing interests reported.

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Abstract

Background: Holospinal epidural abscess (HEA) is a rare and potentially life-threatening form of spinal epidural infection characterized by extensive involvement of the spinal canal. Its management is particularly challenging because of rapid neurological deterioration, widespread spinal cord compression, and the complexity of surgical intervention.

Case Presentation: A 56-year-old woman with diabetes mellitus developed rapidly progressive tetraparesis following interventional ozone therapy for severe back pain. Contrast-enhanced spinal magnetic resonance imaging revealed a continuous ventral epidural abscess extending from the clivus to the sacrum, causing extensive spinal cord compression. Imaging also demonstrated suspected L4–L5 vertebral infection and a left psoas abscess. Surgical drainage was performed, and methicillin-resistant Staphylococcus aureus (MRSA) was isolated from intraoperative specimens. Despite surgical intervention and broad-spectrum antimicrobial therapy, the patient showed no neurological recovery and died 10 days later following clinical deterioration and sepsis**.**

Conclusion: This case highlights the exceptional rarity of HEA extending from the clivus to the sacrum, involving nearly the entire spinal canal. Even initially small or localized spinal epidural abscesses may spread extensively along the spinal canal, potentially leading to devastating neurological consequences. Such extensive craniospinal involvement poses significant diagnostic and therapeutic challenges. Therefore, clinicians should maintain a high index of suspicion for widespread spinal infection in patients presenting with progressive neurological deficits, particularly following spinal interventions. Early recognition, prompt evaluation of the extent of infection, and timely multidisciplinary management are essential to improve clinical outcomes.

Keywords

Spinal Epidural Abscess; Extramedullary Spinal Cord Compression; Methicillin-Resistant Staphylococcus aureus

Introduction

Spinal epidural abscess (SEA) is a rare but potentially devastating infection that can cause spinal cord compression, rapidly progressive neurological deficits, and death. Diabetes mellitus, immunosuppression, intravenous drug use, bacteremia, and invasive spinal procedures are recognized predisposing factors, and Staphylococcus aureus is the most frequently identified pathogen.[1,2] The classic triad of back pain, fever, and neurological deficit is present in only a minority of patients.[1]

Holospinal epidural abscess (HEA), characterized by extensive involvement of contiguous spinal regions, is particularly rare.[3] Infectious complications after spinal intervention therapy are also uncommon, although spondylodiscitis and epidural infection have been reported.[4,5] We describe an exceptionally extensive ventral HEA extending from the clivus to the sacrum in a patient who had recently undergone interventional ozone therapy.

Case Description

A 56-year-old woman with diabetes mellitus and hypertension presented with progressive difficulty walking for 1 week and increasing numbness extending from the neck to the fingertips for 3 days. She had developed thoracic herpes zoster approximately 6 weeks earlier. Twenty days before admission, she had been hospitalized for hyperglycemia control. Because of severe back pain, she underwent spinal interventional ozone therapy at another hospital approximately 10 days before the current presentation.

Laboratory testing showed marked systemic inflammation, including a C-reactive protein level of 262.17 and leukocytosis with neutrophilia (Table 1). Neurological examination demonstrated profound deficits: muscle strength was 2/5 in both upper extremities, both lower extremities were plegic, touch sensation was absent below C2, and bilateral Babinski signs were present.

Contrast-enhanced spinal magnetic resonance imaging (MRI) demonstrated a continuous ventral epidural collection extending from the clivus to the sacral region with extensive spinal cord compression. Enhancement of the L4–L5 vertebral bodies raised concern for concomitant vertebral infection (Figure 1).

The patient underwent neurosurgical intervention and drainage. Methicillin-resistant Staphylococcus aureus (MRSA) was isolated from intraoperative specimens. Meropenem was administered intravenously at a dose of 2 g every 8 hours, vancomycin 900 mg IV loading dose, followed by a continuous intravenous infusion of 3.6 g over 24 hours (150 mg/hour), and Clindamycin was administered intravenously at a dose of 1,600 mg three times daily after surgery. Despite surgical and antimicrobial treatment, there was no meaningful neurological improvement. Her clinical condition subsequently deteriorated, and she died 10 days after surgery in the setting of sepsis.

Discussion

Holospinal epidural abscess is a severe manifestation of spinal epidural infection in which the longitudinal extent of disease creates both diagnostic and therapeutic challenges. In a recent systematic review of 77 patients, neurological deficits and back pain were the most frequent manifestations, whereas fever was reported in fewer than half of patients.[3] Thus, absence of fever does not exclude extensive spinal epidural infection. Diabetes mellitus, present in our patient, was the most frequently reported comorbidity in that review.[3]

Staphylococcus aureus(SA) predominates in both conventional SEA and HEA.1,3 In the HEA systematic review, methicillin-sensitive Staphylococcus aureus (MSSA) and MRSA accounted for 40.1% and 24.3% of reported infections, respectively.[3] The recovery of MRSA from intraoperative specimens in our patient therefore accords with the microbiological profile reported in extensive SEA.

