Case Report

Lumbar intervertebral foraminal disc extrusion in a cat

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Abstract

Case summary A 10-year-old domestic longhair cat was presented for investigations into a 4-day history of acute-onset lethargy, hyporexia and right pelvic limb lameness. Based upon the neurological examination, a right femoral nerve localisation was suspected. Pelvic radiographs identified a dorsally displaced L5–L6 intervertebral disc, with subsequent MRI suggestive of a right L5–L6 neuritis secondary foraminal intervertebral disc extrusion. Medical management, consisting of rest and analgesia, resulted in near-complete resolution of clinical signs in 37 days.

Relevance and novel information To our knowledge, this is the first report of a lumbar foraminal intervertebral disc extrusion in a cat and should be considered on the differential list for acute-onset pelvic limb lameness in the absence of neurological deficits.

Keywords: Foraminal; intervertebral disc; extrusion; lameness; MRI

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Introduction

Intervertebral foraminal disc extrusion occurs when extruded nucleus pulposus material enters the intervertebral foramen, rather than the vertebral canal. Lameness can be caused by nerve root compression (also referred to as nerve root signature) that may be misinterpreted on clinical examination as a primarily musculoskeletal disorder. To our knowledge, this is the first report of a lumbar intervertebral foraminal disc extrusion (LIFDE) in the cat.

Case description

A 10-year-old male neutered domestic longhair cat was referred for investigations into a 4-day history of acute-onset lethargy and hiding, hyporexia and right pelvic limb lameness. The cat was predominantly indoor, with supervised access to the garden. Radiographs performed by the referring veterinary surgeon revealed no reported abnormalities. It was subsequently treated with oral meloxicam and showed no improvement. On day 4, the cat was presented to us. General physical examination revealed no abnormalities. The cat's body weight was 4.5 kg, with a body condition score 6/9. Neurological examination revealed a grade 2/5 right pelvic limb lameness, with a reduced ability to fully extend the stifle. Cranial nerve examination, segmental spinal reflexes and proprioception were all normal. There was no pain on spinal palpation. Orthopaedic examination (by an American College of Veterinary Surgeons-boarded surgeon) revealed the previously described right pelvic limb lameness, and discomfort on right coxofemoral joint extension. Orthopaedic and/or neurological disease (L4–L6 femoral nerve lesion) was suspected to be the cause of the cat's clinical signs.

Haematology and biochemistry revealed a moderate hyperglycaemia of 19.9 mmol/l (reference interval [RI] 3.8–7.6). Fructosamine was 226 µmol/l. Feline leukaemia virus/feline immunodeficiency virus SNAP test was negative. *Toxoplasma* species IgM was negative at 1:20, and IgG was negative at 1:50. Coronavirus titre was 0, and alpha-1-acid glycoprotein was within normal limits at 394 µg/ml (RI 300–500).

Radiographs of the pelvis (Figure 1), right stifle and hock were performed under general anaesthesia, which

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Figure 1 Right lateral radiograph of the hips containing the caudal lumbar spine revealing a narrowed L5–L6 intervertebral disc space, and a mineralised disc which is protruding dorsally into the vertebral canal

revealed narrowing of the L5–L6 intervertebral disc space. The L5–L6 intervertebral disc was also mineralised, slightly dorsally displaced and bulging into the ventral aspect of the vertebral canal. The hips were unremarkable, with adequate acetabular coverage of both femoral heads. A smoothly marginated bony spur was observed on the distolateral margin of the lateral malleolus of the fibula at the level of the tarsocrural joint. Smoothly marginated periarticular new bone formation was also seen bridging the plantar margin of the tarsometatarsal joint. The right stifle was normal.

MRI was performed using a 0.4 T low-field scanner (Hitachi Aperto Lucente) of the lumbosacral spinal cord and associated structures. Images were obtained in T2-weighted sagittal and transverse planes and short tau inversion recovery (STIR) sequence in dorsal and sagittal planes. The images revealed a reduced T2 signal intensity of the intervertebral disc at L5–L6. A large amount of signal voiding (on T2 and STIR) material was present along the right dorsolateral aspect of the annulus fibrosus of L5–L6 (Figure 2). Only a very small amount of the signal voiding material was located in the right ventrolateral aspect of the vertebral canal. The extradural material led to (at least partial) obstruction of the ipsilateral intervertebral foramen, and minimal displacement of the spinal cord/cauda equina left dorsolaterally. A thin rim of T2 and STIR hyperintense signal was present in the immediate periphery of this extradural material, and the surrounding epaxial musculature was subtly increased in signal on T2 and STIR vs contralaterally (Figure 3).

