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FOUR LEG NEWS

Introduction -

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Welcome to the **NEUROLOGY UPDATE** edition of Four Leg News! I like to try to compile topics into categories, so we can all get smarter on a single topic at any given time. So in this newsletter, we'll compare intervertebral disc extrusions in Cocker Spaniels vs Dachshunds. We'll delve into diskospondylitis in young dogs and post-operative dogs. Then we'll look at acute noncompressive nucleus pulposus extrusion (ANNPE) and compare it to ischemic myelopathy. Lastly a little bit about fibrocartilaginous emboli! Lots of articles reviewed and packed into this edition. There's a bit of heavy reading in here... so put on your thinking caps!

Oh, and Happy St. Patrick's Day too!

Cheers! Laurie



Characterization of IVDEs in Cocker Spaniels in comparison to Dachshunds

Cardy T., Tzounos C., Volk H., & De Decker S. *Clinical characterization of thoracolumbar and lumbar intervertebral disk extrusions in English Cocker Spaniels*. JAVMA, 248(4) pp. 405-412, 2016.



Objective:

English Cocker Spaniels have been identified as one of the 7 breeds most likely to suffer from intervertebral disk extrusions (IVDE). Dachshunds, also predisposed to this condition, are over represented in the research surrounding thoracolumbar and lumbar IVDEs. The purpose of this study was to characterize the clinical signs of IVDEs in Cocker Spaniels as compared to Dachshunds.

Methods:

A retrospective study of a sample of the veterinary records of 81 English Cocker Spaniels and 81 Dachshunds diagnosed with IVDEs was selected, specifically, those dogs with clinical signs indicating the affected vertebrae between T9 and S1. Criteria included neurologic examination results and diagnostic imaging.

The following information was pulled from the veterinary records:

Signalment, duration, type, and severity of clinical signs. Findings of general physical and neurological examinations, type and presence of neurological deficits, and treatments received. The results of diagnostic tests including diagnostic imaging.

Diagnostic imaging results were used to categorize IVDEs by location into three groups, thoracolumbar (T9-10 through L1-2), mid-lumbar (L2-3 through L4-5), and caudal lumbar (L5-6 through L7-S1).

Treatment outcome data was collected for the Cocker Spaniel sample only. Treatments on record included surgical hemilaminectomy or dorsal laminectomy followed by four weeks of restricted exercise with physiotherapy and anti-inflammatory medication as per the individual case. Non-surgical interventions included strict crate rest for 4-6 weeks with medication as per the individual case.

Short term follow up results were recorded from the medical records, and for those dogs reasonably thought to still be living, owners were contacted for longer term follow up surveys.

Treatment was considered successful in cases where the dog could ambulate independently, control bowel and bladder, and be considered by their owner to be pain free in daily life.

Results/Conclusions:

Comparisons of the results between the breeds showed that the cocker spaniels had a greater likelihood of IVDEs in the mid-lumbar and caudal lumbar spine, while dachshunds were more likely to have IVDEs in the thoracolumbar spine.

88% of cocker spaniels in this study were treated surgically (71/81). Three of surgically treated cocker spaniels were euthanized prior to discharge due to lack of improvement following surgery. Of those

discharged after surgery, 91% were ambulatory (62/68). All medically managed dogs that did not receive surgery were ambulatory at discharge and one of the surgically treated dogs was euthanized two weeks following surgery due to lack of improvement.

Short term follow-up results were available for 63 dogs total (55 treated surgically and 8 medically managed), and of those 91% of the surgically treated dogs were ambulatory and 100% of the non-surgical cases were ambulatory. 16% of the surgically treated dogs were considered neurologically normal at this time, and 1 / 8 of the medically managed dogs was considered neurologically normal. Long term followup (ranging from 5 months to 9 years and 5 months) was only available for 54 of the surgically managed cases. Of these, 91% were considered successfully treated with minimal to no neurological deficits, and 9% were considered unsuccessful.

