

Spondylodiscitis and Epidural Abscess After Spinal Surgery: Case Series Highlighting Diagnostic and Therapeutic Challenges

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Abstract

Objective: To describe the clinical, radiological, microbiological, treatment, and functional characteristics of three patients with postoperative spondylodiscitis (SD) and/or spinal epidural abscess.

Methods: We retrospectively reviewed postoperative SD/EA cases managed at a regional hospital between 2019 and 2023. Patients with previous spinal surgery, magnetic resonance imaging (MRI)-confirmed SD with or without EA, and at least 3 months of follow-up were included. Demographic characteristics, imaging findings, microbiological results, treatment approaches, and clinical outcomes were evaluated.

Results: Three patients (54–67 years) were included. MRI established the diagnosis in all cases by differentiating active infection or epidural abscess from postoperative fibrosis or degenerative changes. Blood cultures identified methicillin-sensitive *Staphylococcus aureus* in one patient, while urinary and wound cultures yielded organisms in another patient without microbiological confirmation from the spinal infection site. One patient with stable neurological findings improved with antibiotic therapy and multidisciplinary supportive care, whereas two patients underwent surgical decompression, including one with staged hardware revision, in addition to systemic antibiotics. At discharge, two patients achieved assisted ambulation, while one remained non-ambulatory.

Conclusion: Postoperative SD and EA require a high index of suspicion because symptoms may mimic expected postoperative complaints. Contrast-enhanced MRI remains the cornerstone of diagnosis. Early individualized treatment, including appropriate antimicrobial therapy, timely surgical decompression when indicated, and multidisciplinary management, may improve neurological and functional outcomes.

Key Words: Discitis, Epidural Abscess, Postoperative Complications

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Introduction

Spinal infections account for 2-7% of all musculoskeletal infections and may involve the vertebrae, intervertebral discs, or adjacent soft tissues (1). The most common forms are spondylodiscitis (SD) and epidural abscesses (EA) (2,3). *Staphylococcus aureus* is the predominant pathogen, although gram-negative bacteria, *Mycobacterium tuberculosis*, *Brucella*, fungi (*Candida*, *Aspergillus*, *Cryptococcus*), and occasionally parasites such as *Echinococcus* can also be involved (4). Infection typically spreads hematogenously but may occur through direct inoculation following spinal surgery or from contiguous tissues. It predominantly affects older adults or those with comorbidities (1). Clinically, patients often present with persistent, progressive paravertebral pain, commonly worse at night, and with neurological symptoms (3,5).

Diagnosis is often delayed because initial symptoms are vague and nonspecific. Even with advances in imaging, particularly MRI (magnetic resonance imaging), spinal infections continue to pose significant diagnostic and management challenges, contributing to high morbidity (1,6). MRI remains the key imaging modality for both diagnosis and monitoring, while clinical suspicion is essential to avoid progression

to severe complications such as paralysis or sepsis (3,7). Effective management combines appropriate antimicrobial therapy with surgical intervention when necessary. The main therapeutic goals are to eradicate infection, relieve pain, preserve or restore neurological function, and maintain spinal stability and nutritional status (2).

Surgical intervention is required in cases of neurological deficit, mechanical instability, or resistance to medical therapy (8). Although only 10–20% of patients with pyogenic spondylitis ultimately need open surgery, those with spinal cord or cauda equina compression and progressive neurological decline require urgent decompression, debridement, and fusion; procedures that can be safely combined with instrumentation after thorough debridement and antibiotic coverage (8).

Pyogenic vertebral discitis and osteomyelitis remain major concerns for spine surgeons despite advances in imaging and medical care. Inadequate or delayed treatment can result in neurological impairment, systemic sepsis, or progressive deformity (9). This series describes three postoperative cases of spondylodiscitis and epidural abscess, focusing on their clinical presentation, radiological findings, treatment approaches, and outcomes. Emphasis is placed on the importance of

multidisciplinary management, including surgical, infectious disease, and rehabilitation teams, to optimize recovery in this complex patient group.

Methods

We retrospectively reviewed postoperative SD/EA cases managed at a regional hospital between 2019 and 2023. Inclusion criteria were prior spinal surgery, MRI-confirmed SD with or without EA, and ≥ 3 months follow-up. Exclusion criteria were non-postoperative infections and incomplete records. Data included demographics, comorbidities, index surgery, imaging, microbiology, interventions, antibiotics, complications, and functional outcomes. Intraoperative tissue or abscess material was obtained for culture in both surgically treated patients (Cases 2–3); however, no microbial growth was detected.