A notable feature of this case is the close temporal relationship between spinal interventional therapy and subsequent neurological deterioration. Oxygen–ozone therapy is used for discogenic spinal pain, but spondylodiscitis and epidural infection have been described after intradiscal procedures.[4,5] The recent intervention, suspected L4–L5 vertebral infection, and subsequent extensive epidural disease raise the possibility of procedure-related inoculation with secondary spread. However, causality cannot be established because the exact technique and injection site were unavailable and the patient had additional susceptibility factors, particularly diabetes mellitus. The procedure should therefore be considered temporally associated with, rather than definitively causal of, the infection.

The clivus-to-sacrum extent also complicated management. Surgical treatment of HEA must balance adequate decompression and drainage against the morbidity of extensive exposure, and operative strategy is individualized according to abscess location, neural compression, and clinical status.[3,7] Neurological status at presentation is a major determinant of treatment and outcome. Selected neurologically intact patients may be managed initially with antimicrobial therapy and close surveillance, whereas significant or progressive neurological deficits generally favor prompt surgical evaluation and decompression.[2,7,8] Earlier surgery has been associated with better neurological outcomes in several retrospective series.[7]

The fatal outcome in this patient was likely multifactorial, with profound neurological deficit at presentation, extraordinary disease extent, diabetes mellitus, MRSA infection, and suspected

concomitant vertebral infection all potentially contributing. This case emphasizes that severe or progressive back pain with inflammatory marker elevation or new neurological deficits after a spinal intervention should prompt urgent evaluation for infection. When clinical findings suggest multilevel involvement, imaging of the entire spinal axis may be necessary to establish the full extent of disease.

Ethics Declarations

Consent for Publication

Consent for publication was obtained from the patient's legally authorized representative (son), as the patient is deceased.

Availability of data and materials

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

Competing interest

The authors declare no competing interests.

Figure Legends

Figure 1. Contrast-enhanced spinal MRI demonstrating an extensive ventral epidural abscess extending continuously from the clivus to the sacral region with spinal cord compression. Enhancement of the L4–L5 vertebral bodies raised suspicion for concomitant vertebral infectious involvement.

Figure 2. Axial T2-weighted and contrast-enhanced T1-weighted lumbar MRI demonstrating findings consistent with a left psoas abscess at the L1–L2 level.

Abbreviation

HEA: Holospinal epidural abscess

MRI: Magnetic resonance imaging

MRSA: Methicillin-resistant Staphylococcus aureus

MSSA: Methicillin-susceptible Staphylococcus aureus

SA: Staphylococcus aureus

SEA: Spinal epidural abscess

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Table 1. Laboratory findings at presentation

Laboratory parameter	Result	Reference range
C-reactive protein (CRP)	262.17 ↑	0–5.0
Creatinine	1.14 ↑	0.5–0.9
Sodium	133 ↓	136–145
White blood cell count (WBC)	13.29 ↑	4–10
Absolute neutrophil count (NEU#)	11.82 ↑	2–7
Absolute lymphocyte count (LYN#)	0.77 ↓	0.8–4.0

Figures

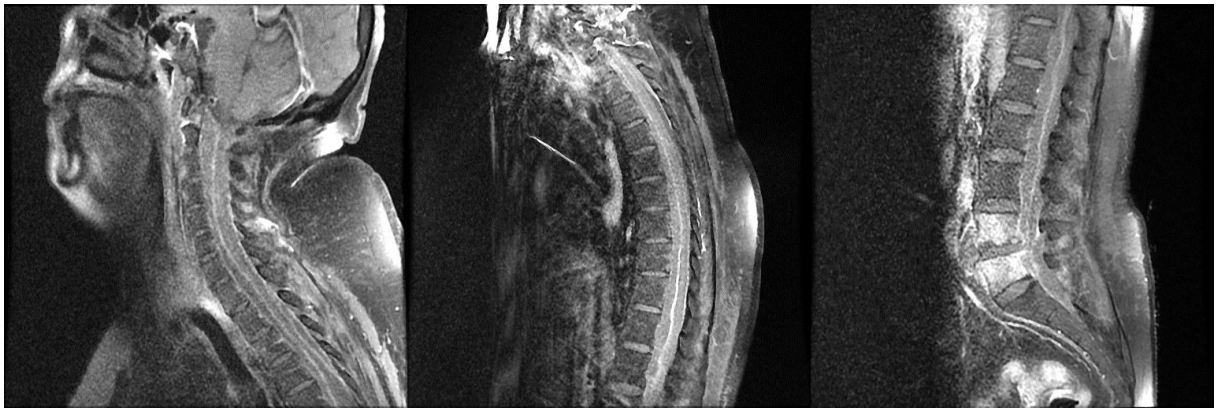


Figure 1. Contrast-enhanced spinal MRI demonstrating an extensive ventral epidural abscess extending continuously from the clivus to the sacral region with spinal cord compression. Enhancement of the L4–L5 vertebral bodies raised suspicion for concomitant vertebral infectious involvement.