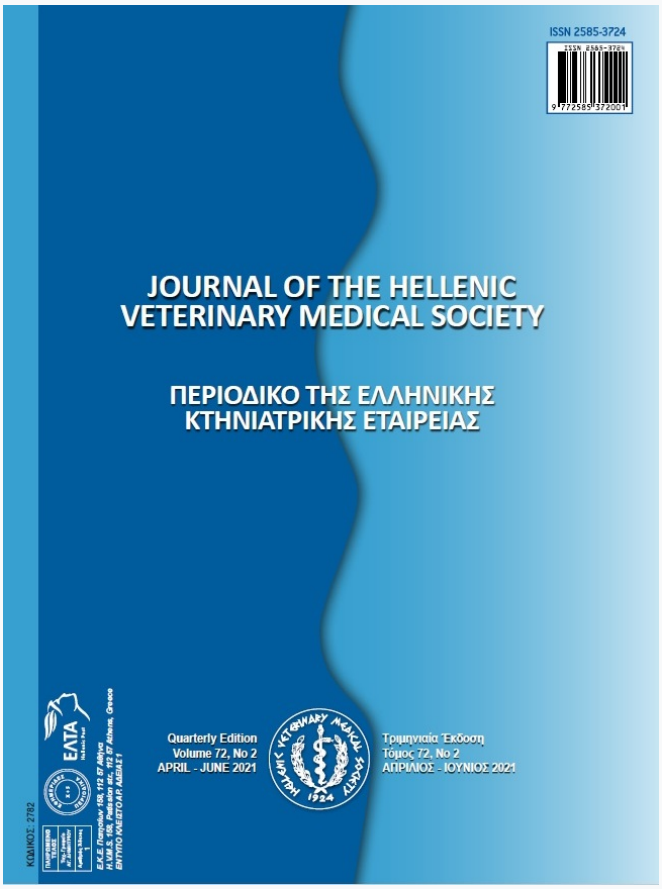
Journal of the Hellenic Veterinary Medical Society

Vol 72, No 2 (2021)



Acute non-compressive nucleus pulposus extrusion in dogs and cats: An overview

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doi: 10.12681/jhvms.27516

To cite this article:

BOTSOGLOU, R., SARPEKIDOU, E., PATSIKAS, M., & KAZAKOS, G. (2021). Acute non-compressive nucleus pulposus extrusion in dogs and cats: An overview. *Journal of the Hellenic Veterinary Medical Society*, *72*(2), 2809–2816. https://doi.org/10.12681/jhvms.27516

J HELLENIC VET MED SOC 2021, 72(2): 2809-2816
ΠΕΚΕ 2021, 72(2): 2809-2816

Review article
Ανασκόπηση

Acute non-compressive nucleus pulposus extrusion in dogs and cats: An overview

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ABSTRACT: Acute non-compressive nucleus pulposus extrusion (ANNPE) is a common neurologic emergency and is characterized by a sudden extrusion of hydrated nondegenerated nucleus pulposus without or with minimal remaining spinal cord compression. It causes primarily spinal cord contusion and is often the consequence of intensive exercise or trauma. It is accompanied by a peracute onset and often but not always, by lateralization of spinal cord dysfunction. The T3-L3 spinal cord segments are mostly affected, resulting in paraparesis or paraplegia. Urinary and fecal incontinence can also be present. Neurologic manifestations do not deteriorate after the first 24 hours and then there is a progressive improvement or they remain static; that depends on the severity of the spinal cord injury. It has been mainly diagnosed in older non-chondrodystrophic large breed dogs, mostly in males but any sex and canine breed can be affected. On rare occasions cats can be affected as well. It concerns usually middle-aged, non-purebred and mostly male cats, that have experienced external spinal trauma. The onset is also peracute, spinal pain can be evident and the T3-L3 spinal cord segments are mostly affected, resulting in non-progressive paraparesis or paraplegia. Urinary and fecal incontinence are also possible. The diagnostic procedure and the treatment are similar in dogs and cats. The diagnosis is usually presumptive and is based on the medical history, the clinical presentation and the magnetic resonance (MRI) findings, which is the diagnostic modality of choice. There are several MRI criteria such as: an hyperintense lesion overlying an intervertebral disk, reduced volume of nucleus pulposus, extradural material or signal change and intervertebral disk space narrowing in T2 weighted images, that helps us to differentiate ANNPE from other myelopathies. The extruded nucleus pulposus can, rarely have an intradural, extra-/intramedullary detection. The ANNPE should be differentiated from other causes of acute myelopathy such as: ischemic myelopathy and fibrocartilagenous embolism, Hansen type I intervertebral disc disease (the compressive or the non-compressive type), vertebral fracture/luxation. Aortic thromboembolism, ischaemic myelopathy, fibrocartilaginous embolism, intervertebral disc extrusion, vertebral fractures/luxations are the main differentials in cats. A definitive diagnosis can only be achieved through histological examination, postmortem or after surgery. The treatment includes usually conservative management (cage rest, nursing care and physiotherapy), so a surgical exploration takes rarely place. The outcome of ANNPE in both dogs and cats is favorable, except the cases with loss of nociception and extended spinal cord injury.

