BF-1846
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RESEARCH ARTICLE Indian Journal of Animal Research

Spinal Epidural Empyema in a Male Cat

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ABSTRACT

Background: A 6-year-old, male neutered, domestic short hair cat presented to the hospital with shifting leg lameness and gait abnormalities. There was a weak response to deep pain in the physical examination and no reaction to the sensory response test. The cat had a strong pain response during thoracolumbar palpation. It was confirmed that the substance was compressing the spinal cord at the thirteenth thoracic vertebrae and the first lumbar vertebrae and hyperintense changes were observed in the surrounding soft tissue.

Methods: Six months later, the patient presented to the hospital again due to severe lameness and back pain. Magnetic resonance imaging (MRI) showed that more than 70% of the substances that were compressing the spinal were the contents of an epidural abscess. The patient underwent decompression with hemilaminectomy and routine suturing.

Result: Nine days after surgery, there were no abnormalities in urination, defecation, or movement. This is a rare case of epidural empyema in a cat. The clinical symptoms, diagnosis and surgical intervention were described six months after the cat was diagnosed as having a spinal abscess.

Key words: Cat, Hemilaminectomy, lumbar spine, Spinal epidural empyema.

INTRODUCTION

Diseases of the thoracolumbar spine often result in varying degrees of neurological dysfunction in cats (Dhanalakshmi *et al.,* 2021). As the spinal cord injury worsens, it becomes increasingly difficult to use its limbs and the ability to feel pain sensations diminishes or disappears altogether (Sharma *et al*., 2013). Spinal epidural empyema (SEE) is a rare condition in dogs, cats and humans and is a characteristic manifestation of a neurological disease that causes spinal cord dysfunction due to the abscess compressing and causing inflammation of the spinal cord (Lavely *et al*., 2006; Maeta *et al*., 2010; Trebacz *et al*., 2013). Hematogenous spread or direct inoculation cause continuous infection of the adjacent tissues (Reihsaus *et al*., 2000). Clinical symptoms include lethargy, thoracolumbar pain, progressive neurological paresis, plegia, fever and urinary incontinence (Rapoport *et al*., 2016). Prior to the 1930s, SEE human cases were diagnosed through necropsy, as 81% of affected persons died and were considered to have neurological diseases (Lavely *et al*., 2006). SEE has rapid clinical manifestations and delays in diagnosis and treatment lead to permanent neurological dysfunction and high mortality rates (Guo and Lu, 2020). Prompt diagnosis and treatment, including systemic antibiotics, with or without surgical intervention, are important for determining the prognosis (Dewey *et al*., 1998; Lavely *et al*., 2006).

MATERIALS AND METHODS

History and case presentation

This study began in (2022) and was conducted over a period of six months at 'T' Animal Medical Center, located in Daejeon, South Korea. A 6-year-old male Korean short-haired cat presented with thoracolumbar pain. For six days before arriving to the hospital, he showed left hind limb lameness, including intermittent knuckling signs. He had a serious pain reaction when palpated around the thoracolumbar spine. Radiography showed that thoracic vertebrae 1 and 11 were fused and had formed extensive forms of spondylosis deformans. There was also a change in bone proliferation around and dorsal to the vertebral canal.

There was also a weak response to deep pain in the left hindlimb and no reaction during hopping and plating. Six milliliters of midazolam (0.85 mg/kg, Bukwang Midazolam Inj. Bukwang Pharm Corp., Korea) and 6 ml of propofol (8.5 mg/kg, Freepol-MCT, Daewon Pharm. Co., Korea) were used for anaesthesia induction. The patient was anesthetized with isoflurane using a respiratory anaesthetic machine that was used for magnetic resonance imaging (MRI) tests.

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How to cite this article: Lee, S.H., Seo, J., Seo, B.B. and Cho, J.H. (2024). Spinal Epidural Empyema in a Male Cat. Indian Journal of Animal Research. 1-5. doi: 10.18805/IJAR.BF-1846.