Conservative and surgical management options were discussed with the owner. Owing to the fact the cat was nervous in the hospital and refused to eat, it was discharged for conservative management with a view to performing surgery if it did not improve over the subsequent days. Medical therapy was instituted with meloxicam (0.05 mg/kg PO q24h [Metacam; Boehringer]) and gabapentin (~11 mg/kg [BOVA UK]).

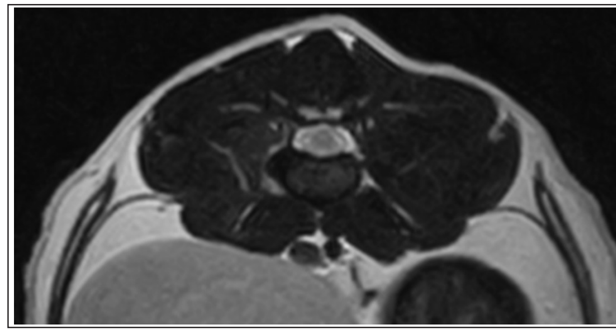

Figure 2 Transverse T2-weighted MRI of the lumbar spine through the L5–L6 intervertebral disc, showing a large volume of T2 hypointense material at the right dorsolateral aspect of the annulus fibrosus of L5–L6, occluding the intervertebral foramen

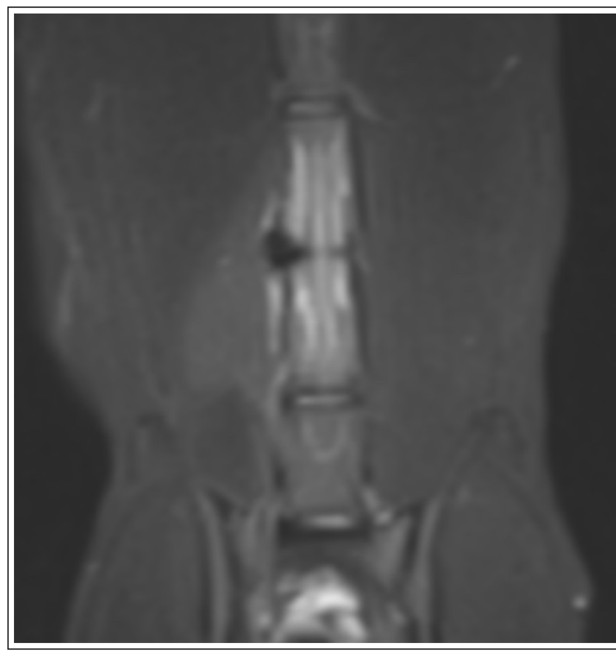

Figure 3 Dorsal short tau inversion recovery (STIR) at the level of the vertebral bodies of the lumbar spine, demonstrating a large volume of STIR hypointense material located right laterally at the intervertebral foramen. There is also a subtle hyperintensity of the surrounding epaxial musculature compared to the contralateral side

Follow-up via telephone 2 days post-discharge (8 days post-initial lameness) revealed normal appetite, an improved behaviour (exploring) and an improvement in lameness, as assessed by videos supplied by the owner. Gabapentin was reduced to twice-daily dosing on day 9 owing to excessive sleepiness, suspected to be caused by gabapentin administration. Follow-up on days 23 and 37 revealed continuing improvement of the lameness and a return to normal behaviour. Gabapentin was stopped on day 37 and meloxicam was continued for a further 14 days. At the time of writing, 5 months later, the cat was reportedly completely normal.

Discussion

The prevalence of intervertebral disc extrusion (IVDE) is reported to be between 0.12% and 0.25%,[1,2] with an increased incidence of thoracolumbar IVDE reported in British Shorthair and Persian cats in one study.[1] The majority of cats undergoing surgical treatment for IVDE appear to have a favourable prognosis.[3] To our knowledge, this is the first report of an LIFDE in a cat.