***Keywords*:** Contusion, nucleus pulposus, extrusion, non-compressive myelopathy, MRI

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Date of initial submission: 25-06-2020
Date of acceptance: 24-07-2020

INTRODUCTION

Traumatic intervertebral disc extrusion (TIVDE) is a primary type of spinal cord injury that is typically occurred to dogs with underlying degeneration of the dorsal aspect of the annulus fibrosus.(Dewey and da Costa, 2016, Hansen, et al., 2017,) An external force causes the focal rupture of annulus fibrosus and the entrance with high velocity of nucleus pulposus material (either degenerative or hydrated) into the spinal canal. (Dewey and da Costa, 2016) In an interesting study, less than one third of the dogs (29%) with traumatic disc extrusion had spinal cord compression and that, was positively associated with chondrodystrophic breeds, older individuals and generalized intervertebral disc (IVD) degeneration. The authors proposed that preexisting IVD disease may predispose dogs to spinal cord compression subsequent to traumatic IVD extrusion. But, in contrast to that, in the majority of the dogs in the study (15 out of 22) that experienced non compressive nucleus extrusion, the latter was not degenerate. (Henke, et al., 2013) It is evident that in non-chondrodystrophic breeds of dog and in cats, that suffer from a traumatic disc extrusion, the herniated nucleus pulposus is often not mineralized but hydrated and therefore causes a primarily concussive injury, with little or no compression, the nowadays so called "acute non-compressive nucleus pulposus extrusion" (ANNPE) (Platt and Olby, 2004) It is also known as traumatic disc extrusion, high velocity low volume disc extrusion, dorsolateral intervertebral disc explosion, traumatic disc prolapse and Hansen type III intervertebral disc (IVD) disease. Although from all the terms used, the one that is best to be avoided, is Hansen type III, as Hansen described intervertebral disc degenerations (type I and type II) and this particular type of disc disease is non-degenerated. Moreover, Hansen was not the one that described it. (De Risio, 2015, Beltran, 2017) Information about this entity is scarce. A research in Pubmed based on words like: ANNPE (6 results for dogs and 4 for cats), traumatic disc extrusion (8 results for dogs and 1 for cats), high velocity low volume disc extrusion (only 2 results for dogs) and traumatic disc prolapse (12 results for dogs, 2 for cats) in dogs and cats, retrieves limited number of papers.

