Spontaneous regression of lumbar Hansen type 1 disk extrusion detected with magnetic resonance imaging in a dog

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Case Description—A 3-year-old French Bulldog was evaluated because of acute signs of back pain and spastic paraparesis.

Clinical Findings—Neuroanatomic localization indicated a lesion in the T3-L3 spinal cord segment. Magnetic resonance imaging revealed extradural spinal cord compression at the ventral right aspect of the intervertebral disk space L3-4. On the basis of these findings, a diagnosis of sequestrated Hansen type 1 disk extrusion without extradural hemorrhage was made.

Treatment and Outcome—The dog was treated conservatively with cage rest, restricted exercise on a leash, and NSAIDs. Results of follow-up examination 5 weeks later indicated complete resolution of clinical signs, and results of repeated MRI indicated a 69% reduction in the volume of the herniated disk material.

Clinical Relevance—Findings for the dog of this report indicated spinal cord compression attributable to extruded intervertebral disk material resolved. Functional improvements in dogs with such problems may be partly attributable to spontaneous regression of intervertebral disk extrusions. (J Am Vet Med Assoc 2014;244:715–718)

A 3-year-old 9-kg (19.8-lb) sexually intact male French Bulldog was referred to the neurology service of the Vetsuisse Faculty of the University of Zurich because of gait abnormalities and signs of pain that developed acutely 48 hours before. No traumatic events had been observed. The dog did not have a history of previous illness, and findings of physical examination were unremarkable. Results of neurologic examination indicated the dog was ambulatory with spastic paraparesis of the hind limbs. Proprioception was decreased in right and left hind limbs (right more affected than left), and spinal reflexes were exaggerated bilaterally. Severe signs of pain were detected during palpation of the lumbar portion of the vertebral column, and vertebral were in a kyphotic position. No history of urine retention was reported, and palpation revealed the urinary bladder was moderately filled. The cutaneous trunci reflex was normal on the left side and absent on the right; the caudal extent of the reflex was the level of the fourth lumbar vertebra. Neuroanatomic localization of the lesion was determined to be in the T3-L3 spinal cord segment. The degree of neurologic impairment was graded as 2 of 5 on the scale of Sharp and Wheeler.1

The primary differential diagnoses included herniation of a degenerated intervertebral disk or vascular myelopathy resulting in spinal cord infarction or hemorrhage. Inflammatory and neoplastic diseases were considered less likely on the basis of the history and signalment of the dog. Results of hematologic and serum biochemical analyses were within reference ranges.

The dog was premedicated with an IV bolus of fentanyl and anesthetized with propofol. After endotracheal intubation, anesthesia was maintained with isoflurane in oxygen and anesthetic device.2 The MRI included T2-weighted turbo spin echo sagittal (echo time, 100 milliseconds; repetition time, 3,069 milliseconds; number of signal averages, 1; echo train length, 17; slice thickness, 2.5 mm; interslice gap, 0.75 mm; field of view, 234 mm; matrix, 598 X 461), T2-weighted turbo spin echo transverse (echo time, 8 milliseconds; repetition time, 2,073 milliseconds; number of signal averages, 3; echo train length, 5; slice thickness, 3 mm; interslice gap, 0.3 mm; field of view, 180 mm; matrix, 400 X 310), T2*-weighted fast field echo transverse (echo time, 16 milliseconds; repetition time, 33 milliseconds; flip angle, 7°; number of signal averages, 2; echo train length, 1; slice thickness, 2 mm; field of view, 180 mm; matrix, 328 X 274), and T1-weighted turbo spin echo transverse (echo time, 90 milliseconds; repetition time, 573 milliseconds; number of signal averages, 1; echo train length, 19; slice thickness, 3 mm; interslice gap, 0.3 mm; field of view, 180 mm; matrix, 400 X 299) sequences obtained before and after IV administration of contrast medium.3 The nuclei pulposi of the lumbar intervertebral disks had moderate, inhomogenous signal loss in T2 sequence images, and the width of the intervertebral disk space at L3-4 was moderately narrowed (Figure 1). A moderate amount of material with variable, low T1- and T2-sequence signal intensity was detected in the ventral right aspect of the vertebral canal at the level of the intervertebral disk space at L3-4 and extended caudally (Figure 2). To calculate the volume of the extruded disk material and the spinal cord, the images were exported to a computer workstation.4 Areas of interest were manually drawn around the areas of intervertebral disk material, spinal cord, and vertebral canal by one of the authors (MD). The volume was calculated by multiplication of the cross-sectional area by the MRI image slice thickness. The intervertebral disk material had an approximate volume of 0.16 cm3, and the area was 27.3% of the area of the vertebral canal at the level of the maximal size of the extruded material. The spinal cord area was 49.2% of the area.
of the vertebral canal at that same level, and the remainder of the area of the vertebral canal contained epidural fat and vasculature. The spinal cord had normal MRI signal intensity, was displaced dorsally and to the left, and was mildly compressed. The linings of the dorsal and ventral aspects of the subarachnoid spaces were interrupted from L1-2 to L4-5. Evaluation of the T2* MRI sequence images revealed no susceptibility artifacts. The lesion was not contrast enhanced after IV administration of gadolinium. The imaging diagnosis was mild, extradural spinal cord compression at the level of the intervertebral disk space L3-4 at the ventral right aspect with swelling of the subarachnoid space over 4 spinal cord segments. On the basis of the MRI findings, a diagnosis of sequestrated Hansen type 1 intervertebral disk extrusion was made.

