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Case report

Spontaneous spinal epidural abscess in an adolescent patient: A case report and literature review

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ABSTRACT

Introduction: Spinal epidural abscess (SEA), particularly the spontaneous variant, is a severe and rare condition often associated with vertebral osteomyelitis, hematogenous infections, and spinal interventions, leading to severe neurological damage and disabilities. Although more common in adults, spontaneous SEA (SSEA) in adolescents is extremely rare but represents a significant risk, as presented here.

Presentation of case: A 16-year-old boy presented with progressive back pain, uncontrolled fever, and paresthesia in the right lower extremity. Despite the absence of common risk factors, SEA was diagnosed at the L4–L5 level. Laboratory results revealed leukocytosis and elevated levels of inflammatory markers. Magnetic resonance imaging (MRI) confirmed the diagnosis of SEA, and surgery revealed Group A Streptococcus in the abscess. The patient showed significant improvement after laminectomy and a six-week course of intravenous cefazolin.

Discussion: SSEA often presents with nonspecific symptoms, leading to delayed diagnosis and treatment. The gold standard for diagnosis is MRI, and typical treatment involves antibiotic administration and surgical decompression. The importance of maintaining a high index of suspicion for SEA in adolescent patients presenting with back pain and fever, even in the absence of common risk factors or sources, is highlighted.

Conclusion: We report the infrequent manifestation of SEA in an adolescent patient, and the difficulties in the diagnosis and treatment thereof. Despite these common risk factors, SEA should be considered as a differential diagnosis in adolescents with back pain and uncontrolled fever. Prompt diagnosis, early surgical intervention, and appropriate antimicrobial therapy are vital to improve patient outcomes and prognosis.

1. Introduction

Spinal epidural abscess (SEA) is a serious medical condition that often results from vertebral osteomyelitis, hematogenous infections, or spinal intervention [1,2]. Although typically more prevalent in adults, an increase in the occurrence of SEA has been observed in the adolescent population. Despite its rarity, SEA can lead to severe disability and even death if not promptly detected and treated [1]. This increase may be related to aging, immunosuppression, intravenous drug abuse, or spinal interventions (Fig. 1).

A spontaneous SEA (SSEA) is a rare type that can result in severe neurological damage and is particularly hazardous in children [2–4]. SSEA occurs when bacteria enter the epidural space, usually through blood-borne infection, and create a pus-filled mass between the vertebral periosteum and the dura mater. The most common pathogen is *Staphylococcus aureus*, followed by the Streptococcus species. SSEA can involve any part of the spine, but is more frequent in the thoracic and lumbar regions [5–7]. SSEA, defined as an SEA without identifiable predisposing factors, is extremely rare in children and adolescents, with only a few cases reported in the literature. Therefore, we present a case of SSEA in an adolescent to assist physicians in the future identification and successful diagnosis of this rare condition. This case was written according to the SCARE 2020 Standards [8].

2. Presentation of case

A 16-year-old boy presented to our emergency department with a week-long history of progressive lower back pain, uncontrolled fever, and malaise. His medical history was unremarkable with no recent reports of trauma, infection, intravenous drug use, animal bites, or dental or spinal procedures. The patient had developed numbness in his right lower limb without any neurological motor weakness, and had not taken

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any medication other than NSAIDs.

Upon physical examination, the patient had a temperature of 38.2 °C, heart rate of 112 bpm, and blood pressure of 140/90 mmHg. He presented with tenderness over the lower lumbar spine, reduced range of motion, and paraspinal muscle spasms. He had normal strength but decreased sensation in his right lower extremity with absent ankle reflexes, and no signs of meningeal irritation or cauda equina syndrome (Fig. 2).

Laboratory tests showed leukocytosis (white blood cell count of 12.9 × 10 [9]/L), elevated C-reactive protein (CRP) (214 mg/L), and elevated erythrocyte sedimentation rate (ESR) (129 mm/h). Blood cultures were obtained, and empiric intravenous antibiotics were administered.

The patient was admitted to hospital with a diagnosis of an epidural abscess with right facet arthritis. Magnetic resonance imaging (MRI) revealed an epidural abscess at the L4–L5 level, compressing the nerve roots and dura. The abscess appeared hypointense on T1-weighted images and hyperintense on T2-weighted images, with peripheral enhancement after contrast administration. There was no evidence of vertebral osteomyelitis or discitis. Blood culture results were negative for bacteria and fungi. The patient underwent urgent laminectomy and abscess drainage, which yielded Group A streptococci in the intraoperative pus (Fig. 3).

