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Magnetic Resonance Imaging Diagnosis of Epidural Idiopathic Sterile Pyogranulomatous Inflammation in a Dog

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Abstract : An 8-year-old, shih-tzu female dog was referred due to neurological signs including paraparesis and back pain. On the complete blood count, hematologic analysis showed elevated leukocytosis. Serum biochemical analysis revealed elevated serum alkaline phosphatase concentration and C-reactive protein concentration. On the neurologic exam, the dog was suspected to have thoracolumbar myelopathy. On magnetic resonance imaging, there were masses within the spinal canal at L1-3 intervertebral disc space that were located dorsal to spinal cord. It was hyperintense on T1-, T2-weighted magnetic resonance images, Fluid-attenuated inversion recovery, and fat suppression images. The contrast-enhanced T1-weighted images showed no enhancement. The lesions were well circumscribed. The spinal cord was compressed and displaced ventrally by the mass. After removal of the masses via L1-L3 dorsal laminectomy, pyogranulomatous inflammation was confirmed by histopathological examination. Six months after surgery, the dog recovered uneventfully and remained fully ambulatory with no neurological deficits. This case demonstrates the utility of magnetic resonance imaging for the diagnosis of spinal canal pyogranulomatous inflammation.

Key words **:** pyogranulomatous inflammation, magnetic resonance image, spinal cord, dog.

Introduction

Epidural idiopathic sterile pyogranulomatous inflammation is inflammation of the panniculus adiposus (12). Idiopathic sterile pyogranuloma (ISP) is dermatologic disease occasionally seen in dogs (12). Recent studies have described epidural ISP in the spinal canal causing neurological deficits (1,7,9). Although the cause and pathogenesis of ISP remain unknown, absence of foreign material and microbial agents suggest an aberrant inflammatory histiocytic response (12). Epidural idiopathic sterile pyogranulomatous inflammation and infiltrative lipoma have similar features on CT and MR images, and both could be consistent with a fatty mass in the spinal canal (6). Complete removal of epidural ISP in the spinal canal leads to a good prognosis. In contrast, it is difficult to totally remove infiltrative lipoma, which results in a high rate of recurrence (7). ISP are also controlled mainly with systemic corticosteroid (13,14). Therefore, it is important to differentiate the two diseases for appropriate treatment strategy planning. The usefulness of MR imaging for the diagnosis of infiltrative lipomas has been reported; in contrast, only one report has described epidural ISP (6,7). Our purpose is to report the utility of MR imaging for diagnosis of pyogranulomatous inflammation in the spinal canal.

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Case

An eight-year-old female Maltese dog weighing 6.5 kg was referred to Gyeongsang National University Veterinary Medicine Teaching Hospital presenting with a 2-3 week history of back pain and pelvic limb paraparesis. On the neurologic exam, the dog showed upper motor neuron signs, hyperesthesia at T11-L2, and loss of conscious proprioceptive positioning reaction. There were no other remarkable general physical examination findings, palpation, mental status, cranial nerve examinations, motor function of thoracic limbs, perineal reflex, and panniculus reflex. The dog was suspected to have thoracolumbar myelopathy. Hematologic analysis showed elevated leukocytosis (19,700 cells/ml, normal range: 6,000-17,000 cells/ml). Serum biochemical analysis revealed elevated serum alkaline phosphatase concentration (3500 U/L) and C-reactive protein concentration (3.7 mg/dl, normal range: 0-1 mg/dl).

No abnormalities were detected on lateral and ventrodorsal thoracic and lumbar spinal radiographic examination. In 2—row helical CT images (Somatom Emotion®, SIEMENS Medical Systems, Erlangen, Germany), the spinal cord and vertebral bone had no abnormal signs. No signs of intervertebral disc displacement or intervertebral disc space narrowing were noted. On 0.4-Tesla MR images (APERTO 0.4, Hitachi Medical Co., Tokyo, Japan), a high signal intensity lesions were observed in T2-weighted, T1-weighted, Fluid-attenuated inversion recovery (FLAIR),and fat suppression images (Fig 1 and 2). The contrast-enhanced T1-weighted images showed no enhancement (Fig 1C and 2D). There were lesions within the spinal canal at L1-L3 intervertebral disc space that