Location of the IVDE had a significant association with outcome following, specifically those with caudal lumbar IVDEs were ambulatory sooner, and hospitalized for a shorter length of time on average, and in the short term follow-up period they were more likely to be neurologically normal. However, the study also showed the dogs with caudal lumbar IVDEs were treated for a longer period of time prior to being referred for care directly related to the spine. The reason may be the difference in the presentation of symptoms, since chronic unilateral lameness and a greater likelihood that these dogs test neurologically normal might make it difficult to differentiate the IVDE symptoms from other orthopaedic conditions and that caudal lumbar IVDE may be under diagnosed in the English Cocker Spaniel. Surgical treatment of the caudal lumbar IVDEs was complicated by morphological changes in the spinal nerves and tissue, suggesting that early diagnosis and intervention is important.

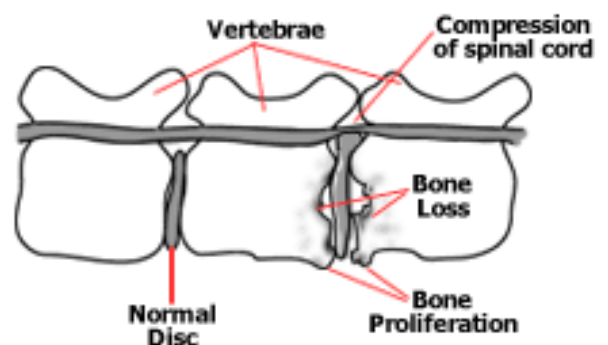
Juvenile Diskospondylitis

Kirberger R. *Early diagnostic imaging findings in juvenile dogs with presumed diskospondylitis: 10 cases* JAVMA, 249(5) pp. 539-546, 2016.

Diskospondylitis is seen most commonly in dogs aged 5 to 9 years. It is an infection of the intervertebral disk and adjacent vertebral end plates. Symptoms can include spinal hyperesthesia, stilted gait, appetite and weight loss, signs of depression, fever, and paresis. The causes of the infection can be found using blood, bone, and urine cultures to identify bacterial infections. The most common bacteria identified in dogs with diskospondylitis is *Staphylococcus aureus*. In juvenile dogs the condition has been found following infection with parvovirus as a secondary infection of joints and the spine due to the damage parvovirus causes to the intestinal tract.

Diagnostic imaging of dogs affected by diskospondylitis show initial vertebral end plate irregularities, followed by collapse of the intervertebral disk space, vertebral end plate sclerosis, and then eventually ventral spondylolysis. During the healing phase the disk space fills with new bone and the vertebrae fuse.

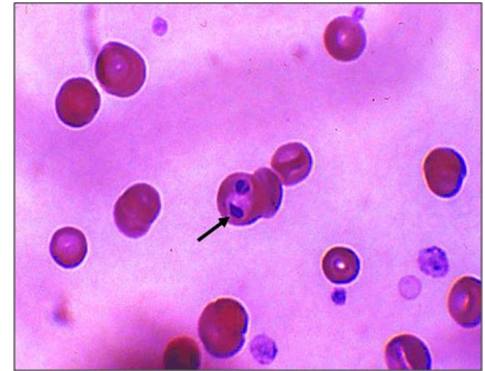
Objective:



The purpose of this study was to describe the findings of early radiographic, ultrasonographic, and CT imaging in juvenile dogs with suspected diskospondylitis.

Methods:

A retrospective study of 10 dogs aged under 6 months with a presumptive diagnosis of diskospondylitis with a mean age at diagnosis of 14.7 weeks, and a mean follow up period of 6 weeks. All dogs in the study had a history of hospitalization and received treatment for a primary condition, and 6 of these dogs received radiographic diagnostic imaging at this time. Three of the dogs were treated for parvovirus, one for blunt force trauma resulting in a fracture to the last caudal vertebra, one for blunt force trauma that resulted in fractures of the tibia and fibula, two for bite wounds (dog bites), one had for a presumed upper motor neuron deficit affecting the pelvic limbs resulting in lameness, one dog for a tibiotarsal joint infection, and one for babesiosis (a tick-borne microscopic parasite that infects red blood cells). The two dogs affected by blunt force trauma and the two dogs with the bite wounds initially showed no evidence of spinal cord involvement.