BIOMECHANISM

The combination of the healthy hydrated nucleus pulposus surrounded by a dense and fibrous annulus fibrosus enables the normal IVD to withstand marked variations of physiologic loading and biomechanical stress without resulting in structural failure. However, under specific circumstances, where the vertebral segment and IVD are subjected to supraphysiologic forces, for example during intense exercise or trauma, structural integrity may be disturbed. In such a case, a small cleft may occur in the complex lamellar structure of the annulus fibrosus, which has as a consequence, that the nondegenerate nucleus pulposus material will be extruded dorsally into the vertebral canal. (De Decker and Fenn, 2017) The fact that dogs with ANNPE tend to be older may be associated with age-related changes in the microstructure and biomechanics of the anulus fibrosus, such as alterations in collagen fiber cross-linking, decreases in water and proteoglycan content, and changes in interfiber cohesiveness. These changes may contribute to the separation of annular fibers and the development of annular clefts, providing potential pathways for extrusion of nuclear material when mechanical stress is applied to the spine. (Fenn, et al.,2016b, Hansen, et al., 2017) Dewey W. C., and da Costa C. R support, that the degeneration of the thinner dorsal aspect of the annulus fibrosus, that may be occurred through the years, make the fibrous lamellae less resistant to a sudden increase of intradiscal pressure. (Dewey and da Costa, 2016) The nuclear material is hypothesized to extrude with great force, causing a focal contusive injury and sometimes significant bleeding to the ventral or lateral portion of the spinal cord. As the extradural material may be nondegenerate and, highly hydrated (consists of 80% to 88% water, Henke, et al., 2013), it typically rapidly dissipates or is resorbed, leaving minimal to no spinal cord compression. Postmortem findings of small clefts in the dorsal annulus, as well as extradural nondegenerate nucleus pulposus material in the vertebral canal support this scenario. The nearby region of the spinal cord may present evidence of focal contusive injury, hemorrhage, and necrosis. (Bergknut, et al., 2013, De Decker and Fenn, 2017) The initial mechanical injury (primary spinal cord injury) may cause relatively little damage in itself, but it triggers the secondary mechanism of injury which augments the severity of damage to the spinal cord. (Jeffery and Blakemore, 1999, Dewey and da Costa , 2016) A spontaneous recovery is possible. It is more often observed in animals with moderate-to-severe rather than 'complete' injuries and it can be noticed in conservatively or placebo-treated clinical spinal cord injuries. It occurs, either as the result of the reversal of reversible lesions, such as the restoration of normal intra- and extracellular concentrations of ions

or the removal of compression, if existed, allowing the restoration of normal white matter conduction, and usually starts quite soon after the injury occurred, that is within about 14 days, or through the process of 'plasticity', which consists of the reorganization of surviving CNS neurons and can continue over a period of weeks or months. (Jeffery and Blakemore, 1999, Freeman and Jeffery, 2016)

CLINICAL PRESENTATION

ANNPE is characterized by peracute onset, often lateralized (60% up to 90% of the affected dogs) paresis or paralysis of one to four limbs, depending on the location of the affected spinal cord segment and the extent of the lesion. The clinical signs usually occur suddenly after vigorous exercise or traumatic injury. After an initial short period of deterioration (within the first 24 hours), the clinical status of affected dogs may stabilize or even improve, without specific treatment. The clinical findings are pretty similar to those of ischemic myelopathy (IM). Recent studies had shown that the most common detection of the lesion is located at T3-L3 spinal cord segments, and more specifically the T12-T13, T13-L1 and L1-L2 IVD spaces are most commonly affected, whereas IM is more often at L4-S3 spinal cord segments.(Feen, et al.,2016b, De Decker and Fenn, 2017). Nociception may be present or not and spinal shock is also possible. (Mari, et al., 2019, Cardy, et al., 2015, Feen, et al.,2016 b, Mari, et al., 2017, Full, et al., 2015) There are also cases, where a lesion at C6-T2 spinal cord segments has been reported or in other studies a lesion at C1-C5 spinal cord segments is reported. In addition, despite the fact that any breed can be affected, older large breed dogs are mostly concerned. A breed predisposition has been also referred, with Border Collies and sighthounds (Greyhounds and Whippets) being overrepresented. (Feen, et al.,2016b, Beltran, 2017, De Decker and Fenn, 2017) The exact reason for those predispositions is unknown. It is noteworthy though, that these breeds represent very active and athletic dogs. On the contrary, English Staffordshire bull terriers seem to have predisposition to IM. (Fenn J., Drees R., et al., 2016) It is also important to be mentioned that male dogs are more frequently affected than female dogs. (Feen, et al., 2016, Beltran, 2017,Mari, et al., 2017, De Decker, Fenn, 2017, Mari, et al., 2019) Dogs with ANNPE are significantly older (7.0 ± 2.2 years old) compared to those with ischemic myelopathy (5.9 ± 2.8 years old) and were more likely to have a history of vocalization (62% of the affected dogs) at the onset of clinical signs. Moreover, they may have spinal hyperesthesia (48% of the affected dogs) during the initial examination; this condition is not accompanied by severe or sustained spinal pain, though. (Cardy, et al., 2015, Feen, et al., 2016, Beltran, 2017, De Decker and Fenn, 2017) The fecal incontinence was considered to be another typical clinical finding in dogs with ANNPE compared to those with IM. According to another study though, this opinion seems to be controversial. Fenn J. and his colleagues support that loss of inhibitory upper motor neuron pathways to rectal reflexes, and reduced voluntary control of the external anal sphincter, are more common to IM because ischemic lesions typically affect the central and dorsal portions of the spinal cord, potentially damaging the rectal sensory tracts, whereas ANNPE lesions generally cause contusive damage to the ventral or lateral portions of the spinal cord. They mention as well, that the presence of a lower motor neuron lesion at L4-S3 spinal cord segments that is more frequently met in IM, was not associated with an increased risk of fecal incontinence. (Fenn, et al., 2016b) Some other symptoms that may also be present, are urinary incontinence, and in severe cervical myelopathies, although rare, dysfunction of the respiratory system. (Fenn, et al., 2016b, De Decker, Fenn, 2017)

