



# Surgical management of a lumbar far lateral intervertebral disc extrusion in a cat

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*Journal of Feline Medicine and Surgery Open Reports*  
1–5

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DOI: 10.1177/20551169241261577

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## Abstract

**Case summary** A 9-year-old male castrated domestic shorthair cat was presented with a 2-week history of acute, progressive left pelvic limb lameness. Gait evaluation revealed a grade 3/5 left pelvic limb lameness with no apparent orthopedic cause for the lameness based on orthopedic examination or radiographs. The neurological examination was otherwise normal. MRI revealed a left-sided L6–7 far lateral intervertebral disc extrusion with possible secondary neuritis of the L6 spinal nerve. A left-sided L6–7 foraminotomy was performed to remove the extruded disc material and provide additional space for the significantly enlarged nerve root. An L6–7 fenestration was also performed. The patient made an excellent recovery with near-complete resolution of lameness at 26 days postoperatively.

**Relevance and novel information** This case report contributes to the growing body of literature on lateral intervertebral disc extrusion as an etiological factor in pelvic limb lameness in cats, particularly when neurological deficits are absent. Furthermore, the case report highlights the diagnostic utility of cross-sectional advanced imaging for cats with lameness for which an orthopedic or radiographic cause cannot be identified. Finally, this case underscores the efficacy of surgical intervention as a treatment option for cats with lumbar far lateral intervertebral disc extrusions that do not improve with medical management alone. This finding could have implications for future surgical approaches in cats with similar findings.

**Keywords:** Foraminotomy; foraminal; intervertebral disc extrusion; lameness; surgery

**Accepted:** 24 May 2024

## Case description

A 9-year-old male castrated domestic shorthair cat was presented to the North Carolina (NC) State University Emergency Service for evaluation of persistent left pelvic limb lameness. Approximately 2 weeks before presentation, the patient developed acute left pelvic limb lameness and was prescribed gabapentin (7.5 mg/kg) and robenacoxib (0.9 mg/kg) (Onsior; Elanco) by the primary veterinarian. After 2 weeks of activity restriction and pain medications, the cat showed no obvious improvement, prompting re-evaluation at a local emergency department. Radiographs of the left pelvic limb and pelvis, which included the lumbosacral vertebral column, revealed mild narrowing of the L6–7 intervertebral space. In the ventrodorsal view, a small, mineralized structure was superimposed over the left intervertebral

foramen (Figure 1). The pelvis, left pelvic limb and associated soft tissue structures were otherwise unremarkable. The patient was then referred to the NC State University Emergency Service and transferred to the Neurology Service for further work-up.

On presentation to NC State University, the cat had a moderate left pelvic limb lameness with no apparent ataxia and no significant gait deficits appreciated in the

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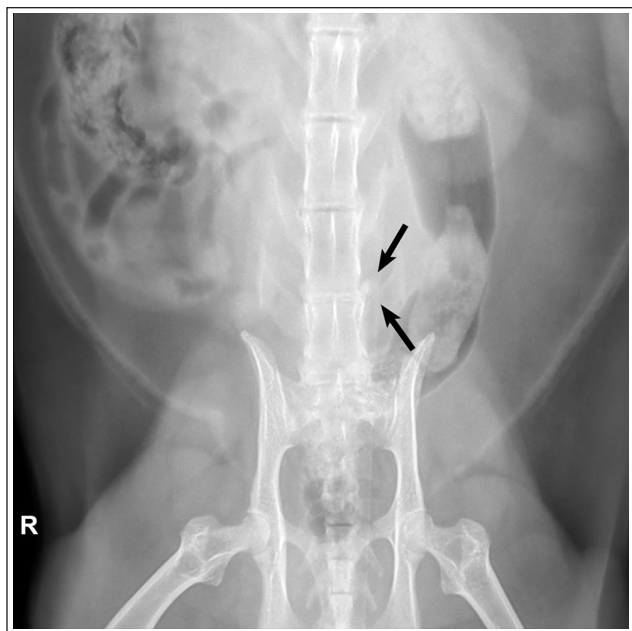
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**Figure 1** Ventrordorsal radiograph of the pelvis and lumbosacral spine revealing a narrowed L6–7 intervertebral disc space and a mineralized disc (black arrows) that has extruded laterally into the left intervertebral foramen