Babesia canis (arrow) within a red blood cell

Results/Conclusions:

After presumed successful treatment and discharge for the primary condition all the dogs selected for the study returned to the hospital (at a timeline ranging from 5 - 21 days) due to signs of pain affecting the vertebral column. Radiographs for all dogs were obtained at this initial visit. 8 of the 10 dogs showed radiographic changes indicating a collapse of intervertebral disk spaces, and the remaining 2 dogs (who did not show radiographic changes on the initial visit) showed evidence of intervertebral disk space collapse in follow-up images taken two weeks later.

All affected disk spaces in all dogs were narrowed and all narrowed disk spaces were associated with lysis of the adjacent vertebral epiphysis (seen in radiographs taken 4 - 34 days following initial examination for pain). 9 of the 10 dogs had follow up radiographs after this, showing that 4 of them developed metaphyseal lysis typical of that seen in adult dogs with diskospondylitis. Interestingly, the caudal aspect of the cranial vertebra subluxated dorsally relative to the cranial aspect of the caudal vertebrae in 5 dogs, in 8 of 10 narrowed thoracic and lumbar disk spaces. No subluxations were observed in affected cervical disks.

Four of the dogs had ultrasonography at this initial visit and all four of those dogs showed typical ultrasonographic changes typical of diskospondylitis at that time, including ventrally bulging tissue at the affected disk space. In two of these four dogs, ultrasonographic changes were evident before radiographic changes.

These same four dogs also received CT scans. These did not show narrowed disk spaces, but did show subluxations and detectable bony lysis. Volume rendered CT images for 3 dogs scanned at their initial visit showed differences in density in the affected disk areas corresponding with abnormalities identified with ultrasonography but prior to becoming identifiable on radiographs. A fourth dog, scanned only after

successful treatment, did not show these density differences, which may indicate that this test can be used to determine effectiveness of treatment.

These findings are atypical of diskospondylitis when observed in adult dogs. Specifically, the typical vertebral endplate lysis was not detectable on radiographs as it is in adult dogs until more advanced stages. This may be due to differences in density of the structures due to immaturity. Since these are usually the earliest signs of diskospondylitis in adult dogs, juvenile dogs at risk of diskospondylitis may benefit from ultrasonography and CT scans that detect changes before they are evident on radiographs.

Postoperative Spondylodiskitis

Canal, S., Contiero, B., Balducci, F., Calo, P., Bernardini, M., *Risk factors for diskospondylitis in dogs after spinal decompression surgery for intervertebral disk herniation. JAVMA, 248(12) pp. 1383-1390, 2016.*

Objective

Incidents of postoperative spondylodiskitis (POD) in humans has increased with the number and type of surgical procedures being done. Postoperative diskospondylitis (POS), considered a possible equivalent condition in veterinary medicine, may also be on the rise as spinal surgeries become more widely practiced on dogs and may have similar risk factors as those seen in people. This study seeks to identify the frequency of and risk factors for POS in dogs.

Methods

A retrospective single cohort study of dogs that have undergone spinal decompression surgery (a sample size of 372). The surgeries were all performed by the same surgeon at the same facility. They were separated into two categories based on whether the anatomical approach was dorsal or ventral.

Diagnostic images of dogs diagnosed with POD were examined and showed structural changes typical of diskospondylitis. Dogs were examined daily during hospitalization, 10 to 14 days after surgery, and then monthly after that for 3 months.

Results

Of 372 dogs included in the study 8 (2.2%) developed POD. The following factors showed significance for risk:



Breed - German shepherd dogs were 9.8 times as likely to develop POD as the other breeds in the study.