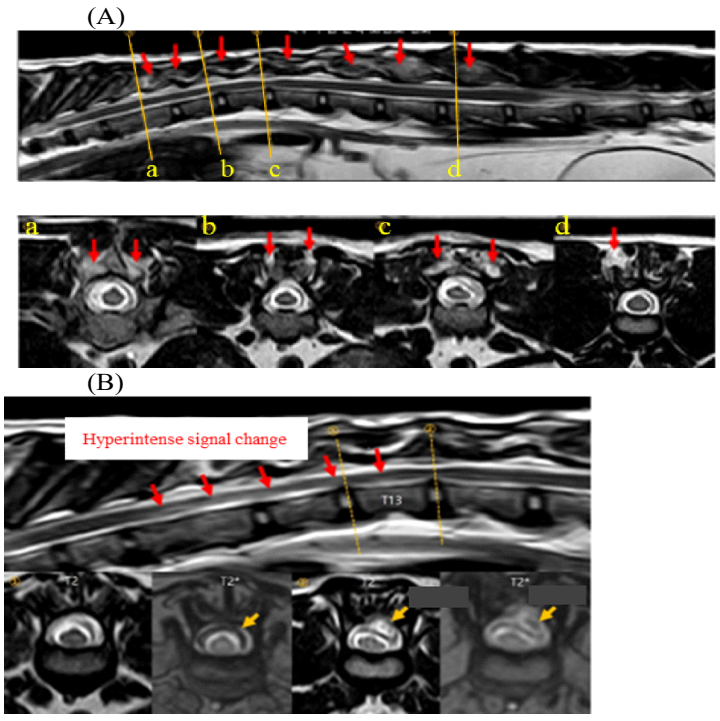
Submitted: 10-07-2024 **Accepted:** 23-09-2024 **Online:** 11-12-2024

RESULTS AND DISCUSSION

MRI and Radiographic finding

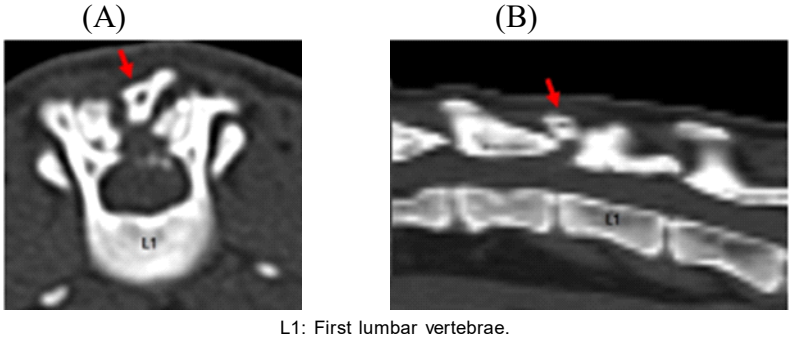
Using pre-contrast and post-contrast T2- and T1-weighted MRI images helps in distinguishing and identifying various tissues and lesions (AlZubi Ali Ahmad, 2023). The hyperintense signal change in the spinal cord parenchyma was confirmed at the tenth thoracic vertebra to the first lumbar vertebra and a substance suspected of being blood pressing against the spinal cord was observed in the epidural region (Fig 1).

In addition, the signal of the surrounding muscles around the spinous process increased from the caudal thoracic vertebrae to the lumbar vertebrae and the spinous process of the 1st lumbar vertebra was fractured (Fig 2). During the 3 days of hospitalization following the diagnosis, the patient was prescribed PDS (0.5 mg/kg, q12h Solondo Tab., YUHAN Co., Korea), gabapentin (10 mg/kg, q12h, Gabalep Cap., Chong Kun Dang Pharmaceutical Corp., Korea), streptokinase (0.05 T/kg, q12h, Verase Tab., Nelson, Korea) and misoprostol (5 μg/kg, q12h, Misoprostol



(A) Sagittal and transverse views. The cross section of letters a, b, c and d in the upper panel is shown in lower panels a, b, c and d. The changes in hyperintensity were confirmed around the muscles of the tenth thoracic spine to the fourth lumbar spine. (B) Sagittal T2-weighted images obtained at the level of T13. T2-weighted MRI sagittal image of the thoracic spine showing apparent hyperintense signal changes (red arrow). The transverse image at the level of T13. A dorsal lateral

Fig 1: MRI image of the lower thoracic and upper lumbar vertebrae of a six-year-old male short hair cat.



L1: First lumbar vertebrae.

