


CASE REPORT



# Unexpectedly rapid decrease in the size of a spinal epidural abscess after percutaneous posterior pedicle screw fixation without decompression surgery: a case report

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**INTRODUCTION:** Spondylodiscitis accompanying spinal epidural abscess is often treated with decompression surgery when there are neurological symptoms. We report a case of spondylodiscitis accompanying spinal epidural abscess with severe lower extremity pain that was successfully treated with percutaneous posterior pedicle screw fixation without decompression surgery.

**CASE PRESENTATION:** A 53-year-old man was admitted to our hospital with severe low back pain (LBP), lower extremity pain and numbness, and fever. Lumbar magnetic resonance imaging (MRI) revealed spondylodiscitis at L2–L3 and a small epidural abscess located ventrally in the spinal canal. Initially, the patient was treated conservatively with empirical antibiotics. However, the lower extremity symptoms worsened and the epidural abscess expanded cranially to the T12 level. Percutaneous pedicle screw fixation without decompression was performed thirty-three days after admission. Postoperatively, the LBP and lower extremity pain dramatically improved. A postoperative MRI performed one week post-operatively showed an unexpectedly rapid decrease in the size of the epidural abscess, although no decompression surgery was performed. Two months after surgery, the epidural abscess completely disappeared. At the final follow-up (five years postoperatively), no recurrence of epidural abscess was observed, and the patient had no symptoms or disturbance of activities of daily living.

**DISCUSSION:** This surgical strategy should be carefully selected for patients with spondylodiscitis with accompanying spinal epidural abscess who have lower extremity symptoms. The stabilising effect of pedicle screw fixation may be advantageous for controlling spinal infections. Percutaneous posterior pedicle screw fixation without decompression is an optional treatment for spondylodiscitis accompanying spinal epidural abscess.

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## INTRODUCTION

Spondylodiscitis usually affects the intervertebral disc space and predominantly in older and chronically debilitated patients [1, 2]. In some cases, patients have only mild low back pain (LBP) and fever; thus, early diagnosis is difficult in such cases. When patients have lower-extremity symptoms, physicians must consider the existence of spinal epidural abscesses accompanied by spondylodiscitis. Spinal epidural abscesses without neurological symptoms can be conservatively treated [3]. However, patients with neurological symptoms are often treated with decompression surgery of neural tissues at an appropriate time [4]. We report a case of spondylodiscitis accompanying spinal epidural abscess with severe lower extremity pain that was successfully treated with percutaneous pedicle screw fixation without decompression surgery.

## CASE PRESENTATION

### History

A 53-year-old man with hypertension and diabetes was admitted to our hospital with severe LBP, lower extremity pain and numbness, and fever (39.6 °C). The patient had a history of persistent LBP for two months and was treated conservatively with a diagnosis of lumbar disc herniation. In the previous hospital, infectious disease had not been pointed out, thus, no antibiotics had been administered. Lower extremity symptoms and fever developed on the day of admission. On physical examination, reduced sensation in the lower extremities was found; however, no muscle weakness of the lower extremities was observed. He was unable to walk because of the LBP and lower-extremity symptoms. Laboratory examination showed an increase in white blood cell (WBC) count (10,410/μL; neutrophils 89.0%,