Age - Dogs over 8.8 years of age were at a higher risk.

Size - Dogs over 20 kg were more likely to develop POD (body condition score was not recorded for the dogs in this study and therefore this refers simply to size, not to whether the dog was overweight or not).

Type of IVDH - Dogs with disk protrusion were 4.5 times as likely to get POD as dogs with disk extrusion.

The primary symptom of POD in all cases was a return of pain a few weeks after surgery, after an initial period of improvement. The authors of the study urge careful monitoring of post op patients for this clinical sign and an awareness of the potential risk factors of breed, age, size, and type of IVDH.

ANNPE vs Ischemic Myelopathy

Specchi, S., Johnson, P., Beauchamp, G., Masseau, I., Pey, P., *Assessment of interobserver agreement and use of selected magnetic imaging variables for differentiation of acute noncompressive nucleus pulposus extrusion and ischemic myelopathy in dogs.* JAVMA, 248(9) pp. 1013-1021, 2016.

Acute noncompressive nucleus pulposus extrusion (ANNPE) and ischemic myelopathy are two different conditions with very similar clinical signs. Dogs affected by both these conditions show acute onset, focal, and non-progressive neurological signs that are associated with spinal cord dysfunction. Antemortem differentiation of these two conditions can be difficult due to the similarities in clinical signs.

Objective

To identify and evaluate the interobserver agreement on presumptive diagnosis of ANNPE vs ischemic myelopathy using MRI alone to determine identifying criteria in MRI findings that can be used to enhance the diagnoses of both conditions.

Method

A retrospective observational study of 20 dogs showing the clinical signs of ANNPE (14) or ischemic myelopathy (6) with a presumptive diagnosis of either, respectively.

Three blinded observers (board certified veterinary radiologists) were given the MRIs of 20 dogs that had previously been diagnosed and treated for ANNPE or ischemic myelopathy. Several MRI features of interest previously thought to be characteristic of either ANNPE or ischemic myelopathy

were examined, and interobserver agreement assessed, including on presumptive diagnosis between the two given options on which basis the dogs were divided into two groups.

In addition to a review of level of agreement on previously identified MRI indicators the authors of this study performed an assessment of postcontrast T1W FS sequences and T2W images to see if differences could be used to provide further criteria for presumptive diagnosis.

Results

There was perfect agreement in both groups on the presence of specific previously identified features of both conditions and fair to perfect agreement on the presence or absence of criteria previously shown to differentiate between the two conditions.

New findings in regards to the T1W FS sequences found that all dogs with an ANNPE diagnosis showed meningeal contrast enhancement with epidural fat enhancement and/or intramedullary spinal cord enhancement. The dogs presumptively diagnosed with ischemic myelopathy did not. This result may be due to inflammation caused by the traumatic extrusion of the hydrated disk material and the subsequent revascularization of the disk material in the epidural space.

All dogs with a presumptive diagnosis of ischemic myelopathy (6) had intramedullary hyperintensity on T2W images with a longitudinal directional pattern only. Dogs in the ANNPE group also had intramedullary hyperintensity but with oblique or vertical directional pattern in 9 dogs (of 13) and longitudinal in only 4.

Additionally there was a discrepancy in length of the hyperintensity signal between the two conditions. This was attributed to the differences in cause of the two conditions (focal trauma vs regional vascular compromise).

Overall the results showed the MRI findings could be used to differentiate between the two conditions, and provided additional criteria for both using the T1W FS sequences and the T2W images.

The need for consistent criteria to differentiate these clinically similar conditions can be demonstrated by the following study, completed using a similar sample group of dogs.





Fenn, J., Drees, R., Volk, H., De Decker, S., *Comparison of clinical signs and outcomes between dogs with presumptive ischemic myelopathy and dogs with acute noncompressive nucleus pulposus extrusion.* JAVMA, 249(7) pp. 767-775, 2016.

