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## Case Report

# Unusual case of staphylococcus epidermidis-induced spinal epidural abscess in an adolescent: Clinical insights and diagnostic considerations ☆,☆☆

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## ABSTRACT

Spinal epidural abscess (SEA) is an uncommon infection typically caused by *Staphylococcus aureus*, predominantly affecting older adults with risk factors such as advanced age, comorbidities, and prior surgical interventions. This report details a case involving a 14-year-old male presenting with acute lumbar pain, lower limb weakness, urinary retention, and skin pustules. The patient had no history of immunologic diseases, diabetes, or drug use. Contrast-enhanced magnetic resonance imaging (MRI) with gadolinium demonstrated a peripheral fluid signal surrounding the thoracic spinal cord, consistent with an epidural abscess from T9-T12 to L1, causing spinal cord compression. Cultures from the abscess and skin pustules identified *Staphylococcus epidermidis* (*S. epidermidis*). The patient underwent surgical drainage and remained stable postoperatively. This case highlights an unusual SEA presentation in an adolescent without typical risk factors, emphasizing the importance of considering atypical pathogens and further investigation into infection sources.

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**Abbreviations:** SEA, spinal epidural abscess; MRI, magnetic resonance imaging; *S. epidermidis*, staphylococcus epidermidis; WBC, white blood cell; ESR, erythrocyte sedimentation rate; CRP, C-reactive protein; SI, spinal infection.

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## Introduction

Spinal abscesses are categorized based on infection localization into 3 categories: epidural, subdural, and intramedullary [1]. Spinal epidural abscess (SEA) is an uncommon infection characterized by the accumulation of purulent material within the space between the dura and vertebral periosteum [2]. The most common microbial cause of SEA is *Staphylococcus aureus*, accounting for approximately two-thirds of cases. Other causative microbes involve coagulase-negative *Staphylococcus* (such as *Staphylococcus epidermidis*), *Streptococcus*, gram-negative bacilli (notably *Pseudomonas aeruginosa* and *E. coli*), and less frequently, anaerobic bacteria, fungi, mycobacteria, and parasites [3]. Advanced age, comorbidities, and surgical procedures are common risk factors [1]. SEA typically occur at a mean age of 50 years, mainly in those aged 30–70, with rare occurrences in children [4]. Clinical presentation of neck or back pain, fever, potential neurological deficits, and magnetic resonance imaging (MRI) with gadolinium contrast are the diagnostic standards [1]. SEA can result in spinal cord ischemia due to compression, leading to potentially life-threatening consequences [4]. Therefore, prompt surgical drainage and administration of antibiotics are imperative in managing this critical medical condition [1]. This paper describes a patient's case who presented with acute back pain and neurological symptoms. Despite the absence of apparent risk factors, a thoracic-lumbar SEA due to *Staphylococcus epidermidis* (*S. epidermidis*) was diagnosed. The unique presentation of *S. epidermidis* without typical infection routes raises questions about the source of infection.

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## Case presentation

### Chief complaints

A 14-year-old male patient presented to the neurological department with acute severe lumbar pain radiating to the lower limbs, where mild weakness progressed over 1 week to significant motor impairment.

### Medical history and physical examinations

The patient has no history of immunologic diseases, diabetes, or medication use. Clinical examination showed 3/5 motor weakness in the lower limbs, 4/5 dorsal plantar flexion of the foot, urinary retention, diffuse skin pustules on the back of the thigh, shoulder, and humerus, and a little on the back.

### Laboratory examinations

These pustules were cultured, revealing *S. epidermidis* as the causative pathogen. Laboratory test results revealed a marked increase in white blood cell (WBC;  $15 \times 10^9/l$ ), erythrocyte sedimentation rate (ESR; 78.00 mm/h), and C-reactive protein (CRP; 123.96 mg/l) levels, suggesting a severe infection, with liver and kidney function tests normal and negative results for both the Vidal and Wright tests.

## Imaging examinations and differential diagnosis

Based upon the neurologic symptomatology and blood test findings, the differential diagnosis was a compressive lesion in the lower dorsal spinal cord such as a tumor, disc, hemorrhage, or abscess. Contrast-enhanced MRI with gadolinium demonstrated a peripheral fluid signal surrounding the thoracic spinal cord, consistent with an epidural abscess from T9–T12 to L1, causing spinal cord compression (Fig. 1). The recommendation for surgical excision was made, with the patient's consent obtained and medical consultations prior to the procedure indicating no objections.