Fig 2: The spinous process of the first lumbar vertebra was fractured and displaced forward (red arrow).

Tab., Nelson, Korea) and the clinical symptoms were gradually improved.

Six months later, the cat presented again with more severe back pain and bilateral hind limb lameness. There was a knuckling sign, but no sensory or reflex impairment of the hind limb. The patient had no sensory or motor nerve problems in the neck, face, forelimbs or tail. Complete blood count revealed a mild neutrophilia elevation (11.76*109/L; reference range, 2.3-10.29*10^9/L) and serum biochemical values were within the reference ranges (data not shown).

To confirm the lesion of the thoracolumbar spinal cord via MRI, anaesthesia was induced using midazolam and propofol to allow implantation of the tracheal tube and general anaesthesia was performed by respiratory anaesthesia using isoflurane at the same dose. In the present study, we found that an abscess and a hematoma were severely compressing the spinal cord in the epidural region of the 13th thoracic vertebra and the 1st lumbar vertebra (Fig 3).

Surgical intervention

Surgical decompression was conducted the day after the diagnosis was confirmed by MRI. The patient was placed in the left recumbent position and the skin was incised between the eighth thoracic and third lumbar vertebrae to allow entry into the thoracolumbar space and to ensure visibility of the surgical field. When the subcutaneous fat and muscle were separated, there were no noticeable abnormalities in the subcutaneous tissue or the paravertebral muscles. A left-sided hemilaminectomy was performed using an ultrasonic surgical device (Sonocure, Tokyo Iken Co., Japan) between the thirteenth thoracic vertebra and the first lumbar vertebra. After the spinal canal was opened, pus exuded from the epidural space (Fig 4A) and a large amount of friable tissue that was compressed by the spinal cord was removed (Fig 4B). It was identified as spinal epidural empyema and the spinal cord appeared to be mostly normal. The area of the lesion was flushed with a large amount of sterile saline solution. The incised subcutaneous tissue and skin were routinely sutured (Fig 4C).

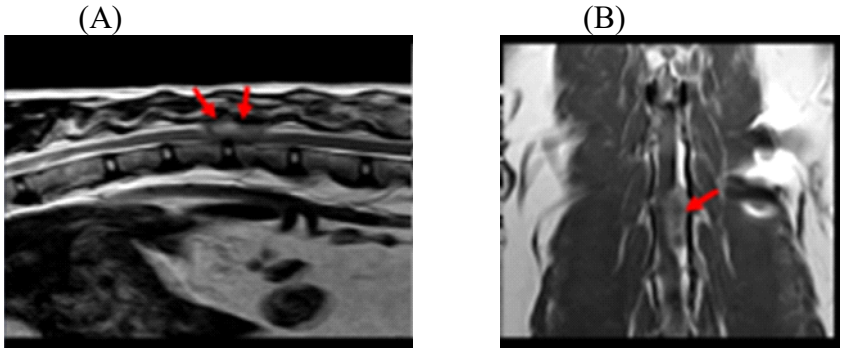
Postoperative management

The abscess that was recovered from the epidural space was subjected to aero/anaerobic bacteria identification and an antibiotic susceptibility test. During hospitalization, the patient was given oral gabapentin (10 mg/kg, q12h) and intravenous injections of cefazolin (25 mg/kg, q12h, IV, cefazolin inj., Chong Kun Dang Pharmaceutical Corp., Korea) and famotidine (0.5 mg/kg, q12h, IV, Gaster, Donga ST, Korea) into the vein, twice a day for five days.

Staphylococcus aureus was identified in the bacterial culture test. The results of the antibiotic susceptibility test revealed sensitivity to ampicillin, trimethoprim/sulfamethoxazole, amikacin, imipenem, amoxicillin/clavulanic acid, cefazolin, ampicillin/sulbactam and enrofloxacin, except for ampicillin. Based on the sensitivity results, antibiotics were empirically replaced with cefixime (10 mg/kg, q12h, Cefixime cap., Nelson, Korea). Additional drugs, including famotidine (0.5 mg/kg, q12h, PO famotidine, Hanmi Pharm, Korea), metronidazole (10 mg/kg, q12h, PO, Flasinyl Tab., HK Inno. N Corp.), gabapentin (10 mg/kg, PO, q12h) and streptokinase (0.05 T/kg, PO, q12h), were given twice a day for seven days.