It is also possible that the extruded hydrated nucleus pulposus has an intradural-extramedullary or intramedullary detection. It is a rare type of intervertebral disk herniation and the number of the published studies in the veterinary literature is limited. (McKee and Downes, 2008, Kent, et al., 2010, Tamura, et al. 2014) The intramedullary nuclear material can be non-degenerated, as it is in the case of ANNPE, or degenerated, as a result of Hansen type I IVD related disease. According to some recent studies, the affected dogs were severely paraparetic or paraplegic and there was lateralization of the signs, that was notable with small differences in motor function or nociception between the two pelvic limbs. (De Risio, 2015)

DIAGNOSTIC PROCEDURE AND DIFFERENTIAL DIAGNOSIS

Differential diagnosis of a paresis/paralysis, following an acute-peracute onset, either after an external trauma or not, includes (Cardy, etal., 2015, De Decker and Fenn, 2017).:1) Acute non compressive nucleus pulposus extrusion (ANNPE), 2) Ischemic myelopathy (IM) or Fibrocartilagenous Embolism(FCE), 3) Hasnen type I IVD (compressive or non-compressive) disease, 4) Vertebral fracture or luxation, 5) Hydrated

nucleus pulposus extrusion (a kind of IVD herniation with predilection for the cervical region) (HNPE).

The MRI is considered to be the gold standard for the diagnosis of ANNPE. (De Decker and Fenn, 2017, Ros, et al., 2017) If MRI is not available or if the owners cannot support this type of examination due to financial reasons, myelography can be proved quiet helpful as well, especially for excluding, acute, compressive mostly, myelopathies. (Ros, et al., 2017) According to several surveys, there are some MRI findings that support a ANNPE diagnosis: (Henke, et al., 2013, Mari, 2017, Fenn, et al., 2016a, De Decker, Fenn, 2017, Trampus, et al., 2018)1) a focal T2-weighted (T2W) intramedullary hyperintensity (IH) overlying a narrowed intervertebral disc. The area of IH on T2-weighted images is often lateralized and it is generally less than one vertebra (2nd lumbar) in length. This has also prognostic role. (Mari, et al., 2019), 2) reduced volume of nucleus pulposus, 3) extradural material compatible with hydrated nucleus pulposus, causing no spinal cord compression (SCC) or compression less than 10 per cent (Ros, et al., 2017), 4) a non-longitudinal directional pattern of the T2W IH originating from an intervertebral disc, often lateralized. We can measure the area of maximal IH (cross-sectional area) and compare it to the area of the normal spinal cord at the same level, on transverse T2W images. If this ratio is greater than 40%, it has a positive association with fecal and urinary incontinence, according to a study. (Mari, et al., 2019), 5) a cleft in the dorsal part of the annulus fibrosus and 6) meningeal/epidural contrast enhancement in post-contrast T1-weighted (T1W) fat-suppressed images. (Mari, et al., 2017)

According to a study of Fenn J and his colleagues, the following from the aforementioned criteria are those with the strongest inter and intraobserver agreement: (Fenn, et al., 2016a)

- a hyperintense lesion overlying an intervertebral disk,
- reduced volume of nucleus puplosus,
- extradural material or signal change and
- intervertebral disk space narrowing.