Objectives

To compare the clinical signs and long term outcomes following treatment of dogs with presumptive acute noncompressive nucleus pulposus extrusion (ANNPE) vs presumptive ischemic myelopathy.

Method

A retrospective study of 93 dogs previously treated for presumptive ANNPE or ischemic myelopathy. The dogs were divided into groups by presumptive diagnosis based on perfect agreement by blinded radiologist and

neurologist findings on the respective presumptive diagnosis. 51 were placed in the ischemic myelopathy group and 42 in the ANNPE group.

Differences in clinical signs and long term outcomes were observed.

Results

The study found a few significant differences in clinical signs and long term outcomes between the two conditions.

Vocalization at onset of symptoms was 2.5 times more likely in cases of ANNPE and spinal hyperesthesia at the initial examination was 3.0 times more likely in this group. Dogs that showed both these clinical signs together were 6.5 times as likely to have a presumptive ANNPE diagnosis.

Duration of hospitalization, time to first signs of improvement, and time to independent urination was not significantly different between the two groups. However, dogs with ANNPE were 2.9 times more likely to be independently ambulatory on discharge from the hospital indicating a faster recovery of neurologic function for dogs with ANNPE.

Long term follow-up information indicated that successful outcomes in both cases occurs at a rate of about 73.8% with no significant difference between the groups. However, long term fecal incontinence is 8.3 times as likely in dogs with ischemic myelopathy, possibly due to the greater occurrence of upper motor neuron lesions in cases of ischemic myelopathy.

Fibrocartilaginous Emboli

Nakamoto, Y., Ozawa, T., Katakabe, K., Nishiya, K., Yasuda, N., Mashita, T., Morita, y., Nakaichi, M., *Fibrocartilaginous Embolism of the Spinal Cord Diagnosed by Characteristic Clinical Findings and Magnetic Resonance Imaging in 26 Dogs* Journal of Veterinary Medical Science, 71(2) pp. 171-176, 2009.

Objective

To describe the clinical and diagnostic findings of dogs with a presumptive diagnosis of fibrocartilaginous embolism (FCE) using MRI.

Method

26 dogs presenting with clinical signs of acute nonprogressive ataxia were diagnosed with FCE based on clinical signs and MRI. MRI were evaluated for spinal cord compression, degenerative disks, and parenchymal lesions.

Results

All dogs observed had abnormal MRI scans. Scans showed focal, hyperintense, sharply demarcated intramedullary lesions involving primarily the grey matter on T2-weighted FSE images and hypointense or normal grey matter and a reduction of intervertebral matter in both cranial and caudal segments within two segments of the lesion on T1-weighted SE images.

Lesions were located predominantly at T3-L3 and C1-5, with the fastest recovery seen in dogs with T3-L3 lesions and second fastest recovery in dogs with C1-5 lesions.



TAKING CARE OF THE OWNER

All of the information presented in the newsletter thus far has been very academic. I just want to take a moment to get everyone thinking about the owner, and the anxiety that he or she will be feeling in cases such as those described. First off, owners are scared as heck when seeing their dog become wobbly, weak, or worse, paralyzed! They're worried that 'this is the end'! It's important to explain to them (in common language) what's going on, and take your time to do so! It's also important to give them hope (or rather, not take it away from them)! A neurologic specialist, who's cases we periodically see, has a way of leaving people scared, hopeless, and distraught after he sees their dogs. We had one client name him "Dr. Doom & Gloom". On multiple occasions, we have helped clients through a difficult neurologic episode with their dog, or pointed them in the direction of someone who can offer a unique perspective and treatment plan (i.e. a fabulous holistic vet). Many a client has thanked us for giving them back their 'hope'! So, it's great to know all of this information, and it's great to educate the owner and ensure that their expectations are realistic, but be sure to keep their 'hope' intact so long as there is a window of opportunity for improvement!



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Visit www.fourleg.com

Drop me a line! Send me your questions!



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