After surgery, the patient's walking ability and condition were check intermittently. The patient's appetite was good on the day after surgery and a knuckling sign in the left hind limb was observed intermittently on the third day after surgery. The patient could walk independently enough to bear weight on both hind limbs. On the eighth day after the surgery, MRI was performed under the same anaesthesia scheme. All epidural suppurative lesions that were compressing the spinal cord disappeared (Fig 5A and B).

SEE is a serious neurological disease that is caused by the accumulation of suppurative substances outside the dura mater of the spinal canal. In another study, computed tomography confirmed the presence of an abscess in the epidural space of the cervical spine. The problem was caused by a scratch during surgery (Granger *et al*., 2007). In addition, there were cases in which bacteria invaded the epidural space due to the

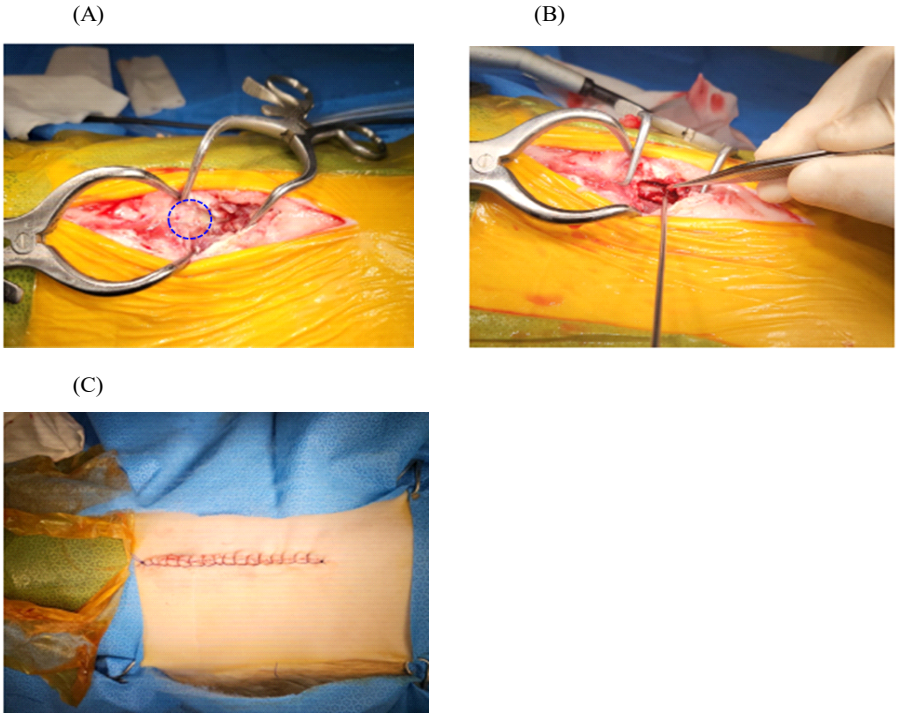


(A) Substances compressing the thoracolumbar vertebrae were observed at the thirteenth thoracic vertebra and the first lumbar vertebra (red arrows). (B) T1 weighted image, T2 hyperintense and T1 isointense were identified in the epidural space (red arrow).

Fig 3: Sagittal T2-weighted MRI image of the thoracolumbar vertebrae.

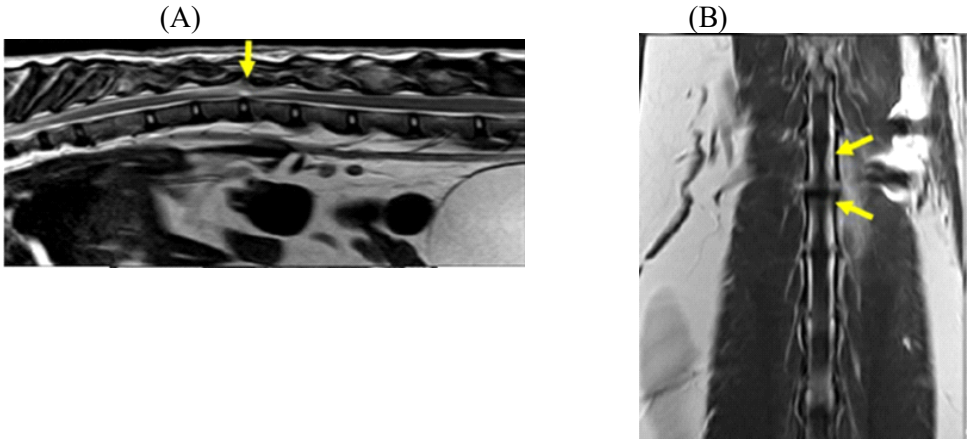
hematogenous spread of infection, contiguous infections involving the adjacent tissues, direct inoculation and migration of foreign bodies (Stefani *et al.* 2008; Trebacz *et al.* 2013; Monteiro *et al*. (2016); Woodruff *et al*. (2019); Guo and Lu, 2020).