We treated the patient with intravenous cefazolin for 6 weeks after surgery. He showed significant improvement in the signs of infection, such as fever and neuropathic pain in the right lower extremity, and was discharged to a local rehabilitation clinic. After three consecutive CRP levels normalized, the patient was discharged. At the six-month follow-up, the patient had regained normal sensation and motor strength without back pain or signs of infection.

3. Discussion

The variable and nonspecific presentation of SSEA, as exemplified in this case, often leads to delays in diagnosis and treatment. Although back pain is a common initial symptom, the absence of distinct neurological symptoms at presentation can result in a misdiagnosis, further complicating the treatment course [4,9]. The classic triad of symptoms includes fever, back pain, and neurological deficits in approximately half of cases [10]. Inaccurate diagnoses are prevalent, particularly in patients with an intact neurological status upon admission. Patients with less unusual causes of back pain are frequently misdiagnosed when they do not have fever, high inflammatory markers, or leukocytosis [4]. Therefore, it is necessary to have a heightened level of suspicion, particularly in individuals with risk factors such as diabetes mellitus, weakened immune systems, use of intravenous drugs, or recent spinal procedures [11].

SEAs are rare, particularly in adolescents. This case highlights the importance of considering SEA as a potential diagnostic tool in adolescents with spinal symptoms and uncontrolled fever. The etiology of the SEA in the present case remains unclear. Although hematogenous spread is a common cause, particularly in adults, it is less frequently reported in adolescents. Further possible origins, such as fundamental spinal osteomyelitis or previous contagion, were not apparent in the medical background of our patient [12,13]. The absence of predisposing risk factors, such as intravenous drug use or recent spinal procedures, further contributes to the rarity of this case.

MRI is the standard to diagnose SSEA because it can show the location, extent, and characteristics of the abscess, as well as the degree of spinal cord compression and inflammation [14]. The best method for definitive diagnosis of SEA is gadolinium-enhanced MRI, which has a sensitivity and specificity of >90% [4].

Treatment of SSEA consists of prompt administration of antibiotics and surgical decompression, with or without drainage of the abscess [15]. Urgent surgical decompression was performed to relieve the symptoms of nerve root compression, and we collected pus samples during surgery to identify the causative organisms and to administer appropriate antibiotics. The cultures confirmed *Staphylococcus aureus* infection, and the initiation of intravenous antibiotics was appropriate.