On the other side, MRI diagnostic criteria for IM include a focal, well demarcated intramedullary T2W hyperintense lesion, mainly affecting grey matter, with the absence of the above mentioned criteria used for ANNPE diagnosis. (Fenn, et al., 2016a, Mari, et al., 2017)

In the case of intradural and extra-/intramedullar intervertebral disk herniation, the MRI pattern is pretty similar to the one in extramedullar ANNPE.(De Risio L., 2015) De Risio L. and her colleagues noticed additionally, a linear tract (predominantly hyperintense on T2-weighted images, iso- to hypointense on T1-weighted images and hypointense on T2*-weighted images) extending from the intervertebral disk into the spinal cord parenchyma. This finding has been suggested from the authors to be specific for intramedullary nucleus pulposus extrusion. The sample though was small, as it has been reported only in two dogs and two cats, to be considered as a gold standard. CT myelography may be more sensitive for diagnosing the intradural, extra-/intramedullar nucleus extrusion, particularly when the nucleus pulposus is detected intradurally extra- /intramedullary, as it shows focal accumulation of iodinated contrast medium within the subarachnoid space and/or within the spinal cord parenchyma and maybe a filling deficit in the center of it, the so called “golf tee sign”. (Tamura, et al. 2014). Furthermore, it helps with the identification of nucleal material in the dilated subarachnoid space, it allows differentiation between hydrated and calcified nucleus pulposus material and differentiation from hemorrhage. In CT myelography or myelography, it is also possible to detect an extradural leakage of iodinated contrast medium, suggestive of a dural tear. (De Risio L., 2015) That was also supported by a report, where communication between subarachnoid space and intervertebral disk space after traction views in myelography, was detected. (McKee, Downes, 2008)

Myelography may reveal a small, focal extradural lesion overlying an intervertebral disk, with an adjacent intramedullary pattern because of focal spinal cord swelling. It can also be used to exclude compressive spinal conditions, such as Hansen type I IVD extrusion. However, it will not allow accurate differentiation between ANNPE and other causes of intramedullary lesions such as IM. (De Decker and Fenn, 2017)

Plain radiography and computed tomography do not allow an accurate diagnosis of ANNPE. They can only exclude the causes of the differential diagnosis that demand urgent surgical intervention. More precisely, CT is a good option for excluding Hansen type I intervertebral disc extrusion and is the diagnostic imaging modality of choice for excluding vertebral fractures and subluxations. (De Decker and Fenn , 2017)

ANNPE is differentiated from Hansen type I IVD disease, according to the following clinical findings: Hansen type I IVD disease has usually an acute instead of peracute onset and the clinical signs often present a deterioration after the first 24 hours of the onset. The spinal hyperesthesia is more common to these animals and the clinical findings are usually bilateral and not so obviously lateralized as in ANNPE. The diagnostic imaging plays the most important role to the differentiation. (Cardy, et al., 2015, De Decker, Fenn, 2017) When cervical myelopathy is the presenting complain, the clinician should include in the differential diagnosis the compressive hydrated nucleus pulposus extrusion (HNPE), a type of minimal to non-degenerate nucleus pulposus extrusion, with acute onset (<24h), which can be in various degrees compressive. In the contrary to ANNPE, the onset of the clinical signs is rarely associated with intense physical exercise or trauma. The neurological deficits are usually symmetric. Some MRI criteria that help to distinguish this disease: (De Decker and Fenn, 2017) 1) Ventral, midline, extradural compressive material, homogenous, hyperintense on T2W images and the nucleus pulposus is isointense to normal in all sequences, nondegenerate and lies immediately dorsal to the affected IVD. 2) The characteristic bilobed or "seagull" appearance of the compressive material could be explained by the location of the compressive material ventral to the apparent intact dorsal longitudinal ligament. 3) The affected IVD space is narrowed, the volume of nucleus pulposus is reduced and the dorsal aspect of annulus fibrosus is ill-defined. 4) Focal intraparenchymal hyperintensity can be detected in the overlying spinal cord, suggestive of spinal cord contusion, and the extruded material can demonstrate variable degrees of contrast enhancement. Post contrast enchanced CT can also provide some useful information regarding differentiation of Hansen type I IVD extrusion and HNPE. (De Decker and Fenn, 2017, Nessler, et al., 2018)