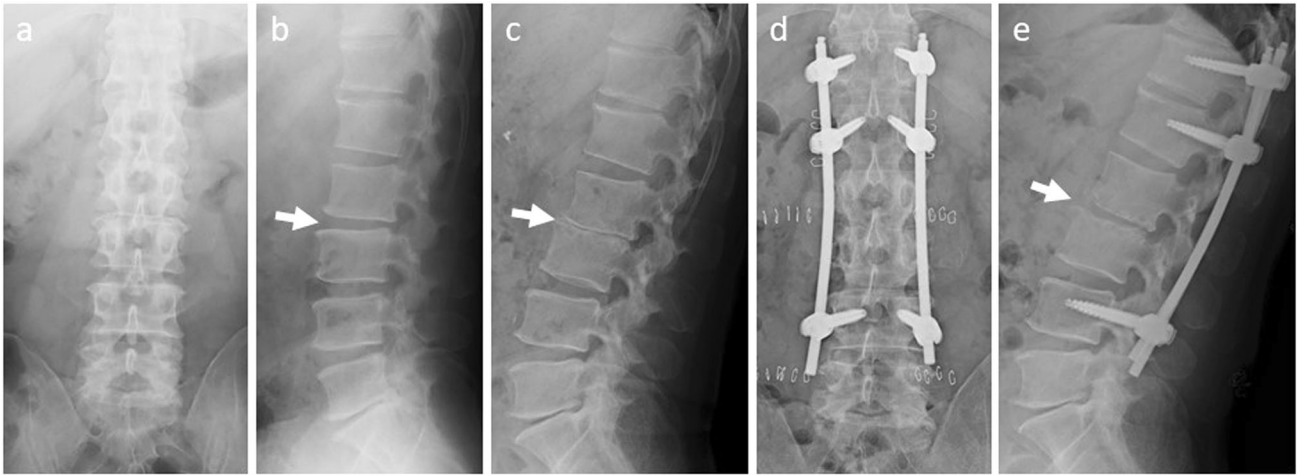
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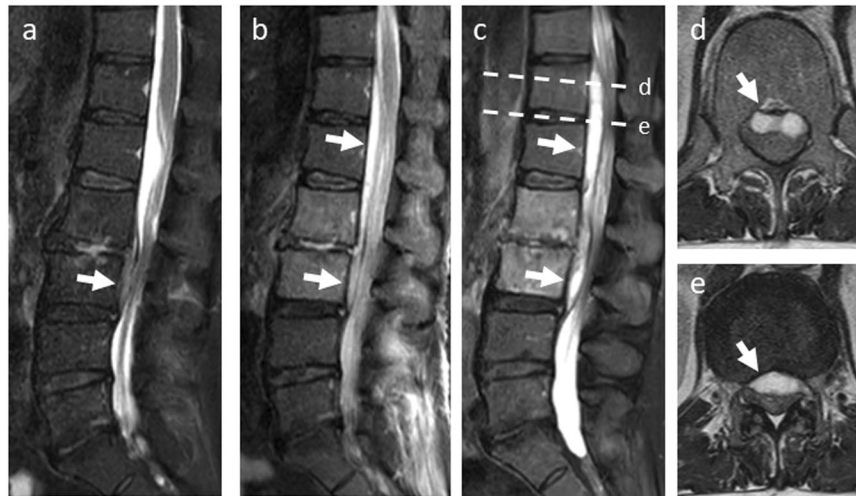
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**Fig. 1 Pre- and postoperative radiographs.** Antero-posterior (a) and lateral (b) radiographs taken at first presentation show that the L2–L3 disc had not collapsed (arrow). Lateral radiograph taken 25 days after admission (c) shows that the L2–L3 disc had obviously collapsed. Post-operative antero-posterior (d) and lateral (e) radiographs show that the L2–L3 disc had widened after percutaneous pedicle screw fixation (arrow).



**Fig. 2 Preoperative magnetic resonance imaging (MRI) of the lumbar spine.** a MRI taken at first presentation (short tau inversion recovery [STIR] sagittal image) showing spinal epidural abscess at L2–L3 levels (arrow). b MRI taken ten days after initial admission (STIR sagittal image) showing epidural abscess extending cranially to T12 and caudally to L3 level (arrows). c MRI taken 24 days after admission (STIR sagittal) showing marked expansion of the abscess at the levels between T12 and L3 (arrows). MRI (T2 weighted axial image) showing large epidural abscess located ventrally in the spinal canal (arrow) at the T12 vertebra d and T12–L1 disc (e).

lymphocytes 5.0%, monocytes 6.0%), C-reactive protein (CRP: 28.16 mg/dL), and procalcitonin (PCT: 4.87 ng/mL), suggesting that a severe infectious disease existed. Plain radiographs showed no obvious cause of LBP or lower extremity symptoms (Fig. 1a, b). Lumbar magnetic resonance imaging (MRI) showed a high signal intensity area on short tau inversion recovery (STIR) image in the L2–L3 disc space, and a small epidural abscess located ventrally in the spinal canal at the L2–L3 level (Fig. 2a).