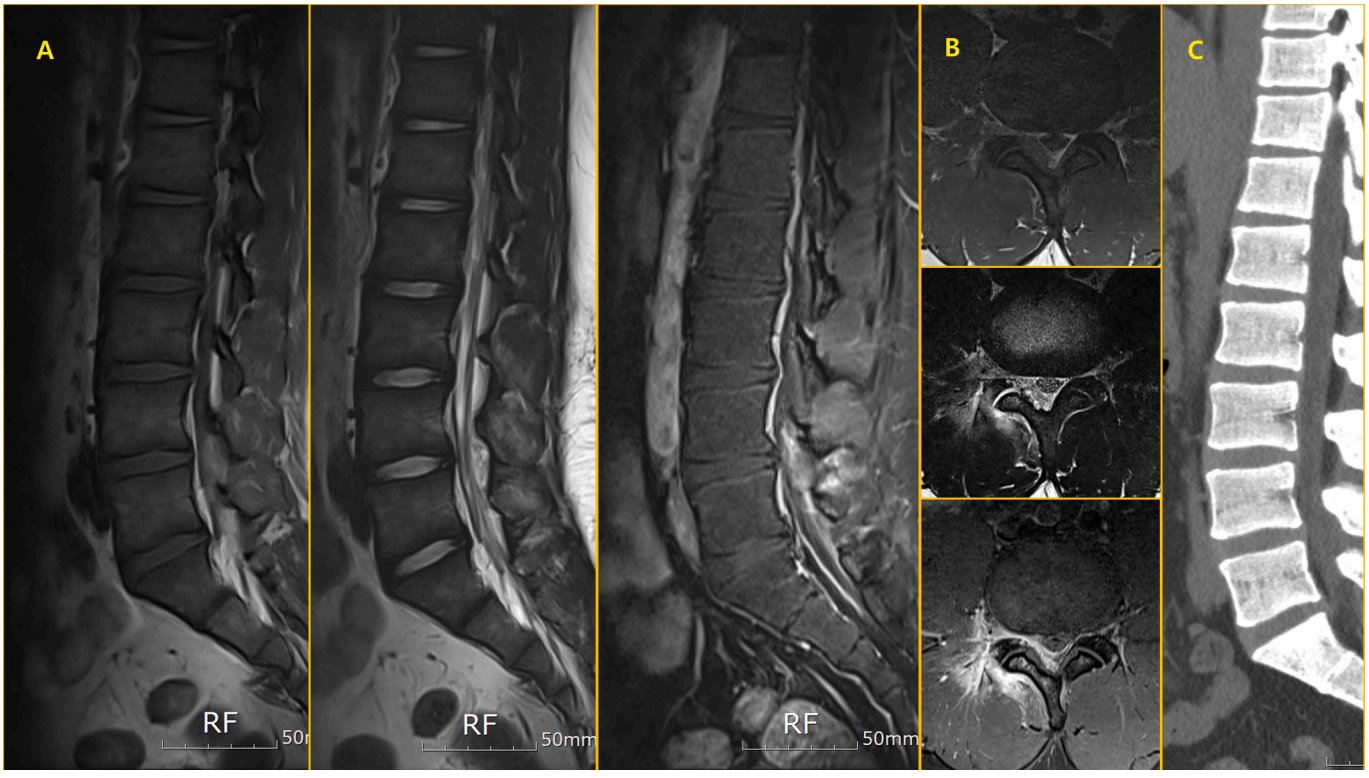

Fig. 1. A. T1-weighted image of MRI showing low signal mass; T2-weighted image, heterogeneous; and enhanced image, partially enhanced. B. Abscess lesion under the right lamina and facet joint inflammation. C. There is no lytic lesion in the vertebral bony area and no calcification in the inflammation area.

