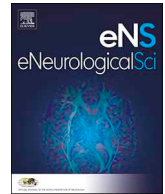




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Letter to the Editor

A case of extensive epidural abscess concomitant with intracranial involvement due to *Staphylococcus aureus* successfully treated with ceftriaxone in combination with linezolid and rifampin

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Dear Editor,

Spinal epidural abscess (SEA) is an uncommon infection, and a neurological emergency that may lead to marked neurological dysfunction and devastating consequences. The typical clinical manifestations of SEA are the classic triad of back pain, neurological deficits, and fever [1]. The most common causative bacteria of SEA is *Staphylococcus aureus*. In general, the management for SEA is surgical decompression and antibiotic therapy [1]. However, it remains controversial whether patients with an extensively spreading abscess should be treated by surgery or medicated by antibiotics alone. Here, we report a case of extensive SEA successfully treated with an antibiotic strategy involving the combination of ceftriaxone, linezolid, and rifampin without any surgical management.

1. Case presentation

A 60-year-old female presented with progressive back pain and fever that had persisted for a week. Her medical history included diabetes mellitus and rheumatoid arthritis, for which she had received immunosuppressive therapy. She was admitted to a hospital and received intravenous antibiotic treatment comprising ampicillin and sulbactam, but her fever persisted and back pain worsened. On examination when she was transferred to our institution, she was febrile with severe tenderness over the lower lumbar spine. She did not complain of any neurological symptoms, although she was unable to ambulate because of severe back pain. Blood tests showed a markedly elevated white cell count (28,200 cells/mm³) and C-reactive protein level of 34.6 mg/dL. MRI showed pyogenic discitis at L3/4 and L4/5 and abscesses disseminated in the anterior space of the L5 vertebral body. Whole-body CT showed no other infectious lesion. An echocardiogram did not suggest any evidence of endocarditis. Empiric intravenous antibiotic therapy with cefazolin and vancomycin was started. CT-guided percutaneous needle drainage of the lumbar spine (L4/5) was performed, and a drainage tube was placed. However, her consciousness deteriorated to a drowsy state on the next day of

drainage. Neurological examination showed neck stiffness, decreased deep tendon reflexes of the extremities, and flexor plantar response, while no other neurological focal signs were noted. MRI of the whole spine revealed SEA that extended from the spinal epidural space at L5 to the intracranial space, located anteriorly to the spinal cord and brainstem (Fig. 1A) in addition to the known lumbar discitis and paravertebral abscesses. Brain MRI showed an epidural abscess anterior to the brainstem and hydrocephalus. Gadolinium (Gd) contrast enhancement of leptomeninges in the bilateral hemisphere suggested that the infection also involved the subarachnoid spaces (Fig. 1B–E). Cerebrospinal fluid (CSF) analysis with lumbar puncture was not performed due to the abscess. The drainage catheter placed in the lumbar abscess was removed. Blood and the drained pus cultures were positive for methicillin-sensitive *Staphylococcus aureus* (MSSA). Antibiotic therapy was changed to ceftriaxone based on the antibiotic sensitivity profile of the bacteria. The administration of intravenous linezolid 600 mg twice daily for two weeks and per oral rifampin 600 mg daily were simultaneously started. Considering the extensive nature of the abscess and favorable initial response to the antibiotic therapy, surgical treatments were suspended. The mild disturbance of consciousness had resolved and lower back pain gradually improved. Follow-up MRI revealed resolution of the spinal epidural and intracranial fluid collection adjacent to the brainstem and hydrocephalus. Blood cultures became negative. When the spinal and intracranial epidural abscesses had almost disappeared and the residual abscess around the lumbar spine was markedly reduced, intravenous antibiotic therapy was switched to the oral administration of sulfamethoxazole and trimethoprim. She made an almost full recovery. Abnormal neurological deficits and sequelae were not observed. Nine weeks after admission, she was discharged to another facility. After four months of rehabilitation, she was free from back pain, and was able to ambulate independently.

2. Discussion

The mainstay of management for SEA is surgical decompression and abscess drainage in combination with antibiotic therapy [1]. Some