This case series was prepared in accordance with the PROCESS 2023 guidelines (10). Written informed consent for publication of clinical data and images was obtained from the patients. A detailed clinical timeline was constructed to summarize the diagnostic process, interventions, and outcomes.

Case Reports

Case 1

A 63-year-old woman with previous long-

segment posterior instrumentation (T9–L5) for osteoporotic L1 fracture presented with severe back pain, immobility, and progressive paraparesis. Inflammatory markers were elevated, and hypoalbuminemia (1.9 g/dL) indicated malnutrition. Contrast-enhanced MRI revealed L4–L5 SD with a $15 \times 15 \times 9$ mm rim-enhancing posterior EA compressing the thecal sac (Figure 1). Blood cultures were sterile. Following infectious diseases consultation, empiric intravenous meropenem plus tigecycline was selected because of concern for multidrug-resistant postoperative pathogens and to avoid potentially nephrotoxic agents. As cultures remained negative, the regimen was continued for 6 weeks, followed by 6 weeks of oral ciprofloxacin plus clindamycin (12 weeks total). She was treated conservatively with nutritional and psychiatric support, physiotherapy, and preventive nursing care. Surgical revision of a migrating right hip prosthesis was postponed until infection control. After 24 days, pain and mobility improved, muscle strength increased to 4/5 proximally and 3/5 distally, and she was discharged on continued antibiotics. The case highlights the diagnostic challenge of postoperative spinal infections and the importance of comprehensive, multidisciplinary management.

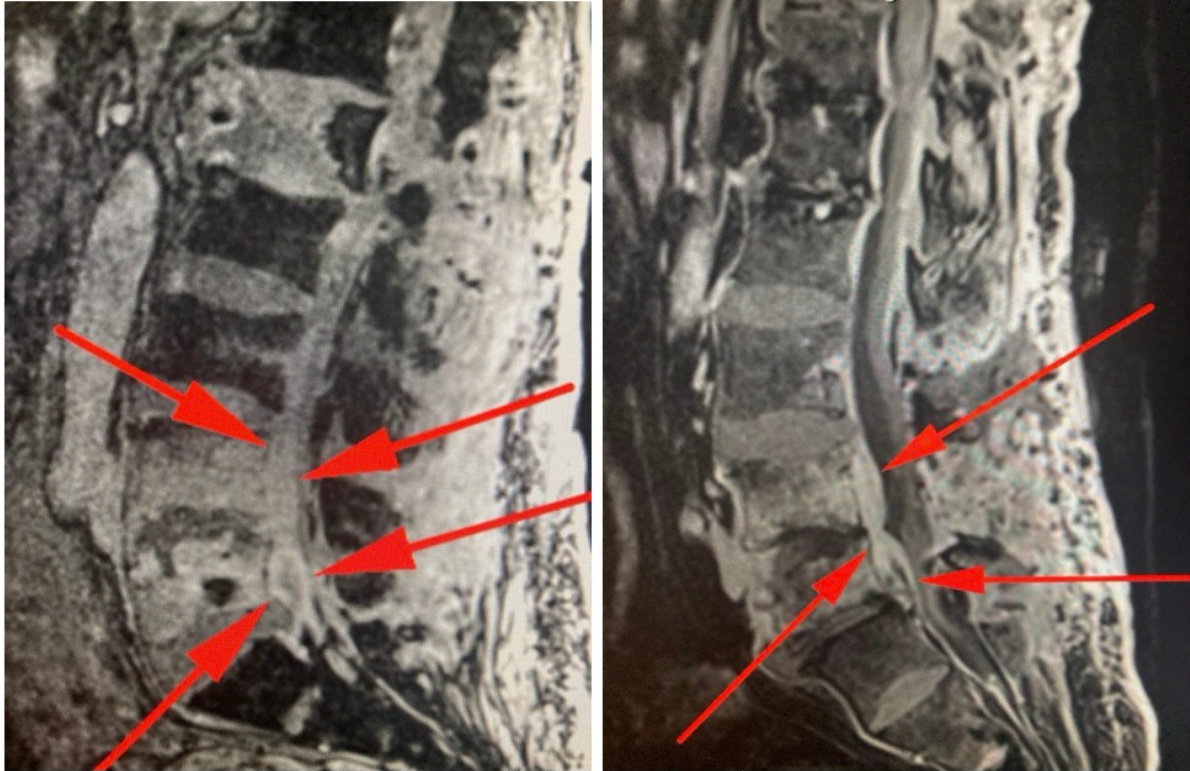


Figure 1. Sagittal contrast-enhanced T1-weighted (left) and T2-weighted (right) lumbar MRI showing L4–L5 spondylodiscitis with vertebral and epidural enhancement and a posterior epidural collection ($15 \times 15 \times 9$ mm) compressing the thecal sac and cauda equina; long-segment posterior instrumentation is visible.