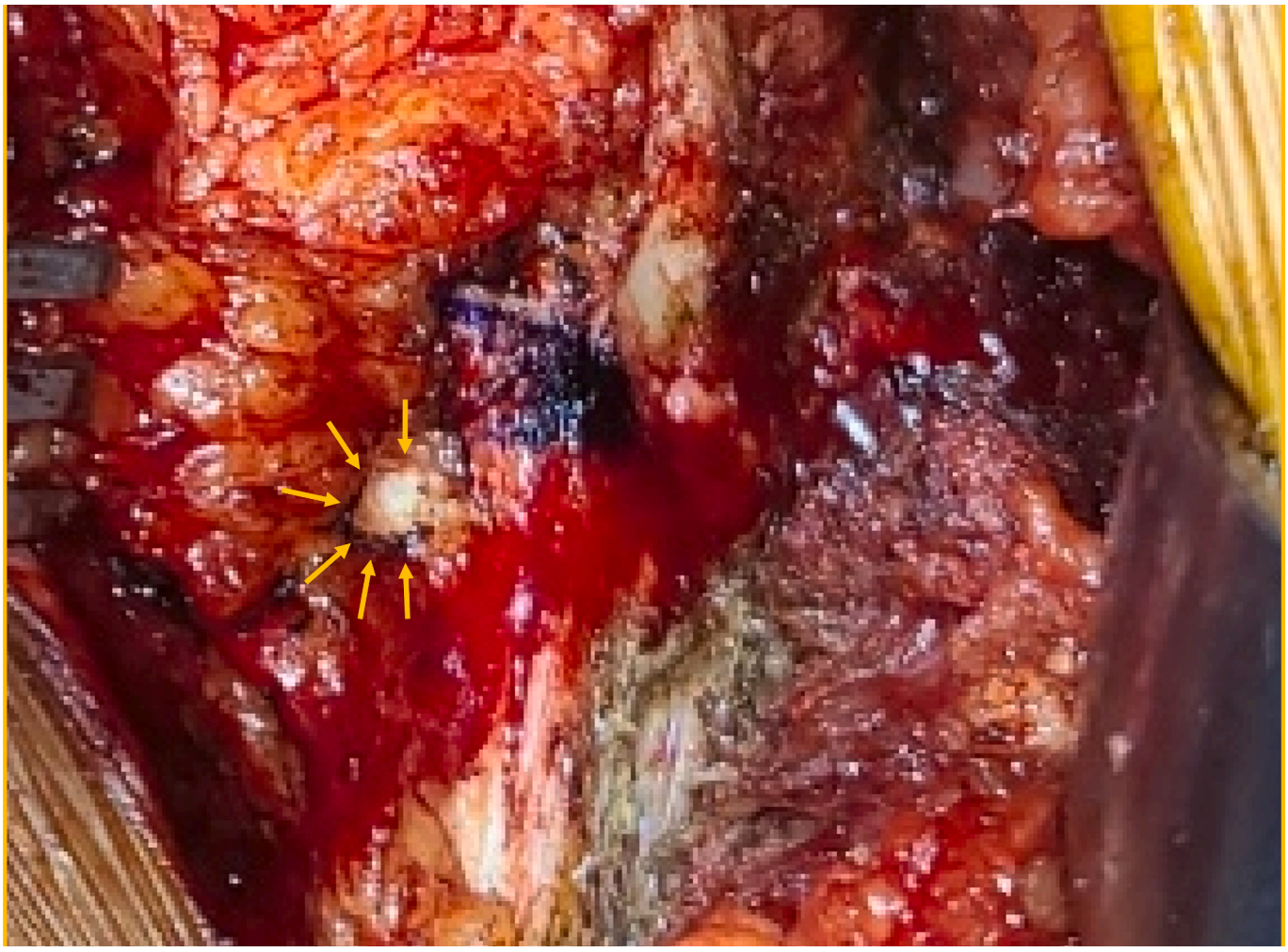

Fig. 2. After laminectomy, a yellowish and relatively curdled appearance of pus is observed on the dorsal side of the dura mater. Culture revealed methicillin-sensitive *Staphylococcus aureus*.

Therefore, antibiotic choice depends on the suspected or confirmed pathogen, but empirical treatment should cover both gram-positive and gram-negative organisms [16]. Surgical intervention is indicated in patients with neurological impairment, spinal instability, failure of medical therapy, and large or multilevel abscesses [17]. However, the reason for surgical treatment in this patient was that SEA in adolescents is likely to have a poor prognosis, progressive neurology with paresthesia was observed, and the uncontrolled fever required identification of the causative agent. The prognosis of SSEA depends on several factors, such as the duration of symptoms, level and severity of neurological involvement, presence of comorbidities, and timeliness and adequacy of treatment [18]. Early diagnosis and treatment are essential to prevent irreversible neurological damage and improve functional outcomes [19,20]. Due to the rarity of SEA in adolescents, limited literature is available to guide management strategies. Most published reports have focused on SEA in adults and treatment guidelines are primarily extrapolated from these studies. A large number of meta-analyses are needed to understand the unique characteristics of SEA in the adolescent population and develop optimal diagnostic and therapeutic approaches.

4. Conclusion

We present a rare case of SEA in an adolescent, underscoring the diagnostic challenges inherent in this population owing to the rarity of the condition. This emphasizes the need for physicians to maintain high suspicion of SEA in adolescents with spinal symptoms, even in the absence of common risk factors.

Ethical approval

This case study was approved by the Institutional Review Board of Sanggye Paik Hospital (SGPAIK 2023-05-011). The approved date is June 2, 2023.

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Author contribution

Dong-Ju Lim, M.D. Ph.D.: conceptualization, investigation, data curation, writing, investigation, editing, and reviewing.
Hoon Jo: data curation, investigation.