Surgical and conservative treatment options were discussed with the owner. Because of the owners’ concerns regarding risks of surgery and the ambulatory status of the dog, the patient underwent nonsurgical treatment consisting of cage rest and restricted exercise on a leash for 4 weeks.

Nonsteroidal anti-inflammatory medication was administered for 10 days. The dog was discharged from the hospital 2 days after diagnosis, and the owners were advised to monitor ambulation and urinary tract function.

Five weeks after the initial examination, a neurologic follow-up examination was performed; results indicated neurologically normal gait and posture, and the dog ambulated without obvious neurologic deficits or signs of pain. The quality of spinal reflexes was clinically normal. A subtle delay in the proprioceptive positioning response was detected in the right hind limb. No signs of pain were elicited during palpation of the thoracolumbar portion of the vertebral column. The cutaneous trunci reflex was clinically normal on right and left sides.

At the owners’ request, MRI was repeated (by use of the same MRI settings that were used during initial MRI). Results indicated almost complete regression of the extradural lesion at the level of the intervertebral disk space L3-4. A small amount of residual material with low T1- and T2-sequence signal intensity was detected, but the spinal cord was not compressed (Figures 1 and 2). The volume of the material had decreased to 0.05 cm³, and the area was only 15% of the area of the vertebral canal at the level of the maximal extent of the extruded material; the area of the spinal cord was 99% of the area of the vertebral canal at that location. The material had mild contrast medium uptake. The displacement and compression of the spinal cord had resolved. On the basis of results of the second MRI, a diagnosis of almost complete regression of sequestrated extradural intervertebral disk material was made.

Discussion

Intervertebral disk disease is common in dogs, with an incidence of 27.8 dogs/10,000 dog-years at risk.2–4 Treatments for intervertebral disk disease in dogs include conservative treatments (rest and administration of anti-inflammatory and analgesic medications) and surgery (decompression of neural tissue with or without stabilization of the vertebrae of the affected spinal segment).5 These treatments are selected on the basis of the severity of neurologic dysfunction, detection of compression of the spinal cord versus compression of nerve roots, and financial considerations. Orthopedic and neurosurgical veterinarians typically agree that surgical decompression is the treatment of choice, especially for nonambulatory dogs.2,5 In support of this preference for surgical treatment, dogs that are treated without surgery have a 50% recurrence rate within 1 to 36 months.5 In addition, 13% of dogs treated conservatively have residual ataxia.6 Results of other studies7 indicate success rates of 50% with recurrence rates of 30% for dogs with intervertebral disk disease that undergo conservative treatments. Recovery rates for chondrodystrophic and small-breed dogs following

Figure 1—Parasagittal T2-weighted turbo spin echo sequence MRI images of the lumbar portion of the vertebral column of a 3-year-old French Bulldog evaluated because of acute signs of back pain and spastic paraparesis. A—An MRI image obtained during the initial examination indicating material of low signal intensity (white arrows) in the ventral aspect of the vertebral canal at the level of the mildly narrowed intervertebral disk space L3-4 extending caudally. Notice the absence of subarachnoid and epidural linings from L1-2 to L4-5 (white arrowheads). B—An MRI image obtained during a follow-up examination 35 days after the initial MRI. The material of low signal intensity was not detected at this time.