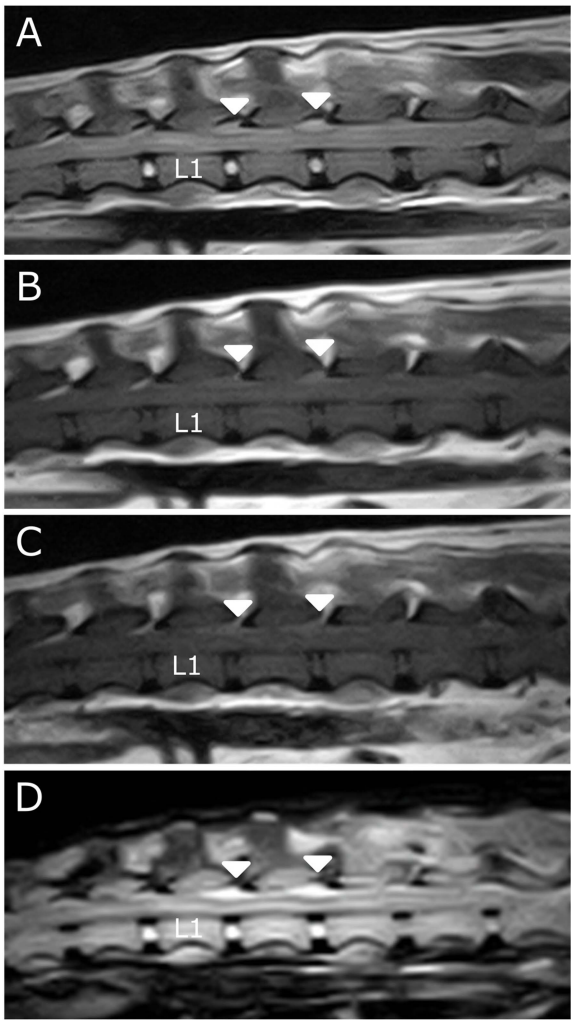

Fig 1. On sagittal magnetic resonance images, a high-signal lesion was detected in T2-weighted (A), T1-weighted (B), contrasted T1-weighted (C), and fat suppression (D) images. There were lesions within the spinal canal at L1-L3 intervertebral disc space that were located dorsally.

were located dorsally to the spinal cord and well circumscribed. The spinal cord was compressed and displaced ventrally by the mass. No abnormal findings were noted in the muscle adjacent to the L1-L3 vertebra. Cerebrospinal fluid analysis was not performed. Inflammatory disease including noninfectious or infectious fatty tissue, hemorrhage, hematoma, and neoplastic disease was suspected. Dorsal laminectomy was performed at L1-L3 and epidural inflammatory tissues with adhesion of the dura to the periosteum were identified. The lesion was red in color, soft and homogeneous in texture, continuous with normal epidural fat (Fig 3), adherent to dura, and was easy to remove from the spinal cord. All the degenerated tissues were excised. The histopathological diagnosis of mass removed at surgery was pyogranulomatous inflammation. Inflammatory cells, mainly macrophages and neutrophils infiltrated adipose tissue. Infectious pathogenic bacteria were not evident by histology. Six months after surgery, the dog recovered uneventfully and remained fully ambulatory with no neurological deficits.

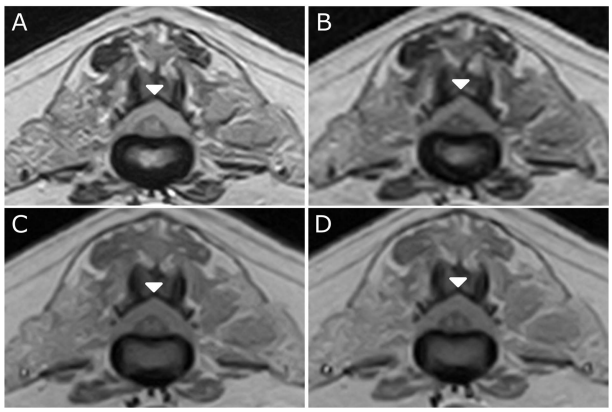

Fig 2. On transverse magnetic resonance images, there was a high-signal lesion (arrowhead) on T2-weighted (A), Fluid-attenuated inversion recovery (FLAIR) (B), T1-weighted (C), and contrasted T1-weighted (D) images. The lesion was well circumscribed. The spinal cord was compressed and displaced to the ventrally by the mass. No abnormal findings were noted in the muscle surrounding the L1-3 vertebra.

Discussion

In veterinary medicine, ISP of epidural fat causing spinal cord compression in dogs is rarely encountered. One study found that ISP of epidural fat caused spinal cord compression in Miniature Dachshunds, and all dogs experienced good neurologic outcome after decompressive surgery (1). Because Miniature Dachshunds are known to be predisposed to panniculitis (12), they may also be predisposed to sterile pyogranulomatous inflammation in any adipose tissue including epidural fat (1,14,16).