Guarantor

Dong-Ju, Lim

Registration of Research Studies

1. Name of the registry: the Research Registry

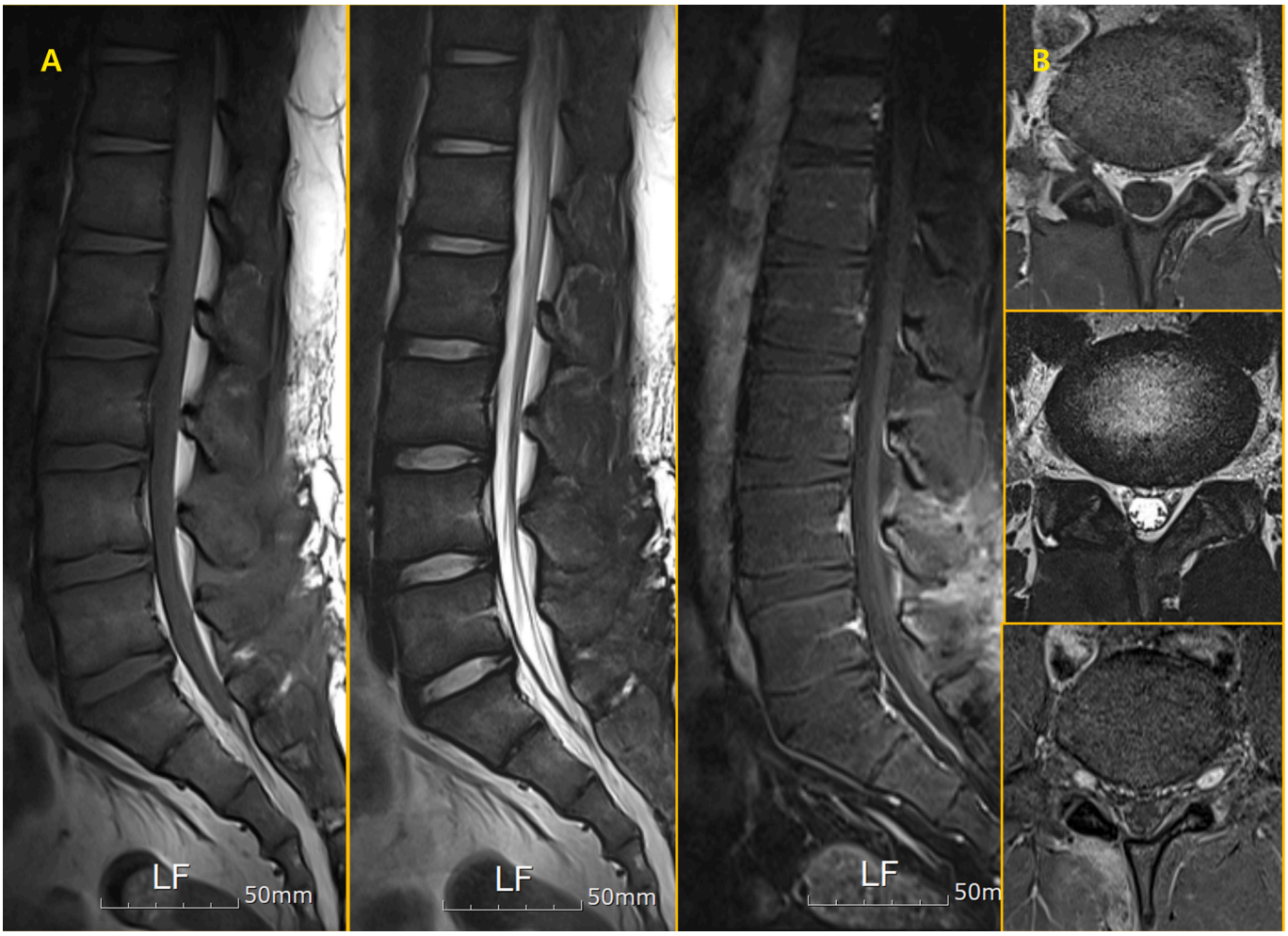

Fig. 3. A. Follow-up MRI performed six months after surgery showing no residual abscess on T1, T2, and contrast-enhanced images. B. The right-sided laminectomy site is visible.

2. Unique identifying number or registration ID: Researchregistry9130
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): Remove the link for anonymity purposes

Consent

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

Conflict of interest statement

The authors have no conflict of interests to declare.