A diagnosis of L2–L3 spondylodiscitis with accompanying spinal epidural abscess was made. The patient was treated conservatively with empirical antibiotics (cefotaxime, 4.0 g/day). Blood culture was found to be positive for *Staphylococcus aureus* three days after admission, and the antibiotic was switched to meropenem (6.0 g/day) based on the in vitro sensitivity results. After continuous conservative treatment for 4 weeks, the pain in the lower back and lower extremities worsened, although the WBC count (4520/ $\mu$ L) and CRP levels (3.49 mg/dL) improved. Subsequently, the L2–L3 disc space collapsed (Fig. 1c), and the epidural abscess gradually expanded. Ten days after admission, the extent of the epidural

abscess extended to the T12 level (Fig. 2b), and 24 days after the admission, the abscess had expanded significantly (Fig. 2c–e). He was still able to walk and no muscle weakness of the bilateral lower extremities was observed, however, hyperreflexia in the lower extremities (ankle clonus) was observed and lower extremity pain had further worsened. Therefore, the patient underwent surgery after informed consent was provided.

#### Surgical treatment

Percutaneous pedicle screw fixation was performed thirty-three days after admission. We scheduled the patient for debridement of the infected L2–L3 disc with posterior decompression and evacuation of the epidural abscess. However, both procedures were not performed. Under general anaesthesia, the patient was positioned prone on a radiolucent table. After making a 1–2 cm longitudinal incision for screw insertion, a guiding needle was inserted into the vertebral body through the pedicle, and a guide wire was inserted through the needle into the vertebral body. The needle was carefully removed and a cannulated cancellous screw was inserted over the

guidewire. Pedicle screws were inserted bilaterally into the T12, L1, and L4 vertebrae. Connecting rods are inserted through the incision for the most cranial pedicle screws, passed sub-fascially through the screw heads, and fixed using set screws (Fig. 1d, e).

### Postoperative course

Post-operatively, the LBP and lower extremity symptoms improved dramatically. Two days after the surgery, the patient was able to walk with a walker and complained of mild LBP with no pain or numbness in his lower extremities.

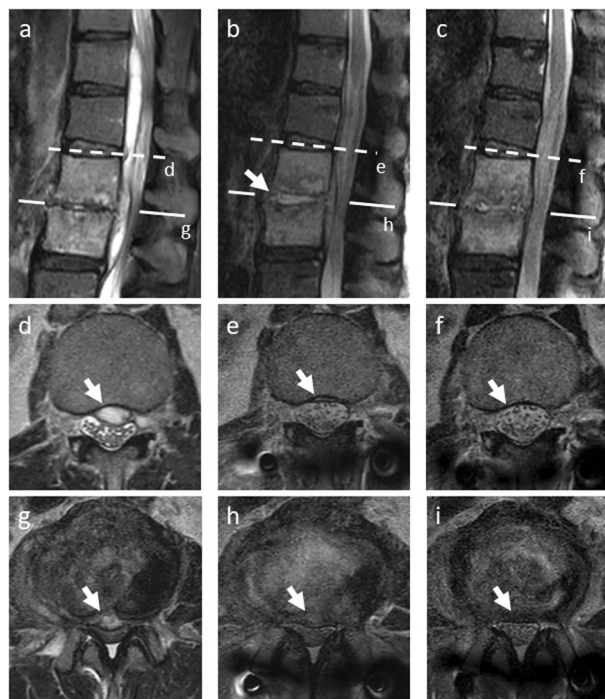
The pre-operatively raised CRP value (3.49 mg/dL) decreased to 1.29 mg/dL one week post-operatively. Eleven days after surgery, CRP levels dropped to 0.50 mg/dL, and intravenous antibiotic treatment was stopped, followed by oral antibiotic treatment using rifampicin (450 mg/day), sulfamethoxazole (1.6 g/day) and trimethoprim (320 mg/day) until 4 months after surgery. Post-operative radiographs taken a week after surgery showed an obvious restoration of disc height at the infected L2–L3 level (Fig. 1e). Considering that no decompression surgery was performed, post-operative MRI showed an unexpectedly rapid decrease in the size of the epidural abscess. The epidural abscess almost disappeared at the T12–L1 levels and markedly decreased at the L2–L3 levels (Fig. 3). Two months after surgery, the epidural abscess had completely disappeared (Fig. 3c,f,i).