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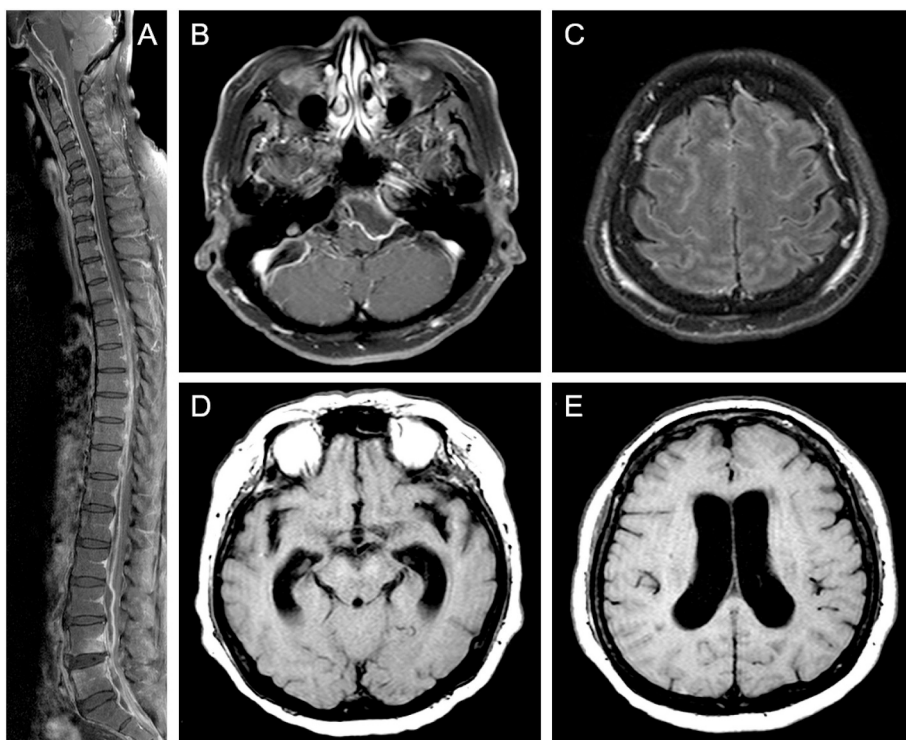


Fig. 1. The extensive epidural abscess from the brainstem to lumbar spine level.

(A) Sagittal T1-weighted MRI of the whole spine with gadolinium contrast demonstrating the extensive epidural abscess anterior to the spinal cord. (B-E) Axial T1-weighted MRI with gadolinium contrast showing intracranial epidural and subdural abscess anterior to the medulla oblongata and right cerebellar hemisphere (B). Axial fluid-attenuated inversion recovery (FLAIR) MRI with gadolinium contrast showing enhanced leptomeninges (C) and Axial T1-weighted MRI showing hydrocephalus (D and E).

factors, however, favor non-surgical treatment: minimal neurological deficit as well as cases with paraplegia present for over 48 h or underlying medical conditions precluding surgery [1]. In cases of extensive SEA including our case, physicians may hesitate to choose surgical decompression via multilevel laminectomies for already compromised patients. This is because of the high risk of postoperative complications including spinal instability. Taken these conditions into account, some reports of cases with extensive SEA proposed less invasive surgical techniques [2]. On the other hand, there have been a few cases successfully treated with conservative antibiotic therapy alone [3] [4] [5]. To the best of our knowledge, this is the first reported case of extensive SEA successfully treated with antibiotic therapy involving the combination of ceftriaxone, linezolid, and rifampin.

Linezolid is an antibiotic with favorable activity against Gram-positive bacteria including MSSA and methicillin-resistant *Staphylococcus aureus* (MRSA), showing excellent penetration into the CSF [6]. There are a number of reports on the use of linezolid and rifampin for the successful treatment of central nervous system infections caused by MRSA or multi-resistant MSSA [7] [8]. Moreover, the *in vitro* evaluation of time-kill curves and *in vivo* model studies reported that the combination of linezolid and rifampin led to higher-level activity against *Staphylococcus aureus* [9]. Based on those limited clinical experiences and experimental studies, the practice guidelines for the management of meningitis or brain abscess due to MRSA recommend rifampin or linezolid or their combination as an alternative [10]. Considering those reports, the addition of linezolid and rifampin to a conventional antibiotic strategy can be expected to enhance antibiotic activity also in the treatment of extensive SEA. Although there have been no clinical studies on the treatment of SEA with the use of linezolid or rifampin, our case report provides supportive evidence that this combination antibiotic strategy may serve as an alternative treatment for SEA in cases for which available treatment options are limited.

In conclusion, we reported a case of extensive SEA successfully treated with an antibiotic strategy involving the combination of ceftriaxone, linezolid, and rifampin, which has been proposed for meningitis and brain abscess caused by *Staphylococcus aureus*. Further clinical studies are needed to clarify the contributions of linezolid and

rifampin to SEA treatment.

Author contributions

KS, RF, SO, TK and TM were involved in the clinical management. KS and TK wrote the draft of the manuscript. All authors contributed to the critical review and approval of the final draft.

Conflict of interest

The authors declare no conflict of interest.

Consent for publication

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

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Kozo Saito*, Ryosuke Fukazawa, Shiori Ogura, Takashi Kasai,
Toshiki Mizuno
Department of Neurology, Graduate School of Medical Science, Kyoto
Prefectural University of Medicine, 465, Kajii-chou, Kawaramachi Hirokoji,
Kamigyo-ku, Kyoto 602-0841, Japan
E-mail address: saitok@koto.kpu-m.ac.jp (K. Saito).

* Corresponding author.