right pelvic limb (see Video 1 in the supplementary material). Postural reaction testing was normal in both pelvic limbs. There was normal tone in the left hindlimb with no appreciable muscle atrophy. No spinal reflex deficits were appreciated. The remainder of the neurological examination was unremarkable. The cat weighed 6.8 kg and had a body condition score of 7/9. The cat's general physical examination was otherwise unremarkable. A neurological disease affecting the left L4–S1 spinal nerve roots or nerves causing a root signature was considered most likely, although an orthopedic cause of the lameness was not entirely excluded. Bloodwork (hematology and chemistry panel) revealed no significant abnormalities. A urinalysis revealed 1+ protein with an otherwise quiet sediment. The cat tested negative for feline leukemia virus and feline immunodeficiency virus. A consultation with the orthopedic surgery department revealed a grade 3/5 left pelvic limb lameness with mild discomfort elicited on extension of the left coxofemoral joint. Based on the normal radiographs of the left pelvic limb, the orthopedic surgery service recommended a work-up for the neurological cause of the lameness.

The cat underwent MRI using a 3-T scanner (Siemens) under general anesthesia and positioned in dorsal recumbency. The L6–7 disc was hypointense on T2. Across the left intervertebral foramen of L6–L7, there was a T2- and T1- hypointense rounded structure measuring approximately 4 × 6 mm, which appeared to be located at the exit of the intervertebral foramen (Figure 2). There was a hyperintense signal around the intervertebral foramen in

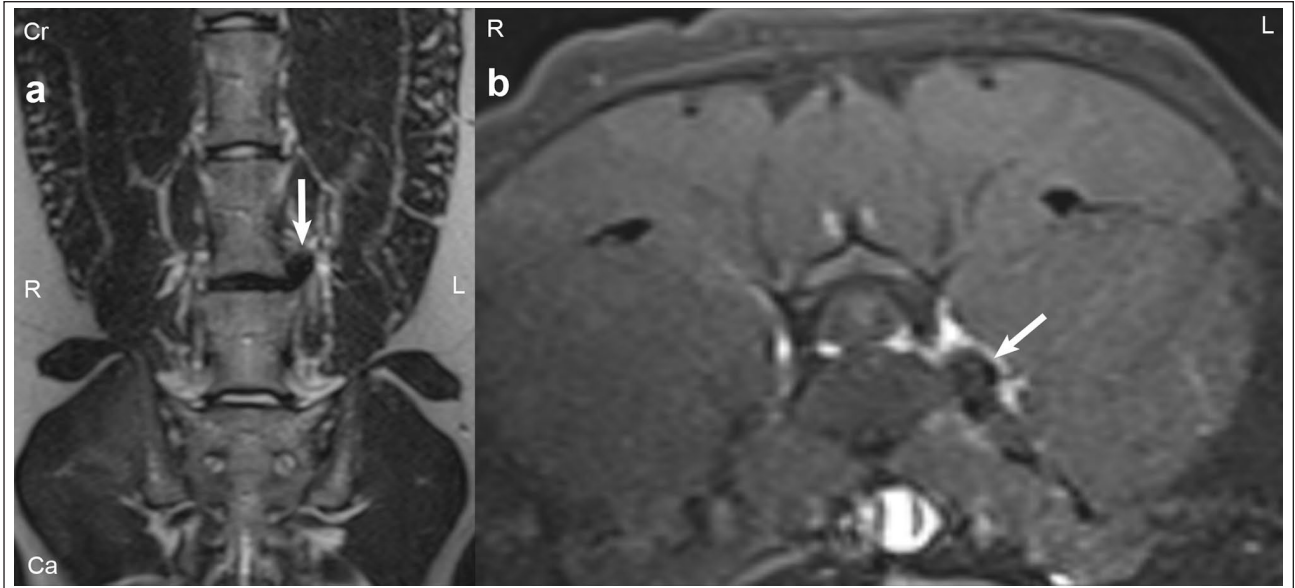
the dorsal short tau inversion recovery (STIR) images. In post-contrast images, this structure was peripherally contrast-enhancing and the left L6 spinal nerve was also contrast-enhancing. Therefore, the cat was diagnosed with a left-sided L6–7 far lateral disc extrusion surrounded by focal inflammation and edema with possible secondary neuritis of the L6 spinal nerve.