All the above mentioned parameters can help us to form a presumptive diagnosis. However a definitive diagnosis can only be achieved through histologic examination of extruded non-degenerate nucleus pulposus material from the vertebral canal, either postmortem or during surgery. (Feen, et al., 2016b, De Decker and Fenn, 2017,)

TREATMENT

The treatment of ANNPE involves usually conservative management (nursing care and activity restriction) as there are no efficient neuroprotective treatments That includes: Restricted activity (cage rest or walk with short lead), for a 4 to 6 week period. (De Risio, 2015, De Decker and Fenn, 2017) Nursing care, which consists of: 1) Manual bladder expression or urinary catheterization, if urinary incontinence is suspected (Henke, et al., 2013, De Decker and Fenn, 2017) In some clinics catheterization is a standard procedure in nonambulatory, severely paraparetic or paraplegic dogs independent of their urinary function. (Mari, et al., 2019). 2) Monitoring and management of respiratory dysfunction in severe cervical myelopathies, which includes turning recumbent patients every 4 hours to avoid lung atelectasis or accumulations of secretions (De Decker and Fenn, 2017). 3) Due to prolonged recumbency we can have the following consequences: urine scald, pressure sores, and decubital ulcers. To prevent this from happening we could turn the recumbent patient every 4 hours and keep him/her on a dry and soft place. (De Decker and Fenn, 2017). 4) Nutritional support to conserve body condition and sustain physical rehabilitation (De Decker and Fenn, 2017). 5) Physical rehabilitation. That is an important supportive method for the recovery of patients with spinal cord injuries that enjoys increasingly recognition. The severity of neurologic dysfunction will will determine the requirements of physical therapy. Its purpose is practically to retain joint range of motion, to eliminate muscle atrophy, and to prevent patient´s discomfort. (Henke, Gorgas, et al., 2013, De Risio L., 2015, De Decker and Fenn, 2017) The physiotherapy program must fit to the restrictive activity if the latter is indicated.(Thomas et al., 2014) 6) Underwater treadmill training or swimming can be also helpful during the recovery period. (Henke, et al., 2013)

In case of spinal hyperesthesia (48% to 57% of the patients), analgesia may be needed for the first few days. (De Decker and Fenn, 2017) Anti-inflammatory medications, such as steroids at anti-inflammatory doses or nonsteroidal anti-inflammatory drugs, can be administered initially for pain relief, but it should be mentioned that these medications do not have any significant protective effect on the spinal cord. (Dewey and da Costa, 2016, Mari, et al., 2019)

When the patient has difficulties with micturition, medication including (diazepam, prazosin, and phenoxybenzamine) may also be usefull, aiming to reduction of the internal/ external urethral sphincter tone. (Sharp and Wheeler 2005, Mari, et al., 2019).

Surgical procedure may be considered in some

cases, especially when the presumptive diagnosis is intradural/extramedullary nucleus pulposus extrusion and may result in good outcome and prognosis. (Sanders, et al., 2002, Liptak, et all., 2002, Kent, et al., 2010) Moreover, in some cases, surgery is performed as exploratory procedure as there is not yet a diagnostic procedure capable to estimate the volume of intradural/extramedullary or intramedullary extruded intervertebral disk material and to associate it with the degree of spinal cord compression. (De Risio, 2015) Further investigation should take place, in order evidence based guidelines, that would suggest in which cases the surgical procedure would be profitable, to be developed. (De Risio, 2015) Obviously, in case of compressive TIVDE a surgical decompression, through hemilaminectomy or ventral slot, according to the detection of the extrusion, is applied. (Henke, et al., 2013)