References

[1] R. Houston, C. Gagliardo, S. Vassallo, P.J. Wynne, C.A. Mazzola, Spinal epidural abscess in children: case report and review of the literature, World Neurosurg. 126 (2019) 453–460, https://doi.org/10.1016/j.wneu.2019.01.294.
[2] B. Kitov, I. Kehayov, A. Davarski, R. Stoyanova, Outcome of surgical treatment of spontaneous spinal epidural abscesses for a 10-year period, Folia Med. (Plovdiv) 62 (2020) 482–489, https://doi.org/10.3897/folmed.62.e49902.
[3] A. Fotaki, M. Anatoliotaki, I. Tritou, A. Tzagaraki, M. Kampitaki, G. Vlachaki, Review and case report demonstrate that spontaneous spinal epidural abscesses are rare but dangerous in childhood, Acta Paediatr. 108 (2019) 28–36, https://doi.org/10.1111/apa.14579.
[4] J.H. Schwab, A.A. Shah, Spinal epidural abscess: diagnosis, management, and outcomes, J. Am. Acad. Orthop. Surg. 28 (2020) e929–e938, https://doi.org/10.5435/JAAOS-D-19-00685.
[5] R.O. Darouiche, Spinal epidural abscess, N. Engl. J. Med. 355 (2006) 2012–2020, https://doi.org/10.1056/NEJMra055111.
[6] D.P. Davis, R.M. Wold, R.J. Patel, A.J. Tran, R.N. Tokhi, T.C. Chan, et al., The clinical presentation and impact of diagnostic delays on emergency department patients with spinal epidural abscess, J. Emerg. Med. 26 (2004) 285–291, https://doi.org/10.1016/j.jemermed.2003.11.013.
[7] D. Rigamonti, L. Liem, P. Sampath, N. Knoller, Y. Namaguchi, D.L. Schreibman, et al., Spinal epidural abscess: contemporary trends in etiology, evaluation, and management, Surg. Neurol. 52 (1999) 189–196, discussion 97, https://doi.org/10.1016/S0090-3019(99)00055-5. discussion 97.
[8] R.A. Agha, T. Franchi, C. Sohrabi, G. Mathew, A. Kerwan, SCARE Group, The SCARE 2020 guideline: updating consensus surgical CAse REport (SCARE) guidelines, Int. J. Surg. 84 (2020) 226–230, https://doi.org/10.1016/j.ijsu.2020.10.034.
[9] P. Sendi, T. Bregenzer, W. Zimmerli, Spinal epidural abscess in clinical practice, Qjm 101 (2008) 1–12, https://doi.org/10.1093/qjmed/hcm100.
[10] E. Reihsaus, H. Waldbaur, W. Seeling, Spinal epidural abscess: a meta-analysis of 915 patients, Neurosurg. Rev. 23 (2000) 175–204, discussion 5, https://doi.org/10.1007/pl00011954. discussion 5.
[11] A.S. Baker, R.G. Ojemann, M.N. Swartz, E.P. Richardson Jr., Spinal epidural abscess, N. Engl. J. Med. 293 (1975) 463–468, https://doi.org/10.1056/nejm197509042931001.
[12] D.C. Kolinsky, S.Y. Liang, Musculoskeletal infections in the emergency department, Emerg. Med. Clin. North Am. 36 (2018) 751–766, https://doi.org/10.1016/j.emc.2018.06.006.
[13] M.J. Sullivan, G.C. Ulett, Evaluation of hematogenous spread and ascending infection in the pathogenesis of acute pyelonephritis due to group B streptococcus in mice, Microb. Pathog. 138 (2020), 103796, https://doi.org/10.1016/j.micpath.2019.103796.

[14] M. Soehle, T. Wallenfang, Spinal epidural abscesses: clinical manifestations, prognostic factors, and outcomes, Neurosurgery 51 (2002) 79–85, discussion 6–7, https://doi.org/10.1097/00006123-200207000-00013. discussion 6–7.
[15] W.C. Chen, J.L. Wang, J.T. Wang, Y.C. Chen, S.C. Chang, Spinal epidural abscess due to Staphylococcus aureus: clinical manifestations and outcomes, J. Microbiol. Immunol. Infect. 41 (2008) 215–221.
[16] M.L. Hlavin, H.J. Kaminski, J.S. Ross, E. Ganz, Spinal epidural abscess: a ten-year perspective, Neurosurgery 27 (1990) 177–184.
[17] W.T. Curry Jr., B.L. Hoh, S. Amin-Hanjani, E.N. Eskandar, Spinal epidural abscess: clinical presentation, management, and outcome, Surg. Neurol. 63 (2005) 364–371, discussion 71, https://doi.org/10.1016/j.surneu.2004.08.081. discussion 71.
[18] H.J. Tang, H.J. Lin, Y.C. Liu, C.M. Li, Spinal epidural abscess—experience with 46 patients and evaluation of prognostic factors, J. Inf. Secur. 45 (2002) 76–81, https://doi.org/10.1053/jinf.2002.1013.
[19] O. Adogwa, I.O. Karikari, K.R. Carr, M. Krucoff, D. Ajay, P. Fatemi, et al., Spontaneous spinal epidural abscess in patients 50 years of age and older: a 15-year institutional perspective and review of the literature: clinical article, J. Neurosurg. Spine 20 (2014) 344–349, https://doi.org/10.3171/2013.11.Spine13527.
[20] C.N. de Leeuw, P.R. Fann, J.E. Tanenbaum, A.L. Buchholz, B.A. Freedman, M. P. Steinmetz, et al., Lumbar epidural abscesses: a systematic review, Glob. Spine J. 8 (Suppl) (2018) 85s–95s, https://doi.org/10.1177/2192568218763323.