Although the cause and pathogenesis of ISP remain unknown, multifactors have been implicated in the etiology of sterile panniculitis including fungal and bacterial infections, foreign bodies, vasculopathy, nutritional deficiency, pancreatic disorders, and further physicochemical and immunological factors (2,11,12).

A recent study has described epidural idiopathic sterile pyogranulomatous inflammatory mass in the spinal canal on CT and MR images (7). CT or MR imaging could be useful to provide more detailed information about ISP of epidural fat. In this report, the adipose tissue was distinguishable by CT imaging, because of its unique quantification of X-ray resorption; fat tissue showed negative Hounsfield unit values. On MR images, there was a hyperintense mass within the spinal canal in both T2- and T1 weighted images (7). Differential diagnoses for an MR image like that in the study in which T2- and T1-weighted images showed hyperintense signals include hematoma, hemorrhage, and fatty tissue (1,4-6,10,15). Of these, a fat suppression image may be useful to distinguish the involvement of adipose tissue amongst other possible etiologies (3,7). In the present case, there was no a hypoattenuation lesion within the spinal canal on CT images. On MR images, there was a hyperintense mass within the spinal canal in fat suppression image. We suspected that pyogranulomatous inflammation includes an severely inflamed reaction within the lesion (7).

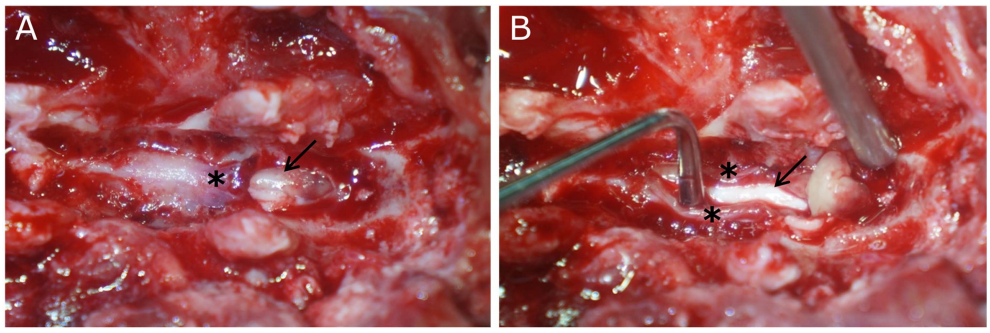

Fig 3. Intraoperative photographs. Extradural inflammatory mass of epidural fat compressing the spinal cord were noted (asterisks). The spinal cord itself appeared to be normal macroscopically (arrow).

The difference between epidural ISP and infiltrative lipomas may be the origin of the fatty tissue. The adipose tissue in infiltrative lipomas originally arises in the muscle and then infiltrates the spinal cavity, but pyogranulomatous inflammation is confined within the spinal canal (1,6). The thoroughly examination the fatty tissue, both CT and MR images are useful for distinct reasons. The CT and MR images can indicate the border between the fatty tissue and other soft tissue components (3,6,10). CT imaging is also useful to detect destruction of the vertebral body, which is a common feature of infiltrative liopomas (4). The important issue in the differential diagnosis of the two diseases is planning the surgical strategy (7). In previous case and in the present case, the dog recovered by removal of the pyogranulomatous inflammation (1).

In our case, C-reactive protein was consistently elevated when the dog showed signs of recurrence. In intervertebral disk herniation (IVDH), most of the cases did not exhibit elevated C-reactive protein concentration (8). The measurement of C-reactive protein may be useful in differentiating IVDH and estimating recurrence (9). Further studies would be needed to evaluate the availability of measurement of C-reactive protein.

Dogs with sterile pyogranulomatous inflammation have a good outcome by systemic corticosteroid (11,16). Cyclosporine may be also useful for treatment of idiopathic sterile pyogranulomatous inflammation for the long term (9). Allowing for the fact that the dog needed immunosuppressive drugs after surgical excision, it is possible that pyogranulomatous inflammation is a systemic disease.

In conclusion, this case demonstrates the utility of magnetic resonance imaging for the diagnosis of spinal canal pyogranulomatous inflammation of epidural fat causing spinal cord compression. Histopathological evaluation was required for diagnosis of ISP. Dogs with epidural ISP may have a good outcome by surgical decompression of the spinal cord. ISP of epidural fat can be considered to be a cause of lumbar myelopathy in dogs.

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