## Surgical management and final diagnosis

Prophylactic antibiotics prior to surgery were made with intravenous vancomycin 1 g bi-daily and ceftriaxone 1 g bi-daily. The surgery was done by a specialist in neurosurgery, which involved T9–T11 laminectomy, canal dilatation, and SEA drainage via a posterior approach (Fig. 2). Purulent fluid samples were collected and sent for Gram staining and bacteriological culture analysis. Irrigation and evacuation were performed multiple times until no abscesses or purulent material remained. The incision was repeatedly and carefully irrigated with iodine and saline mixed with vancomycin before closure, with the negative pressure drainage vessel remaining in situ. After surgery, cultures of the patient's blood and drained pus revealed *S. epidermidis*, consistent with the pathogens detected in skin pustule tests and suggesting these lesions as the likely source of infection. Consequently, based on the final microbiological sensitivity report, the patient was prescribed oral cefixime 400 mg daily and oral amoxicillin 1 g bi-daily for 2 weeks.

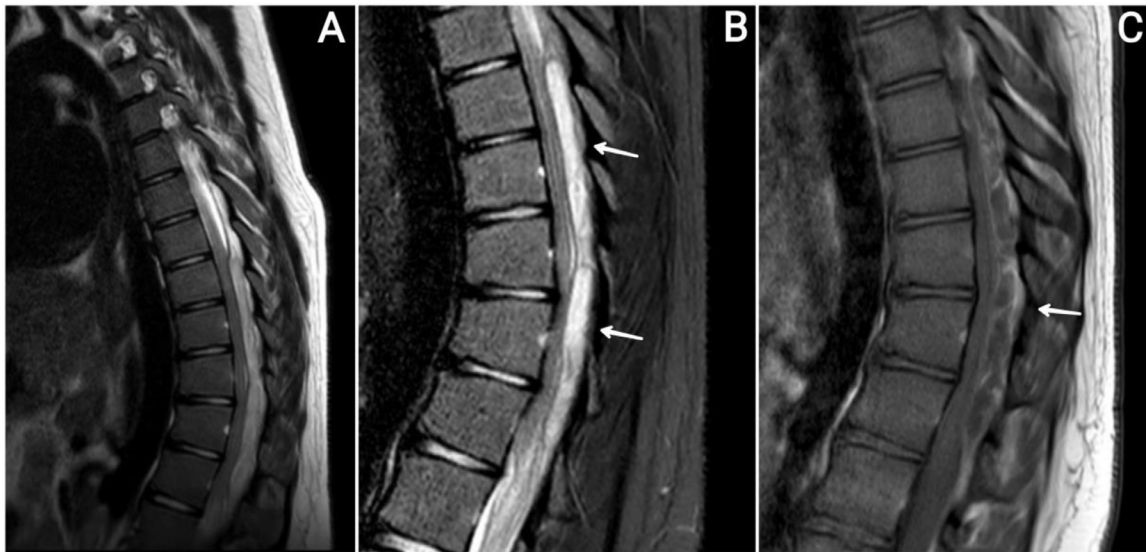
## Outcome and follow-up

The patient had an uneventful recovery postsurgery and was discharged from the hospital within 3 days. The patient has undergone consistent follow-up evaluations. MRI imaging conducted in the third week to assess for disease recurrence and spinal deformity revealed complete lesion resolution and spinal decompression, indicating no disease recurrence [Figure 3]. At the last review, the patient was asymptomatic, exhibiting improved physical examination results with no motor weakness or lumbar pain.

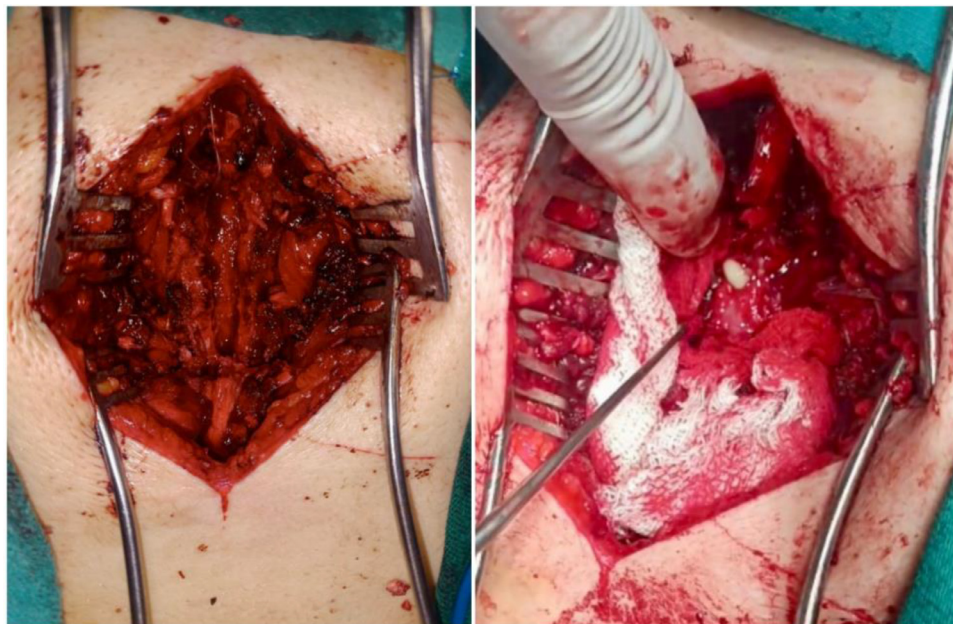
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## Discussion