Case 2

A 54-year-old woman with multiple sclerosis and prior lumbar discectomy with posterior instrumentation presented with severe back and leg pain, fever, gait difficulty, and urinary symptoms. MRI showed L1–L2 SD with a large anterior EA compressing the thecal sac and surrounding pedicle screws (Figure 2). Methicillin-sensitive *Staphylococcus aureus* was later isolated in blood. Empiric intravenous vancomycin plus cefepime was initiated and subsequently de-escalated to intravenous cefazolin plus rifampicin after MSSA was identified. After 4 weeks of intravenous therapy, treatment was continued with oral

cephalexin plus rifampicin for another 4 weeks (8 weeks total).

She underwent urgent decompression followed by repeat drainage and hardware revision for persistent infection and instability. Her course was complicated by drug hypersensitivity, pseudotumor cerebri, and fluctuating neurological deficits related to MS. With coordinated multidisciplinary care, inflammation resolved, strength improved (4/5 proximally, 5/5 distally), and she regained mobility with a brace. This case highlights the complexity of postoperative spinal infection in patients with neurological comorbidities.



Figure 2. Sagittal contrast-enhanced T1-weighted MRI of the thoracolumbar junction showing L1–L2 spondylodiscitis with enhancement of the adjacent endplates and a rim-enhancing anterior epidural abscess extending from the inferior T11 endplate to L1–L2 (60 mm in length and 6 mm in thickness), causing anterior dural compression. Fluid is also visible around the posterior aspects of the L1 pedicle screws.

Case 3

A 67-year-old woman with multiple prior lumbar surgeries was admitted with severe back pain, leg weakness, and progressive immobility. MRI revealed lumbar SD with an EA (Figure 3). She underwent decompression and debridement, followed by repeat surgery for persistent radiculopathy. Cultures identified ESBL-producing *Klebsiella* in urine and later *Acinetobacter baumannii* from a wound, requiring broad-spectrum antibiotics. Empiric intravenous vancomycin plus meropenem was initiated. Although intraoperative cultures remained negative,

meropenem-based therapy was continued considering the ESBL-producing *Klebsiella* isolated from urine and *A. baumannii* isolated from the wound, with subsequent adjustment according to antimicrobial susceptibility results. Intravenous therapy was administered for 6 weeks, followed by 4 weeks of susceptibility-guided oral therapy (10 weeks total). Despite infection control and rehabilitation, her neurological function declined, leading to permanent paraplegia. This case underscores the challenges of managing recurrent spinal infections after multiple operations in elderly patients with frailty and comorbidities.

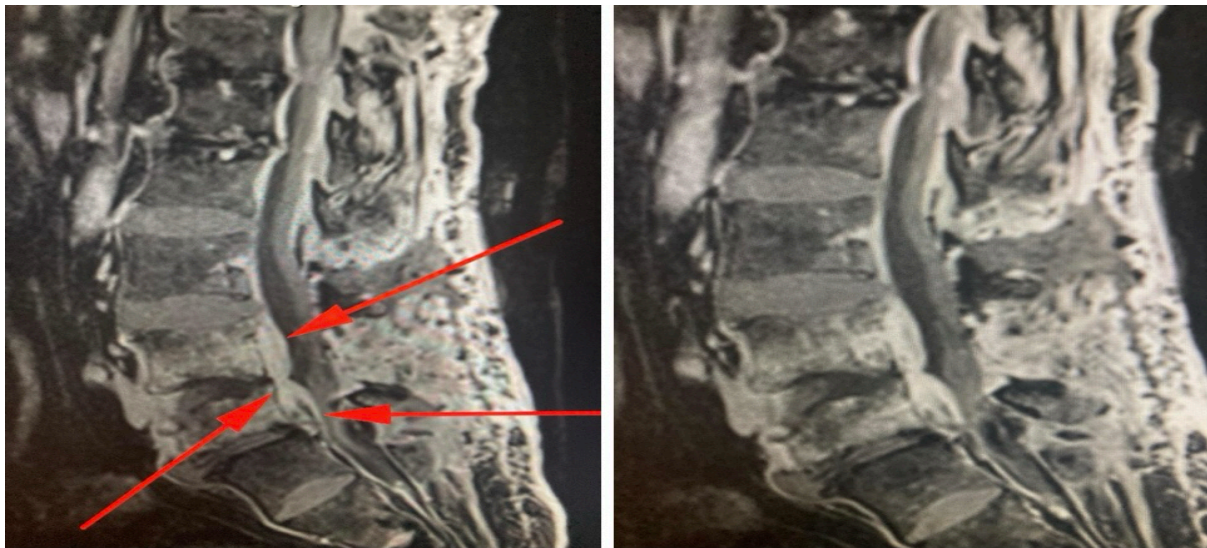


Figure 3. Contrast-enhanced T1-weighted lumbar MRI showing postoperative changes with residual sequestered disc fragments and enhancing epidural soft tissue consistent with partially regressed spondylodiscitis and epidural abscess.