Common causes for pelvic limb lameness in the cat include orthopaedic, muscular and neurological causes. Differentials for neurological causes of lameness include vascular (ischaemic myopathy), inflammatory (neuritis), traumatic (peripheral nerve injury), toxic (localise tetanus), neoplastic (primary or secondary) and degenerative (lateralised IVDEs, foraminal stenosis).[4] A thorough neurological and orthopaedic examination is required to differentiate these causes. Clinical signs related to an IVDE are dependent upon the area affected.[5] With foraminal IVDEs, typically only one spinal nerve is affected. Many spinal nerves typically contribute to one peripheral nerve, explaining why it may be uncommon to see paresis or neurological deficits associated with this, although it has been reported in dogs.[6] The associated lameness, and in this case pain on hip extension, can easily be confused with musculoskeletal disease, emphasising the importance of a thorough examination.

Herzig et al[7] presented a case report of reversible nerve root and peripheral nerve root oedema secondary to IVDE. While this case had a foraminal component, the neurological examination was indicative of an L6–S1 localisation which, along with the severe MRI changes, is different to our presentation as this cat had obvious neurological deficits present on examination. In humans, lumbar foraminal disc extrusion is a commonly reported phenomenon, accounting for about 12% of overall lumbar disc herniations.[8] Cervical intervertebral foraminal disc extrusions have been more extensively covered, with papers discussing both surgical[9,10] and medical[11,12] treatment and outcomes. Bersan et al[11] documented that cervical foraminal extrusions commonly have a normal neurological examination, with cervical hyperaesthesia and thoracic limb lameness. While a high percentage of cases (85%) had a successful outcome with medical management, there is a long wait to be considered free of clinical signs (median 7.5 weeks). In humans, surgery is the treatment of choice, as most people fail to respond to conservative management.[13] In dogs, two case reports have discussed a diagnosis of lumbar foraminal disc extrusions with MRI.[14,15] More recently, a retrospective study on 37 foraminal and far lateral thoracolumbar IVDEs in dogs by Silva et al[6] documented a good-to-excellent outcome in 95% and 90% of surgically and medically managed cases, respectively. It is unclear in this case whether surgical management would have resulted in a quicker resolution of signs. The pathophysiology of pain associated with IFDE is related to both direct mechanical compression and chemical injury.[16] It has been demonstrated in an in vivo canine model that extruded disc material produces inflammatory medicators leading to nerve root dysfunction.[17] As a consequence, this can lead to persistent neuropathic pain, which may be responsible for the longevity of clinical signs seen in cases.

It is currently unclear why the incidence of IVDE in cats is much lower than in dogs. A preliminary study on histopathological changes in the intervertebral discs of otherwise healthy cats showed that while there were some degenerative changes in the nucleus pulposus, they were relatively mild.[18] Distinct differences were found in the microscopic structure of the annulus fibrosus vs dogs, but it is unclear if this provides a protective mechanism against herniation.[18] There is no evidence to explain why foraminal IVDEs occur, but in dogs it is hypothesised to be due to differences in the relative thicknesses of the dorsal and lateral annulus, with a thinner lateral annulus allowing for foraminal extrusions. In humans, a simple oblique MRI is the superior imaging modality to identify foraminal and lateralised intervertebral extrusions.[19,20] Non-calcified discs will not be visible on radiographs, and myelography has no value for lesions within or outside the foramen.[21] It is generally accepted that MRI and CT have the best sensitivity for intervertebral disc herniations.[21] With the increase in advanced diagnostic imaging in companion animals, including cats, identification of these previously uncommon conditions may become more common. Further case series are required to accurately gather information and prognostics on this condition in cats, and to determine if medical or surgical management is superior.

Conclusions

Neurological disease, such as foraminal IVDE, should be on the differential list for any cat presenting with an acute onset of pelvic limb lameness, even in the absence of obvious neurological deficits or paraspinal hyperaesthesia.

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

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Ethical approval The work described in this manuscript involved the use of non-experimental (owned or unowned) animals. Established internationally recognised 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 (either verbal or written) was obtained from the owner or legal custodian of all animal(s) described in this work (either experimental or non-experimental animals, including cadavers) for all procedure(s) undertaken (either prospective or retrospective studies). For any animals or people individually identifiable within this publication, informed consent (either verbal or written) for their use in the publication was obtained from the people involved.

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