Spinal infection (SI) can affect the vertebral body, intervertebral disc, and adjacent paraspinal tissue, representing 2%–7% of all musculoskeletal infections [1]. The incidence of SI ranges from 1:20,000 to 1:100,000, with mortality rates varying between 2% and 20% in developed countries [1]. SEA is a severe infection with a global mortality rate of 5%–16%, and fewer than 50% of survivors fully recovering. Males are affected more frequently than females, with a ratio of 2:1, for reasons that remain unknown [1]. In addition, the main age of SEA is the sixth decade of life; thus, children can be affected in rare cases



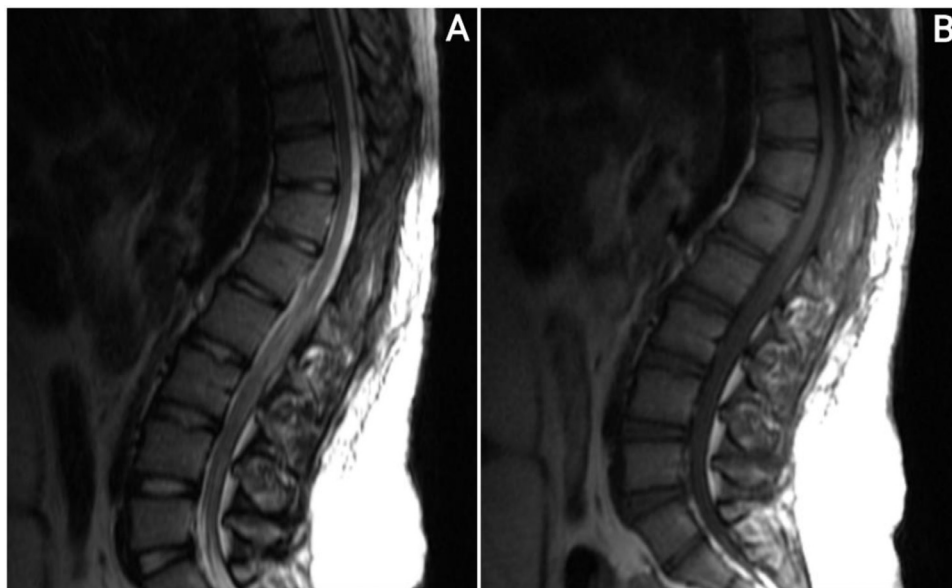
**Fig 1 – Contrast-enhanced magnetic resonance imaging (MRI) with gadolinium demonstrated a peripheral fluid signal surrounding the thoracic spinal cord, consistent with an epidural abscess from T9-T12 to L1, causing spinal cord compression. ([A] Sagittal section of T2-weighted sequence, [B] Sagittal section of STIR sequence, [C] Sagittal section of T1-weighted sequence).**



**Fig. 2 – Dorsal posterior T9-T11 laminectomy and canal dilatation.**

[1,4]. Abscesses are mainly located in the lumbar spine (48%), followed by the thoracic (31%), and cervical (24%). Typically, SEAs manifest as a multisegmental (3-4 segments) condition because bacteria can spread through the epidural space unhindered by anatomical barriers [1]. Herein, we presented the case of a 14-year-old male patient with SEA from T9-T12 up to L1. Hematogenous spread, dissemination from contiguous tissues, and direct external inoculation are common causes of SI [1]. The infection with SI, especially SEA, may be due to

potential risk factors such as advanced patient age, diabetes mellitus, poor nutritional status, immunologic incompetence, intravenous drug injection, HIV infection, trauma, tattooing, acupuncture, adjacent bone or soft tissue infection, substance abuse, and the increasing number of invasive spinal surgeries [1,4]. *Staphylococcus aureus* is the predominant pathogen in SEAs (30%-80%) [1]. *S. epidermidis* infection is uncommon. Recently, *S. epidermidis* has become a significant opportunistic pathogen, primarily responsible for medical device-related in-