Sixteen days after surgery, he had mild LBP, but was able to walk without support; therefore, he was discharged. The patient was followed-up in an outpatient clinic and had no recurrence of symptoms. Post-operatively, computed tomography (CT) images showed that endplate destruction had gradually resolved, and continuity of bone trabeculae was observed between the L2 and L3 vertebrae (Fig. 4); therefore, removal of the pedicle screws was performed 18 months after the initial surgery. No complications occurred after the implant removal. At the final follow-up (5 years postoperatively), bony fusion and no recurrence of epidural abscess were observed (Fig. 5), and the patient complained of no symptoms on his lower back and lower extremities and had no disturbance in activities of daily living.

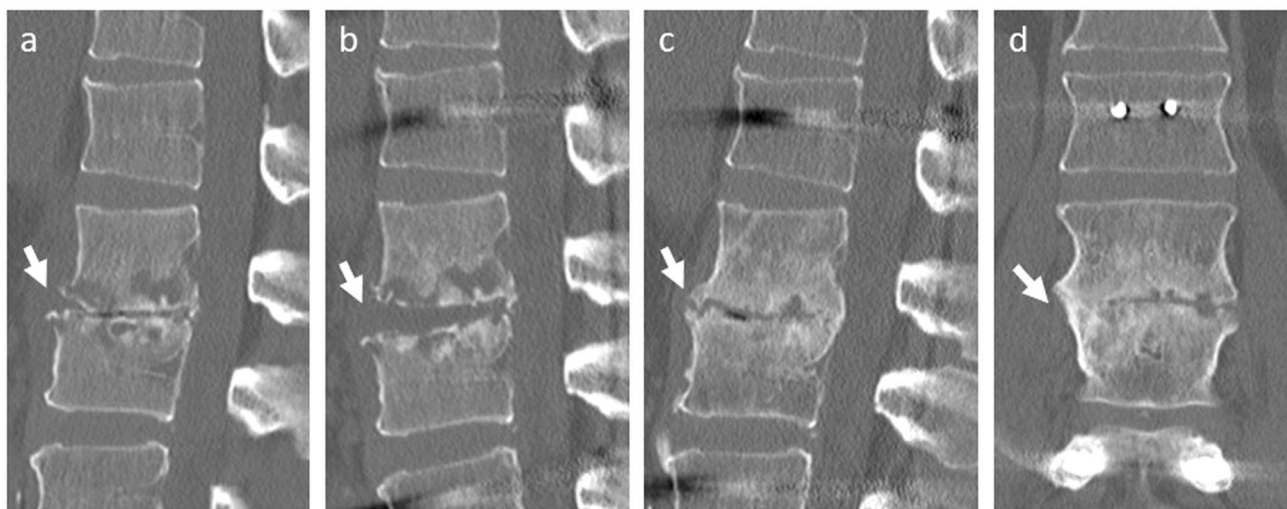
### DISCUSSION

Generally, conservative treatment is successful in many cases with spondylodiscitis, particularly when recognised and treated early. The prognosis is dependent on the clinical and neurological

condition of the patient and is influenced by any delay in the diagnosis [5]. Our patient had been treated with a diagnosis of disc herniation for two months, thus, no antibiotics treatment had been started until he first admitted our hospital. At the first presentation, he showed poor general condition and neurological



**Fig. 3 Pre- and postoperative magnetic resonance imaging (MRI) of lumbar spine.** Sagittal images of MRI (short tau inversion recovery sagittal image) taken pre-operatively (a), a week after surgery (b), and two months after surgery (c); Post-operatively, epidural abscess had decreased and L2–L3 disc space had widened and collected a considerable amount of intradiscal fluid (b, arrow); Axial images of MRI (T2-weighted images) taken preoperatively (d, g), a week after surgery (e, h), and two months after surgery (f, i); The epidural abscess rapidly decreased a week after surgery (e, h, arrows), and disappeared two months after surgery (f, i, arrows).



**Fig. 4 Pre- and postoperative computed tomography (CT) images.** Reconstructed sagittal (a–c) and coronal (d) CT images taken pre-operatively (a), a week after surgery (b), and eighteen months after surgery (c, d). The L2–L3 disc space had widened a week after surgery (b, arrow) when compared with the pre-operative images (a, arrow). Endplate destruction had resolved and continuity of bone trabeculae was observed 18 months after surgery (c, d).