In the present study, it was considered that purulent exudate was induced by a *Staphylococcus aureus* invasion of a spinous process fracture of the first lumbar vertebrae. In other cases of a spinal epidural abscess presenting concurrently with osteomyelitis, although *Staphylococcus aureus* was isolated from the resected soft tissue and was sensitive to fluoroquinolones and clindamycin, the infection was treated with oral enrofloxacin and oral clindamycin for 3 days (Rapoport *et al.,* 2016). In this study, *Staphylococcus aureus* was isolated only in the epidural space between the thirteenth thoracic vertebra and the first lumbar vertebra and there was no invasion outside the spinal cord. Although there were no changes in CBC indicating toxicity, neutrophilia



(A) Encapsulated pus (blue circle) was visualized after the spinal canal was opened. (B) The spinal cord was decompressed following left hemilaminectomy from T13 to L1 and the friable tissues were removed by gentle suction and Adson forceps. (C) Interlocking sutures were applied.

Fig 4: Intraoperative views.



(A) Left lateral view and (B) Dorsoventral view of the thoracolumbar vertebrae. After hemilaminectomy, the suppurative substances compressing the spinal cord completely disappeared (arrow).

Fig 5: MRI imaging after surgical resection.

leukocytosis was confirmed and there were no specific findings in the serum chemistry analysis. Antibiotics were administered based on the results of the sensitivity tests involving bacteria that were isolated from the aspiration of 3 of 5 dogs with an epidural abscess and a diagnosis of disc spondylitis, prostatitis and dermatitis. Two dogs received conventional primary care and were cured within 2 weeks without surgical treatment (Monteiro *et al*., 2016). However, in this case, since no other infectious diseases were found in the other area, microbiological tests were performed using the results of the antibiotic sensitivity tests that were administered during the surgical intervention and suppurative substances in the epidural space were treated by hemilaminectomy. On the third day after surgery, there was no problem in daily life.

SEE in cats can cause pressure atrophy of the vertebrae and serious neurological disorders, but even if treatment is not started early, the condition may not progress right away or have a poor prognosis (Miki *et al*., 2022). In this case, although PDS and gabapentin were prescribed at the first presentation to resolve the compression of the spinal cord and neuropathic pain, it was not fundamentally successful because antibiotics could not be taken for 6 months. At the time of presentation, the patient was found to have an intermittent knuckling sign, mild ataxia and decreased proprioceptive response in the left hindlimb. Six months after the first diagnosis and despite the clinical symptoms becoming more serious than before, surgical intervention and good adherence to an effective antibiotic regimen improved the prognosis.

CONCLUSION

In conclusion, SEE is rare in cats. Cats can feel pain due to compression of the spinal cord. If the patient reacts sensitively to stimuli around the spine and feels pain and the abnormal gait and proprioceptive responses are reduced or resolved, diagnosis using MRI rather than radiography or angiography is necessary. After surgical decompression, it is necessary to prescribe appropriate antibiotics after identifying the infectious bacteria causing the abscess and to perform antibiotic susceptibility testing. In this case, there was no problem of urinary or defecation incontinence after surgery and the patient returned to normal walking without knuckling.

ACKNOWLEDGEMENT

The research was supported by Convergence Research Group project (grant NO. CRC21021-300) of the National Research Council of Science and Technology, Republic of Korea.

Disclaimers

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Conflict of interest

All authors declared that there is no conflict of interest.

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