Treatment options were discussed with the owner, including continuing with medical management or surgery to address the nerve compression. Because of the lack of response to medical management over the course of 2 weeks, the owner elected to pursue surgery. The next morning, the patient was taken to surgery for a left-sided L6–7 foraminotomy. A dorsal approach was made to the spinous processes. The left epaxial muscles were reflected away from the spinal column exposing vertebrae L5–S1. The epaxial musculature around the intervertebral foramen at L6–7 was reflected, revealing a large amount of encapsulated disc material lateral to the foramen, just ventral to the articular facet (Figure 3). The disc material could have been retrieved without performing a foraminotomy; however, a foraminotomy was performed using a Surgairtome (Hall/Linvatec) to visualize the capsule fully and to provide additional space for the inflamed L6 spinal nerve. The capsule was sharply incised with a #11 blade. A large amount of mineralized disc material was visualized (Figure 4). The disc material was gently removed with a nerve root retractor, thereby exposing the L6 spinal nerve, which was grossly enlarged (Figure 5). Disc fenestration was performed at L6–7 by incising the disc space with a #11 blade and the material was removed using a small Buck ear curette. The surgical site was thoroughly flushed and the foraminotomy site was covered with gelfoam. The patient recovered from general anesthesia uneventfully.

The next morning, the patient's gait was static with no significant changes in the left pelvic limb lameness. The cat's postoperative neurological examination remained unremarkable. The cat was hospitalized on intravenous (IV) fluids and methadone (0.15 mg/kg), as well as oral gabapentin (9 mg/kg) and robenacoxib (0.9 mg/kg). The patient was discharged 48 h postoperatively after showing subtle improvement in left pelvic limb lameness with 2 days of robenacoxib (0.9 mg/kg), 3 days of transmucosal buprenorphine (0.011 mg/kg) and 2 weeks of gabapentin (9 mg/kg). At the suture removal appointment 2 weeks postoperatively, the patient exhibited a mild to moderate improvement in gait with a grade 2/5 left pelvic limb lameness. Another recheck evaluation was performed at 4 weeks, which revealed nearly complete resolution of the pelvic limb lameness.

## Discussion

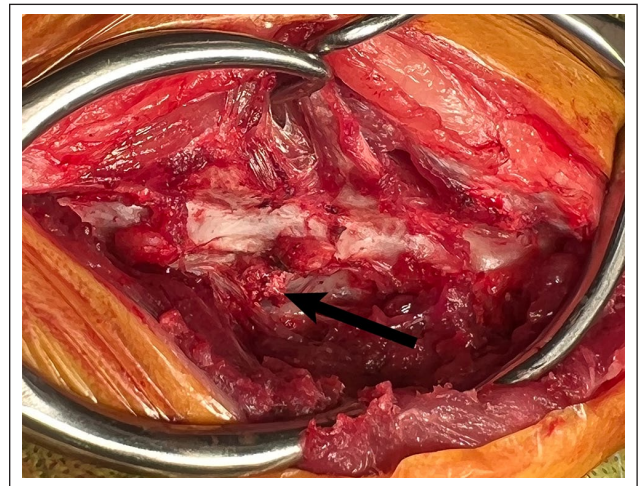
This is the second case report describing a lateral intervertebral disc extrusion (IVDE) in a cat and, to our



**Figure 2** (a) Dorsal T2-SPACE MRI of the lumbosacral spine showing a large volume of low-signal-intensity disc material (white arrow) that has herniated laterally to the left intervertebral foramen. (b) Transverse T1 post-contrast MRI of the lumbar spine at the L6–7 intervertebral disc space demonstrating T1-hypointense material (white arrow) lateral to the left annulus fibrosus and the left intervertebral foramen, consistent with left far lateral intervertebral disc extrusion