**Fig. 5 Postoperative radiographs and magnetic resonance imaging (MRI) of lumbar spine.** Antero-posterior (a) and lateral (b) radiographs taken five years after the initial surgery showing no bony destruction at the L2–L3 disc level (arrows); MRI of the lumbar spine (c: T1-weighted image, d: T2-weighted image) taken five years after the initial surgery, showing the disappearance of the L2–L3 disc space and bony continuity between the L2 and L3 vertebrae (arrows); No recurrence of spondylodiscitis and spinal epidural abscess was observed in MRI images.

symptoms caused by relatively large epidural abscess. There is a possibility that spinal infection had worsened during the two months conservative treatment without antibiotics treatment. We suppose that the delay in the diagnosis and the treatment is a cause of failed conservative treatment requiring surgical intervention in the relatively young patient with no impaired immune function except hypertension and diabetes.

The aim of surgical treatment for patients with spondylodiscitis is to decrease the bacterial load and stabilise the infected site to prevent bony destruction [6]. In patients with spinal epidural abscesses causing neurological symptoms, decompression of the neuronal tissue by evacuation of the abscess is usually indicated [4]. Basically, the source of the infection is the intervertebral disc located anteriorly; thus, infected tissue debridement and bone grafting via the anterior approach are historically the first choice of treatment [6]. Placement of pedicle screws without aggressive debridement of infected tissue in the setting of a spinal infection remains controversial [7]. However, previous reports have emphasised the effectiveness of posterior pedicle screw fixation without debridement of the infected tissue [7–9]. Recently, several authors have reported favourable results of minimally invasive surgery with a combination of percutaneous endoscopic debridement and percutaneous pedicle screw fixation [10, 11]. In these reports, some patients had epidural abscesses causing lower extremity symptoms, although the details were not described. Lambert et al. reported that percutaneous pedicle fixation has an advantage over brace treatment in preventing the progression of kyphotic deformities in patients with spondylodiscitis [8].

In our patient, the spinal epidural abscess was relatively large, and lower extremity pain was severe. Decompression surgery is generally indicated in such patients; however, we decided to perform percutaneous posterior fixation without decompression. Therefore, we carefully followed up the patient's symptoms after percutaneous posterior fusion, and the patient was informed that posterior decompression would be performed as a second surgery if no improvement in lower extremity symptoms was observed. After the surgery, the spinal epidural abscess showed an unexpectedly rapid decrease in size. Moreover, lower extremity pain and numbness dramatically improved immediately after surgery; thus, posterior decompression became unnecessary.

Based on our experience, we thought of two mechanisms that could account for the unexpected rapid decrease in the spinal epidural abscess. First, stabilisation of the infected disc, which suppresses the destruction of the vertebrae adjacent to the infected disc, may be advantageous in controlling spinal infection. Second, the abscess was located ventrally in the spinal canal, which was possibly connected to an abscess in the infected disc space. Thus, the abscess might have been partially suctioned into the disc space because of the decreased intradiscal pressure caused by widening of the disc space after posterior fixation. As shown in Fig. 1, the infected disc collapsed before surgery; however, the disc space widened and a considerable amount of intradiscal fluid was collected during the surgery (Fig. 3d).

This surgical strategy should be carefully selected for patients with spondylodiscitis accompanied by spinal epidural abscesses. Further research is needed to clarify the appropriateness of this surgical strategy. However, percutaneous pedicle screw fixation is a safe and minimally invasive procedure. In addition, its stabilising effect may be advantageous for the control of spinal infections. Thus, we propose that patients with slight or no muscle weakness in the lower extremity can be treated using this strategy, particularly when they have ventrally located epidural abscesses, which are relatively difficult to evacuate by posterior decompression surgery.

In conclusion, percutaneous posterior pedicle screw fixation without debridement and decompression is an optional treatment for patients with spondylodiscitis accompanied by spinal epidural abscesses.

#### DATA AVAILABILITY

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

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### COMPETING INTERESTS

The authors declare no competing interests.

### ADDITIONAL INFORMATION

**Supplementary information** The online version contains supplementary material available at <https://doi.org/10.1038/s41394-022-00543-5>.

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