

## CASE REPORT

# Acute intervertebral disc extrusion in a cat: clinical and MRI findings

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A 5 year old, neutered male, domestic shorthaired cat had acute left hemiparesis and Horner's syndrome. Magnetic resonance imaging (MRI) revealed a loss of the normal signal from the nucleus pulposus of the intervertebral disc at C3/4, narrowing of the ventral subarachnoid space and slight dorsal displacement of the spinal cord and a focal hyperintense lesion affecting the left side of the spinal cord at the same level. The presumptive diagnosis was focal spinal cord oedema associated with intervertebral disc extrusion. A traumatic aetiology was suspected. The cat was treated conservatively and improved gradually over a period of 6 months.

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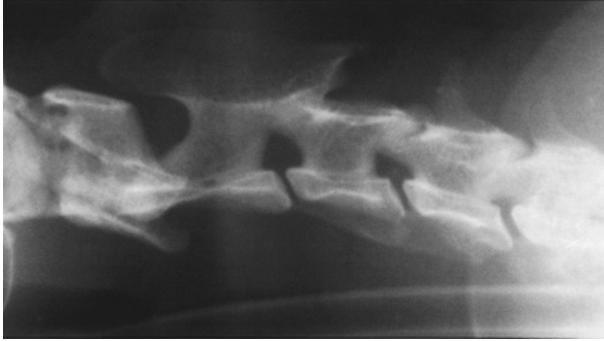
A 5-year-old, neutered male, domestic shorthaired cat was found unable to walk after being missing for 12 h. No signs of trauma were identified on physical examination. Survey radiography of the cervical spine revealed a narrowed intervertebral disc space at C3/4 (Fig 1). The cat was referred without any treatment to the Queen Mother Hospital for Animals, Royal Veterinary College within 24 h of the onset of clinical signs.

The cat was recumbent with normal mental status. There was left hemiparesis and absence of conscious proprioception affecting the left thoracic and pelvic limbs. Muscle tone was slightly reduced in the left thoracic limb and slightly increased in the left pelvic limb. Withdrawal reflexes were reduced in the left thoracic limb but patellar and withdrawal reflexes were exaggerated in the left pelvic limb. Muscle tone and reflexes on the right were normal. Panniculus reflex was intact and deep pain perception was judged normal in all limbs. No signs of pain were detected on palpation of the entire spine, including gentle manipulation of the neck. There was mild anisocoria, protrusion of the left third eyelid and miosis of the left eye that appeared more marked in dim light. Pupillary light reflexes and a fundic examination were normal. The left pinna felt warmer than the right. Administering

10% phenylephrine eye drops into each eye resulted in mydriasis of the left pupil occurring in 55 min, compatible with first order Horner's syndrome (Petersen-Jones 1995). On the basis of the neurological signs, the presumptive diagnosis was left sided cervical spinal cord lesion.

The cat was anaesthetised for MRI of the cervical spinal cord (Philips Gyroscan NT 1.5 Tesla). In T2-weighted images there was a loss of the normal signal from the nucleus pulposus of the intervertebral disc at C3/4 and a focal hyperintense lesion affecting the left side of the spinal cord at the same level (Fig 2). Narrowing of the ventral subarachnoid space and slight dorsal displacement of the spinal cord at C3/4 was identified on sagittal images compatible with an extradural sign on the ventral aspect (Fig 2). T1-weighted images of the cord appeared normal. There was a minor increase in signal intensity affecting the cord at C3/4 after intravenous gadolinium oxide (Gadoteric acid, Dotarem). On the basis of these findings, the presumptive diagnosis was focal spinal cord oedema associated with intervertebral disc extrusion at C3/4.

Cerebrospinal fluid (CSF) collected from the cisterna magna had a neutrophilic pleiocytosis (greater than 99% non-degenerate neutrophils), occasional large mononuclear cells and moderate number of erythrocytes. The total cell count was



**Fig 1.** Lateral radiograph of the cervical region. The intervertebral space at C3/4 appears slightly narrowed and there is a faint opacity superimposed on the intervertebral foramen, possibly reflecting extruded disc material.