**Figure 3** Intraoperative view of a large volume of encapsulated mineralized disc material at the level of the left L6-7 intervertebral foramen obscuring the neurovascular bundle (black arrow)

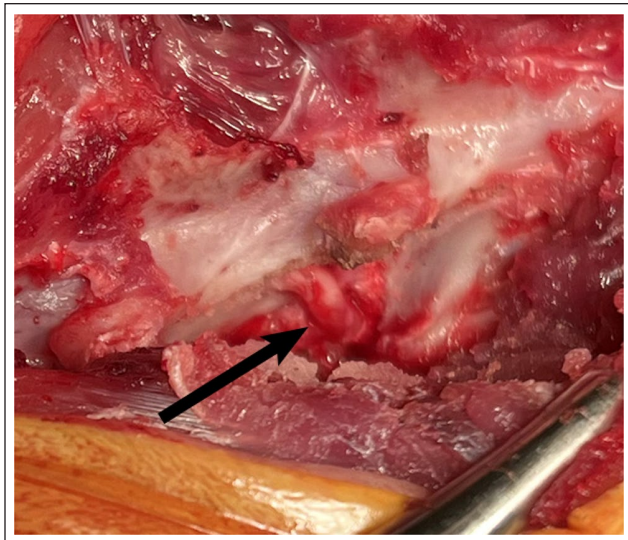


**Figure 4** Intraoperative view of mineralized disc material (black arrow) at the left L6-7 intervertebral foramen after the capsule was incised with a #11 blade

knowledge, the first case to undergo successful surgical treatment. Intervertebral disc disease is uncommon in cats, with a prevalence of 0.23–0.24% in the general population and 2.8% among cases presenting to a neurologist.<sup>1,2</sup> The majority of disc extrusions in cats occur in the lumbar spine.<sup>1–3</sup> Cats undergoing decompressive hemilaminectomy for IVDE have a favorable prognosis for return to normal function.<sup>3–5</sup> Previous studies and case series describe IVDE in cats causing the typical clinical

signs of a myelopathy – such as ataxia, paraparesis or paraplegia, incontinence or altered spinal reflexes – that reflect the vertebral level affected. In addition, spinal hyperesthesia is a common clinical finding in cats with IVDE.<sup>2,5</sup>

Rarely, the extrusion of disc material may occur laterally rather than dorsally, resulting in a foraminal or far lateral (lateral to the intervertebral foramen) extrusion. This may cause pain due to compression of a single nerve root or spinal nerve, respectively, as well as



**Figure 5** Intraoperative view of a severely enlarged L6–7 nerve root (black arrow) after removal of the mineralized disc material and a foraminotomy

chemical irritation from the extrusion of the nucleus pulposus.<sup>6</sup> This pain manifests clinically as lameness in one limb, often referred to as a ‘nerve root signature’. Research in people suggests that the dorsolateral regions of the annulus contain a different microscopic arrangement of fiber bundles, which makes it the weakest area of the annulus fibrosus.<sup>7</sup> Therefore, although dorsally directed disc material is significantly more common in small animals, lateral extrusions can also occur as a result of inherent weakness within the lateral regions of the annulus fibrosus.

Far lateral and foraminal lumbar disc extrusions have been fairly well documented in dogs as a cause of spinal pain and lameness without significant neurological deficits.<sup>8–11</sup> Compared with the typical dorsally directed disc extrusion, the lateral extrusions cause minimal to no spinal cord compression, which would yield neurological deficits. In the most prominent case series in dogs with thoracolumbar foraminal and far lateral disc extrusions, the majority of patients presented with lameness in one limb, with pain on either direct lumbar palpation or hip extension. In addition, most dogs had normal postural reactions and normal patellar or withdrawal reflexes. Surgical strategies to address disc extrusion in dogs included hemilaminectomy, nerve root decompression without drilling and foraminotomy. Furthermore, over 90% of surgically and medically treated cases had a good to excellent outcome.<sup>11</sup> Another effective medical treatment described in dogs for lateralized disc extrusions that are difficult to access with routine surgical approaches, such as those in the

cervical region, includes ultrasound or fluoroscopically guided perineural injections.<sup>12,13</sup>