**Fig. 3 – MRI imaging conducted in the third week to assess for disease recurrence and spinal deformity revealed complete lesion resolution and spinal decompression, indicating no disease recurrence. ([A] Sagittal section of T2-weighted sequence, [B] Sagittal section of T1-weighted sequence).**

fections. It is a major pathogen in catheter-related infections, early-onset newborn sepsis, joint prosthesis infections, prosthetic valve endocarditis, and other infections associated with medical devices [4]. The challenge of medical device-related infections is their association with multidrug-resistant bacteria, which produce adhesion factors and capsules on implant surfaces, compromising antibacterial effectiveness and may necessitate implant removal for thorough infection clearance [4]. The findings from this case, highlighting the absence of risk factors and the isolation of *S. epidermidis* from skin pustules, suggest these skin lesions are a source of infection for SEA. Patients with SI typically exhibit nonspecific symptoms, with back pain being the most commonly reported (85%), followed by fever (48%), and paresis (32%) [1]. Although the classic trio of SEA includes fever, back pain, and neurological dysfunction, around 50% of patients experience either back pain or other nonspecific symptoms [4]. In the present case, urinary retention and motor weakness were significant symptoms in addition to acute lumbar pain. The classical triad of symptoms is a highly specific indication of SEA. However, despite its specificity, it is quite uncommon for patients to exhibit all 3 symptoms simultaneously. Nonetheless, when a patient does present with this combination of symptoms, it is a strong indication for an SEA diagnosis [5]. On the other hand, elevated inflammatory markers such as CRP and ESR are common but nonspecific indicators of SEA [5]. Also, it is important to be cautious with lumbar puncture to not risk seeding the skin flora into the epidural space [5]. MRI is the preferred imaging technique for the diagnosis and management of SEA due to its high sensitivity and specificity, which makes it crucial for early detection [2,6]. It helps differentiate SEA from other conditions with similar symptoms by providing clear images of the spinal anatomy [6]. A key difference between a SI and a neoplastic

process is the involvement of the intervertebral disc space, which is more common in an infection scenario [6]. The initial empirical antibiotic therapy for SEA aims to cover a broad range of pathogens, including the most common causative agents, such as *Staphylococcus aureus*, gram-negative bacilli, and streptococci, with a third-generation cephalosporin or fluoroquinolone alongside clindamycin or vancomycin [5,6]. Although blood cultures are essential for identifying the involved pathogen, cultures obtained directly from the site of infection usually yield more definitive and accurate results [7]. Therapy should be adjusted once culture results and antibiotic susceptibilities are available [6]. In this case, the pathogen happened to be *S. epidermidis*, and the patient was put on amoxicillin and cefixime. The choice between medical and surgical management depends on several factors, including the stage of the disease, the location of SEA, the presence of neurological deficits, and the patient's age [7]. Because of the patient's neurological symptoms and the location of the abscess in the thoracic spine, which presents a high risk for rapid progression [6], surgery was recommended and performed for spine decompression and drainage of the abscess.

## Conclusion

This case highlights an unusual presentation of spinal epidural abscess in an adolescent without typical risk factors, emphasizing the importance of considering atypical pathogens. Furthermore, it underscores the necessity of microbiological confirmation for guiding appropriate therapeutic interventions, especially in cases where standard pathogens are not identified. Further research is needed to investigate the po-



tential role of environmental or other unknown factors in the development of these infections.

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### Data availability

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

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### Ethics approval and consent to participate

Ethics clearance was not necessary since the University waives ethics approval for publication of case reports involving no patients' images, and the case report is not containing any personal information. The ethical approval is obligatory for research that involve human or animal experiments.

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### CRediT authorship contribution statement

**Saja Karaja:** Writing—review and editing, Writing—original draft, Data curation; **Ayham Qatza:** Writing—review and editing, Writing—original draft; **Mulham Alkassem:** Writing—review and editing, Writing—original draft; **Ahmed Aldolly:** Writing—review and editing, Writing—original draft; **Ahmed Sheikh Sobeh:** Writing—review and editing, Writing—original draft; **Mai Halloum:** Writing—review and editing, Writing—original draft; **Amer Al Tawekji:** Writing—review and editing, Writing—original draft; **Wardan Almir Tamer:** Writing—review and editing, Supervisor; **Ayham Qatza:** submitted the final manuscript; All authors read and approved the final manuscript.

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### Patient consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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