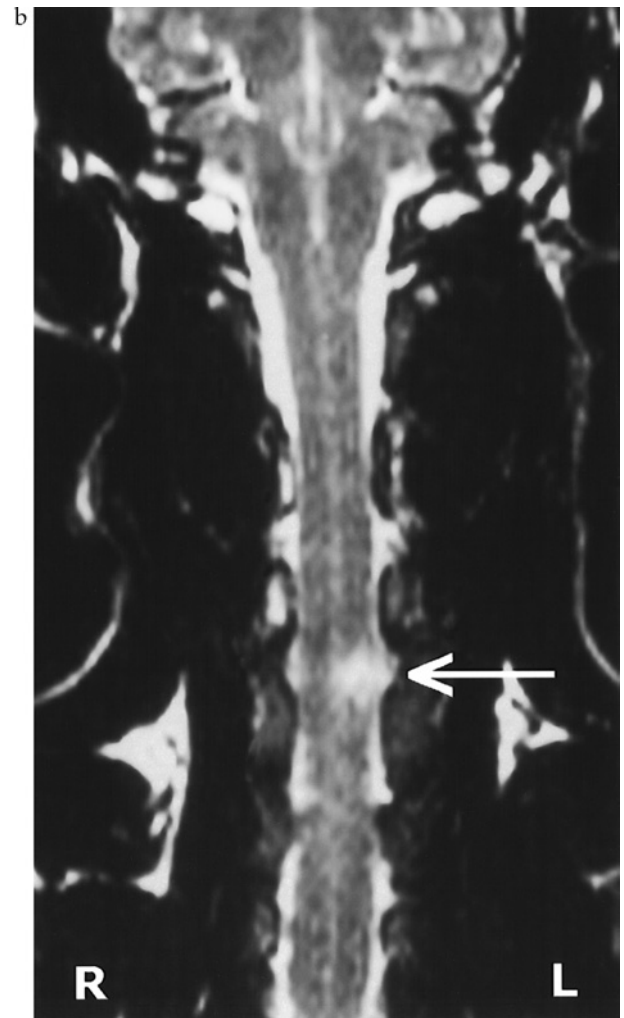
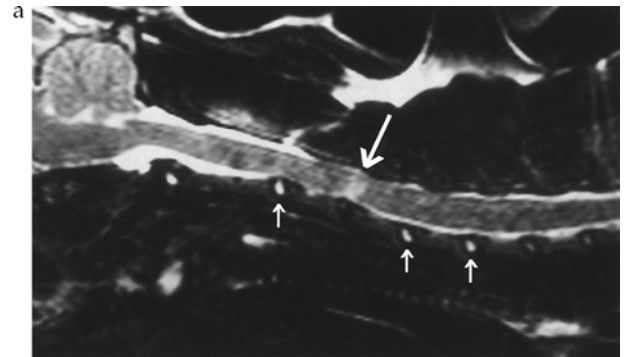
166 nucleated cells/mm<sup>3</sup> (normal less than 5 cells/mm<sup>3</sup>) and 539 erythrocytes/mm<sup>3</sup> (normal 0/mm<sup>3</sup>). Total protein level was elevated at 0.29 g/l (normal less than 0.25 g/l). No microorganisms were identified. The CSF analysis was considered compatible with an acute, moderate inflammatory process.

The cat was treated with prednisolone (initially 1 mg/kg every 12 h) using a reducing dose over a period of 3 weeks. The cat improved gradually. Mild left hemiparesis was the only abnormality detected when re-examined 6 m later.

## Discussion

Degeneration and dorsal protrusion of the intervertebral discs is a common finding in cats at necropsy (King et al 1958, King & Smith 1960a, b & c, 1964); however, few cats ever have clinical signs of spinal cord disease secondary to intervertebral disc protrusion. Sporadic case reports have described cats with either a Hansen type I disc extrusion (Hoerlein 1978, Seim & Nafe 1981, Gilmore 1983, Bagley et al 1995, Sparkes & Skerry 1990, Kathmann et al 2000) or type II protrusion (Heavner 1971, Littlewood et al 1984).

In the present case, the acute onset neurological signs, narrowed C3/4 intervertebral disc space, MRI abnormalities and ipsilateral spinal cord signs all support a diagnosis of traumatic disc extrusion, which is an uncommon diagnosis in the cat (Hoerlein 1978). Although we have no direct evidence of a traumatic incident affecting the cat in this report, this seems a strong possibility. The clinical signs in the present case are similar to those described in a series of dogs that had trauma affecting the cervical spine



**Fig 2.** Sagittal (A) and dorsal (B) T2-weighted MR spin-echo images (TR ms, TE ms) of the cervical spine. The hyperintense signal that represents the normal nucleus pulposus is visible at intervertebral spaces throughout the cervical region (small arrows) with exception of C3/4. Narrowing of the ventral subarachnoid space and slight dorsal displacement of the cord at C3/4 suggests an extradural lesion on its ventral aspect. A focal hyperintense lesion compatible with oedema or necrosis is visible on both images affecting the left side of the spinal cord at C3/4 (large arrow).