This series of three patients demonstrates the complexity of managing postoperative SD and EA in the context of prior spinal

surgery. The summarized demographic, clinical, and therapeutic characteristics are presented in Table 1.

Table 1: Summary of clinical characteristics, imaging, microbiology, management, and outcomes of three patients who developed spondylodiscitis and epidural abscess.

	Age/ sex	Level of infection	Prior surger y	Microbi ological findings	Neurologic al status	Additional pathology	Treatment	Index surgery to symptom onset	Sympto m onset to diagnosti c MRI	Ambulati on status (admissio n/dischar ge/final follow- up)*
1	63/F	L4-L5	T9-L5 instrum entatio n	Negativ e	Paraparesis	Hip prosthesis	Antibiotics	2 months	1 month	Non- ambulant / Assisted / Assisted
2	54/F	L1-L2	L2-L5 instrum entatio n	<i>Staphylo coccus aureus</i> (blood)	Paraparesis	Multiple sclerosis	Decompres sion surgery + antibiotics	1.5 months	1 month	Assisted/ Assisted / Assisted
3	67/F	Lumbar	Multipl e disc surgeri es	<i>Klebsiel la</i> (urine), <i>Acinetob acter baumani</i> <i>i</i> (wound)	Paraplegia	Urinary tract infection	Decompres sion surgery + antibiotics	2.5 months	1.5 months	Non- ambulant / Non- ambulant / Non- ambulant

Discussion

In all patients, new pain and weakness were initially hard to distinguish from chronic postoperative or hardware-related symptoms, delaying infection recognition. Contrast-enhanced MRI was crucial in identifying active infection or abscess and distinguishing these from scarring or degeneration. Small epidural collections could be treated conservatively (Case 1), but rapid neurological decline required urgent decompression (Cases 2 and 3).

Microbiological confirmation of the spinal pathogen was limited. Blood culture identified methicillin-sensitive *Staphylococcus aureus* in Case 2. In Case 3, ESBL-producing *Klebsiella* and *Acinetobacter baumannii* were isolated from urine and wound cultures, respectively; however, these isolates did not provide definitive microbiological confirmation of the spinal pathogen. Intraoperative cultures obtained in Cases 2–3 showed no microbial growth.

Treatment depended on neurological and imaging findings. Conservative management succeeded in one patient (Case 1), while others required staged decompression and hardware revision (Cases 2–3). In the elderly patient (Case 3), infection control was achieved but functional recovery failed, showing the limits of intervention in frail patients.

Effective care combined surgery, antibiotics, nutrition, wound care, and rehabilitation.

Recovery was shaped by addressing malnutrition, mood, and systemic complications. Coordinated management among neurosurgery, infectious diseases, rehabilitation, nutrition, psychiatry, and nursing prevented further decline and supported recovery.

Our cases also illustrate several patient-specific challenges that may influence the course of postoperative spinal infection. In Case 1, severe hypoalbuminemia (1.9 g/dL) indicated marked malnutrition, which may have adversely affected immune function, tissue healing, and recovery. The migrating hip prosthesis in the same patient represented an additional clinical concern and a potential source of infection, although no direct microbiological link with the spinal infection could be established. In Case 2, underlying multiple sclerosis complicated neurological assessment because fluctuations in weakness could potentially reflect either disease-related neurological deterioration or infection-associated neural compression. These observations emphasize the importance of interpreting neurological and systemic findings within the broader clinical context rather than attributing deterioration solely to spinal infection.

Outcomes varied across the three patients. Case 2 showed functional improvement following surgical treatment, whereas Case 3 remained non-ambulant despite infection control and rehabilitation. Case 1 improved with conservative management. Across all cases, early rehabilitation and clear communication were vital for maintaining motivation and quality of life.

In a systematic review of 64 studies, Gentile et al. identified five key factors—microbiology, abscess features, neurological status, spinal stability, and treatment approach—as essential for guiding multidisciplinary care (6). The authors emphasized structured collaboration among radiology, infectious disease, surgery, and rehabilitation to reduce delays and tailor treatment (6). In our series, close coordination between neurosurgery, infectious disease, psychiatry, and rehabilitation followed this model and appeared to enhance recovery in most patients.