OUTCOME

The prognosis for ANNPE is generally favorable if the nociception is present. (Platt and Olby, 2004, Dewey and da Costa, 2016,) Almost the three quarters of the affected dogs recover successfully. Severity of neurologic dysfunction, which can be presented as non-ambulatory para-/tetraparesis or para-/tetraplegia and especially when combined with absent nociception, are negative prognostic factors for both the ambulation and incontinence. (Platt and Olby, 2004) There are several studies, for example the one by Lorenzo Mari and his colleagues that support it. To this study the successful outcome was defined as the ability of unassisted ambulation and complete urinary and fecal continence. It's worth saying that plegic dogs it's hard to regain complete normal gait. (Mari, et al., 2017, De Decker and Fenn, 2017) Although there is a debate to if patients with ANNPE or FCI are more prone to develop fecal incontinence, the vast majority regain continence in the long-term. (Fenn, et al., 2016, Mari, et al., 2017) Some MRI findings such as a lesion affecting a large area of the spinal cord, a large cross-sectional area of the lesion or a hypointense intramedullary signal are negative prognostic factors. (Mari, et al., 2017). Moreover, intramedullary lesions accompany often a poor outcome. There are some limited case reports though, supporting that with the appropriate decompression and management, a successful outcome may be achieved. (Sanders, et al., 2002) There are also three case reports by T. G. Yarrow and N. D. Jeffery, which support that the prognosis after dural laceration following a peracute spinal cord injury appears reasonably good, but some persistent loss of function usually remains. Therefore, diagnosis of dural laceration should not automatically lead us to a poor diagnosis. (Yarrow and Jeffery,2000)

AND NOW WHAT ABOUT CATS?

INTRODUCTION-CLINICAL PRESENTATION

The ANNPE is not well described in cats. However, it is tended to be considered that the pathophysiology, the clinical presentation and the case management is similar to the one in dogs. (Dewey and da Costa, 2016) There are only four case reports (Lu, et al., 2001, McConnel and Garosi, 2004, Chow, et al., 2012, Adams, et al., 2014) and a retrospective study (Taylor-Brown, De Decker, 2015) to our knowledge. The study of Taylor-Brown and De Decker, (2015) analyzes the management and the outcome of 11 cats with presumptive ANNPE. Seven were domestic shorthair cats, followed by three domestic longhair, an Egyptian Mau and a British Shorthair. The median age was 7 years old and the most of them were male neutered. All of them had a peracute onset of clinical signs, with the three quarters experiencing witnessed or suspected external trauma, such as a road-traffic accident or fall from height. The affected spinal cord segments were mostly the T3-L3 (7/11).The clinical signs were non-progressive. Three of the cats in this study had no deep pain sensation. Some of them presented urinary and fecal incontinence. Interesting is that on the contrary to dogs, cats most often are presented with symmetric instead of lateralized clinical signs. Five out of the 11 cats presented spinal hyperesthesia in this study. (Taylor-Brown and De Decker, 2015). A 90% of them were presented with paraplegia or non ambulatory paraparesis. (Taylor-Brown, De Decker, 2015). According to another report, obesity may predispose to ANNPE in cats. (Chow, et al., 2012)

DIAGNOSTIC PROCEDURE AND DIFFERENTIAL DIAGNOSIS

The differential diagnoses for cats presented with an acute or peracute onset of paresis or plegia includes: aortic thromboembolism, ischemic myelopathy, fibrocartilaginous embolism (FCE), intervertebral disc extrusion, and vertebral fractures and luxations. (Taylor-Brown and De Decker, 2015, Mella, et al., 2019) Vertebral fractures and luxations are generally considered the most important differential diagnosis for cats presenting with a peracute onset of spinal cord dysfunction after a witnessed or suspect-