Unlike in dogs, foraminal or far lateral disc extrusion in cats has been described only once before.<sup>13</sup> This cat had pelvic limb lameness with normal proprioception and spinal reflexes. There was no pain on spinal palpation and an orthopedic examination revealed discomfort on right coxofemoral joint extension. The patient in the current report had very similar findings of pelvic limb lameness with pain on extension of the left pelvic limb, with no other neurological deficits or spinal pain appreciated. Further differentials for lameness were considered for this case, such as an orthopedic cause or a vascular event (ie, ischemic myopathy). With the cat’s normal bloodwork, strong pulses with no auscultable heart disease, unremarkable orthopedic examination and lack of orthopedic disease on radiographs, MRI was indicated, which revealed the far lateral disc extrusion.

However, unlike the cat in the report by Ryan and Cherubini<sup>14</sup> that underwent 37 days of medical management before ‘near-complete’ resolution of clinical signs, the patient in this report had already undergone 14 days of activity restriction with appropriate analgesia. Despite medical management, the cat showed no improvement in clinical signs. Therefore, the owner elected to pursue decompressive surgery, given the success described in dogs with similar foraminal and far lateral disc extrusions,<sup>11</sup> although continued medical management may have yielded similar results to the cat previously described. A perineural injection was not considered for this cat, given the uncomplicated surgical approach required to remove the disc material. Advanced imaging helped guide the type of surgery pursued for this cat. Although radiographs were highly suspicious of a lateral disc extrusion, MRI helped identify whether the disc material was within the canal or foramen, or whether all the disc material was far lateral. Identification of the enlarged L6 spinal nerve on MRI helped guide the decision to perform a foraminotomy preoperatively to provide additional space for the inflamed spinal nerve even though the disc material could have been removed without performing a foraminotomy based on imaging. No disc material was present within the vertebral canal; therefore, a hemilaminectomy was not pursued. The patient had a good outcome with surgical decompression of the far lateral disc extrusion and had a very mild lameness appreciated at approximately 4 weeks postoperatively.

## Conclusions

This case report contributes to the growing body of literature on foraminal and far lateral IVDE as an etiological factor in pelvic limb lameness in cats, particularly in

instances where neurological deficits are absent. In addition, this case highlights the diagnostic utility of thorough advanced imaging, such as MRI, to rule out far lateral or foraminal IVDE as part of a work-up in cats presenting with lameness without an obvious orthopedic etiology. The cat in this study, which was unresponsive to initial medical management for far lateral IVDE, underwent a surgical procedure involving decompression of the left L6 spinal nerve and L6–7 foraminotomy, which resulted in resolution of the clinical signs. This case underscores the efficacy of surgical intervention in treating lumbar far lateral IVDE in cats. Therefore, surgical decompression and foraminotomy should be considered a therapeutic strategy in managing lumbar far lateral IVDEs in feline patients, especially when traditional non-surgical approaches prove ineffective.

**Supplementary material** The following file is available as supplementary material:

Video 1: Far lateral intervertebral disc extrusion (IVDE) gait.

**Conflict of interest** The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

**Funding** The authors received no financial support for the research, authorship, and/or publication of this article.

**Ethical approval** The work described in this manuscript involved the use of non-experimental (owned or unowned) animals. Established internationally recognized high standards ('best practice') of veterinary clinical care for the individual patient were always followed and/or this work involved the use of cadavers. Ethical approval from a committee was therefore not specifically required for publication in *JFMS Open Reports*. Although not required, where ethical approval was still obtained, it is stated in the manuscript.

**Informed consent** Informed consent (verbal or written) was obtained from the owner or legal custodian of all animal(s) described in this work (experimental or non-experimental animals, including cadavers) for all procedure(s) undertaken (prospective or retrospective studies). For any animals or people individually identifiable within this publication, informed consent (verbal or written) for their use in the publication was obtained from the people involved.

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