Numerous factors can predispose an individual to spinal infection, many of which compromise immune function (11). As in our cases, diagnosis relies on a combination of clinical and imaging findings, with MRI remaining the gold standard for detecting spinal infection.

Treatment depends on the infection site, stage, and the patient's condition. Mild or

high-risk cases may be managed conservatively, but surgery is often needed when medical therapy alone is uncertain. The main goal is bony fusion, supported by systemic antibiotics for at least six weeks (1). In our series, one patient improved with conservative therapy, while the others required decompression and antibiotics, reflecting the balance between medical and surgical management noted by Lener et al. (1).

Current IDSA guidelines emphasize prompt MRI, microbiological evaluation, and early surgical assessment in patients with vertebral osteomyelitis and progressive neurological deficits (12). In our series, management was similarly individualized according to neurological status, imaging findings, and microbiological results.

Antimicrobial treatment was individualized according to the postoperative setting, microbiological findings, antimicrobial susceptibility, clinical response, and surgical source control. Culture-directed de-escalation was possible in Case 2 after MSSA bacteremia was identified, whereas culture-negative spinal specimens in Cases 1 and 3 necessitated broader empiric treatment.

The goals of surgery are to decompress neural structures, remove infected tissue, stabilize the spine, and restore alignment. Anterior column reconstruction is often

achieved using autograft or titanium cages filled with bone graft, while posterior instrumentation is added if stability is compromised. Titanium implants are preferred for their biocompatibility and imaging advantages. In difficult or recurrent cases, vascularized muscle or omental flaps may be used to enhance local blood flow, promote healing, and support infection control (9). In our series, decompression was performed in two of the three patients. These procedures were primarily posterior approaches aimed at relieving epidural compression, evacuating purulent or fibrotic material, and preserving existing instrumentation whenever feasible. All achieved effective neural decompression without postoperative cerebrospinal fluid leakage or new neurological deficits. Our surgical management followed the strategic framework proposed by Hsieh et al., and the clinical trajectory of our patients is consistent with the findings of Chen SH et al., demonstrating that early intervention effectively halts neurological decline and preserves hardware integrity (9,13).

Postoperative spinal infections can result in serious complications such as SD, implant failure, deformity recurrence, neurological deficits, and sepsis if not managed promptly. Timely and thorough surgical intervention helps remove infected tissue, achieve stable wound healing, and restore

spinal stability. Revision surgery is required in cases of nonunion, implant loosening, persistent infection, or progression to adjacent segments (13). Our experience aligns with these observations: one patient required staged hardware revision due to instability and achieved wound healing without reinfection, while others recovered with stable instrumentation and improved neurological function.

Limitations

This case series has several limitations. The small sample size and retrospective single-center design limit the generalizability of the findings. Although intraoperative specimens were obtained in the surgically treated patients, no microbial growth was detected, limiting definitive microbiological confirmation of the spinal pathogen. In addition, all patients were female, which limits the applicability of our observations across sexes. Standardized neurological and functional outcome measures were not consistently available in the retrospective records. Finally, the total number of spinal operations performed at our center during the study period could not be reliably determined from the available retrospective records; therefore, an institutional incidence estimate could not be provided.

Conclusion

Postoperative SD and EA are rare but serious complications that demand early recognition. Because new or worsening pain is often mistaken for routine postoperative discomfort, maintaining clinical suspicion is essential. Contrast-enhanced MRI remains the cornerstone of diagnosis. Treatment should be individualized; conservative management may suffice in stable cases, whereas urgent decompression is vital for patients with neurological decline or significant canal compromise.

Author contributions

S.Y.M: Conceptualization, Methodology, Investigation, Data curation, Literature review, Visualization, Writing – original draft, Writing – review & editing. **B.A:** Investigation, Supervision, Validation, Clinical management, Writing – review & editing.

S.O.M: Investigation, Validation, Interpretation of infectious disease findings, Writing – review & editing.

S.K: Radiological interpretation, Visualization, Validation, Writing – review & editing. All authors read and approved the final version of the manuscript.

Conflict of interest

The authors declare no conflict of interest.

Ethics committee approval

Written informed consent was obtained from the patients for publication of this case series and accompanying images. Ethical committee approval was not required due to the retrospective descriptive nature of the study and anonymized patient data.

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Declaration regarding the use of artificial intelligence

ChatGPT (OpenAI) was used solely for language editing and grammar correction during manuscript preparation. The authors take full responsibility for the scientific content of the manuscript.

Presentation information

This study has not been presented previously at any scientific meeting.

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