ed traumatic event. (Taylor-Brown and De Decker, 2015) According to signalment, ischemic myelopathy occurs most often in older cats with a stable or improving, non-painful, lateralizing, C6–T2 myelopathy, IVD disease most often occurs in middle aged, purebred cats, with a normal general physical examination and an acute onset of painful and progressive clinical signs, spinal fracture/luxation occurred mostly in younger cats, leading most often in a peracute onset, of a painful, non-ambulatory neurological status. (Mella, et al., 2019). MRI revealed ANNPE findings as defined for the dog as well (Chow, et al., 2012, Taylor-Brown and De Decker, 2015): 1) a reduction in volume of the T2W hyperintensity of the nucleus pulposus signal, 2) very focal, T2W hyperintense intramedullary lesions involving both grey and white matter regions, within the spinal cord overlying an intervertebral disc space (Taylor-Brown and De Decker, 2015), which may help us to differentiate it from FCE, because MRI findings suggesting FCE: affect grey matter mainly, (Lesion‘ s Length: L2) ratio is greater, and the lesion is often lateralized to correspond with the vascular supply to the spinal cord, (Chow, et al., 2012) 3) mild narrowing of the intervertebral disc space, and (Taylor-Brown and De Decker, 2015), 4) extraneous material or signal change within the vertebral canal with absent or minimal spinal cord compression. (Taylor-Brown and De Decker, 2015) Moreover, in five of the 11 cats from the study above mentioned (Taylor-Brown and De Decker, 2015), there was also evidence of ill-defined T2-weighted hyperintensity within the epaxial musculature compared with surrounding muscle suggestive of contusion, hemorrhage or oedema. Definitive diagnosis, as also referred for dogs requires histopathological identification of nucleus pulposus material within the spinal canal, which can be achieved either post mortem or during surgery. (Chow, et al., 2012)

TREATMENT

The treatment is based on supportive care, which includes: 1) Cage rest (Chow, et al., 2012). 2) Physiotherapy (massage, passive range of motion exercises, assisted standing and exercises to develop strength and coordination). 3) In case of spinal hyperesthesia analgetic medication for pain relief can be profitable. That includes opioids, non-steroidal anti-inflammatory drugs and gabapentin. 4) Bladder management: manual bladder expression, indwelling catheter placement or intermittent catheterization. 5) A sympatholytic medication (here prazosin, an a1-blocker) can also be proved quite helpful in bladder management. (Taylor-Brown and De Decker, 2015)

OUTCOME

The outcome is generally good, with almost 90% of the affected cats returning to ambulation with urinary and fecal continence, except one cat that in the long term had permanent urinary and intermittent fecal incontinence according to Taylor-Brown and her colleagues. All the cats that were initially non-ambulatory regained ambulation within a median time of 17 days (range 6–21 days). However none of them had become completely neurologically normal. There is also a case report which supports this outcome. (Chow, et al., 2012) There was no sign of further improvement after the first 6 months. (Taylor-Brown and De Decker, 2015)

CONFLICT OF INTEREST

None declared by the authors.

Fig. 1: Sagittal T2W image of the spinal cord of a 7yo acutely paralyzed Cane Corso dog. There is reduced nucleus volume of the L1-L2 intervertebral disc and focal intramedullary hyperintensity (arrow) over the L1-L2 disc space

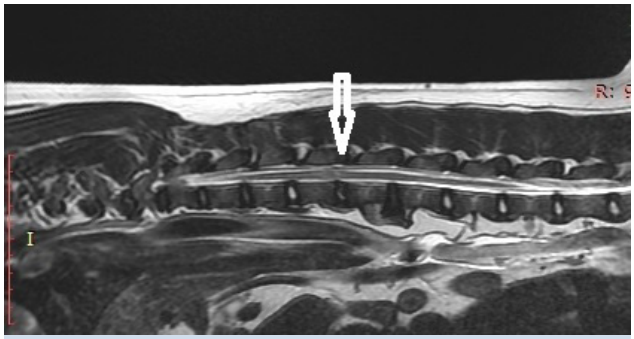

Fig 2: Axial T2W image of the spinal cord of the same dog. The axial image shows mild spinal cord compression by extradural material (arrow) compatible with hydrated nucleus pulposus at the same level L1-L2

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