(Griffiths 1970). All dogs had a variable degree of hemiparesis, Horner's syndrome, hyperthermia of the ipsilateral side and, in some cases, there was positional dystonia. In addition, each dog had a narrowed cervical intervertebral space identified radiographically without evidence of disc calcification or other degenerative changes.

Lesions affecting the lateral tectotegmentospinal tracts within C1-T3 cord segments may result in a sympathetic paralysis of the entire ipsilateral side of the head, body and limbs (DeLahunta 1983) and, therefore, may result in unilateral Horner's syndrome and hyperthermia because of peripheral vasodilatation. It is uncertain whether the degree of Horner's syndrome is related to the severity of cord injury, recovery time or prognosis. It is reported that Horner's syndrome is rarely associated with C1-5 cord disease because lesions severe enough to cause the syndrome usually cause respiratory failure leading to death (Raw 1994); however, in our experience, Horner's syndrome, or at least a partial Horner's syndrome (for example, ipsilateral miosis without any iris pathology), is a moderately frequent finding in animals with cervical spinal cord lesions.

The CSF analysis in the present case is interesting. Presence of erythrocytes and neutrophilic pleiocytosis can be associated with high-velocity-low-volume disc extrusion (author's unpublished data). In Griffiths' report (1970), CSF was collected from only one case, which revealed numerous erythrocytes; however, no comment was made about nucleated cell count or cytology. Similarly, CSF analysis was not reported in the study by Yarrow & Jeffery (2000).

The principles of diagnosis and treatment for cats with suspected disc protrusion are similar to those applied to dogs (Bagley et al 1995). Surgery to remove extruded disc material from the vertebral canal is indicated if there is radiographic evidence of significant extradural compression (Kathmann et al 2000); however, a small volume of extruded disc material may be dispensed in the epidural fat and may be difficult to identify surgically (Sanders et al 1999). Also, it has been stated that surgery may be less beneficial if there is a very small amount of disc material in the vertebral canal, or if the extruded disc material has penetrated the dura and entered the spinal cord (Schrader 1989). In the present case, the degree of impingement on the cord, assessed by MRI suggested the presence of only a small amount of extruded disc material. Because of this, and because we believed the left-sided

intra-parenchymal cord lesion to be responsible for the clinical signs, conservative management is more appropriate in this case.

Use of steroid therapy in animals with acute disc extrusion remains a controversial subject. There is evidence that use of methylprednisolone sodium succinate is beneficial for humans with acute spinal cord injury (Bracken et al 1992); however, these results have not been reproduced in dogs or cats. In dogs with this particular type of high-velocity-low-volume disc extrusion, the prognosis for return of motor function is good if deep pain perception is intact (Griffiths 1970, Yarrow & Jeffery 2000). Nevertheless, some neurological deficits, such as ipsilateral weakness or incontinence, may be permanent.

The principal diagnostic imaging techniques for investigating clinical signs of spinal cord disease in dogs or cats are survey radiography and myelography, although computed X-ray tomography and MRI are used increasingly (Sharp et al 1995, Bagley et al 1995, Kneissl & Schedlbauer 1997, Levitski et al 1999, Olby et al 2000). In the present case, MRI was chosen rather than myelography because of the potential to identify lesions affecting any anatomical component of the cervical spine including the vertebrae, intervertebral discs and spinal cord. Loss of hydration of the nucleus pulposus, which is recognised as a reduced signal on T2-weighted images, is a common finding that indicates either degeneration or protrusion (Flanders et al 1992, Kioumehri & Ziegler 1998). Similarly, the combination of increased signal on T2-weighted images and normal T1-weighted images of the spinal cord, as observed in this cat, is compatible with a non-haemorrhagic spinal cord contusion (Flanders et al 1992, Kioumehri & Ziegler 1998). The location of the lesion based on neurological signs, the survey radiographic findings and the close proximity of the disc lesion, extradural sign and intramedullary lesion on MRI all support the conclusion that extrusion of a small volume of a nucleus pulposus at C3/4 was the cause of clinical signs in this cat.

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