Figure 2—Transverse T2-weighted turbo spin echo sequence MRI images of the lumbar portion of the vertebral column in the dog in Figure 1 obtained immediately caudal to the cranial end plate of the fourth lumbar vertebra at the level of the maximal size of extruded intervertebral disk material. A—An MRI image obtained during the initial examination indicating material of low signal intensity in the ventral right aspect of the spinal canal causing mild displacement and compression of the spinal cord. B—An MRI image obtained during a follow-up examination 36 days after the initial MRI. The extradural material has decreased in size and extent. Compression and displacement of the spinal cord have resolved almost completely.

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surgical decompression for treatment of Hansen type 1 disk extrusions are 86% to 96%, and recovery times are shorter than they are for dogs treated without surgery. These findings suggest a substantial benefit of surgical treatment, compared with nonsurgical treatment (rest and administration of anti-inflammatory and analgesic drugs), for dogs with intervertebral disk disease. Humans with lumbar intervertebral disk herniation who are treated without surgery have a better prognosis (80% recover without clinical signs of disease) than dogs with that problem that undergo such treatments. These differences in results between humans and dogs may be attributable to 2 reasons. Unlike dogs, spinal cords in humans are protected by a central bony canal, and the potential for resorption of disk material may be low for those problems in humans and dogs. The intervertebral disk herniations with the highest potential for resorption in humans are those of the transligamentous type, which is comparable to the Hansen type 1 intervertebral disk disease detected in the dog of the present report. The mechanisms by which parts of herniated disks are resorbed are not known. An immune response to disk material may develop and inflammatory processes may reduce the size of such tissue. Macrophages and neovascularization may be important in resorption of herniated intervertebral disk material. Macrophages infiltrating extruded disk material have a high level of expression of metalloproteinases that are important in resorption of such material. Formation of new blood vessels is important because such vessels form passages into the extracellular matrix of degenerated disks. Results of other studies indicate disk material that extends through ruptured posterior longitudinal ligaments is resorbed more effectively than such material in subligamentous disk protrusions in humans. Such findings have been attributed to the larger quantity of macrophages in transligamentous herniated disk material versus subligamentous herniated material. The Hansen type 1 disk extrusion in the dog of the present report may have induced inflammatory reactions that were similar to those in humans with transligamentous disk herniations. The small amount of gadolinium uptake detected in follow-up MRI images of the lesion in this dog indicated an epidural inflammatory response. Results of another study indicate an inflammatory reaction consisting of neutrophils and macrophages is found in 27% of herniated disk samples collected during surgery of dogs.

A histologic diagnosis of extruded disk material was not made for the dog of the present report. However, the accuracy of MRI for determination of a diagnosis of an extruded intervertebral disk is 100%. Differential diagnoses for the dog included an inflammatory granuloma, hemorrhage, or an extradural lesion of neoplastic origin. These diagnoses were considered unlikely because of the MRI signal characteristics of the lesion in the initial and follow-up images. For these reasons, the imaging diagnosis was considered robust.

Findings for the dog of the present report suggested that resorption of extruded thoracolumbar intervertebral disk material in chondrodystrophic dogs is possible, and full resolution of neurologic signs may be detected after 5 weeks. Dogs with such problems treated without surgery may have good outcomes because of functional compensation of neurologic deficits caused by spinal cord compression, a decrease in inflammation, and a substantial reduction of the size of herniated disk material. Further studies in which repeated MRIs are performed would be required to determine whether the frequency and extent of disk material resorption in dogs with thoracolumbar intervertebral disk disease are similar to those for humans with transligamentous extension of herniated intervertebral disk material. Findings for the dog of this report indicated the importance of including untreated control animals in studies of treatments for dogs with intervertebral disk disease.

References

Detection of misfolded prion protein in retina samples of sheep and cattle by use of a commercially available enzyme immunoassay

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Objective—To determine the usefulness of retina samples for detection of disease-associated prion protein by use of a commercially available enzyme immunoassay (EIA) intended for rapid identification of sheep and cattle with transmissible spongiform encephalopathies (TSEs).

Samples—Retina, brainstem at the level of the obex, and retropharyngeal lymph node samples obtained from 15 TSE-inoculated sheep (scrapie [n = 13] or transmissible mink encephalopathy passed through a bovid [2]); retina and brainstem samples obtained from 11 TSE-inoculated cattle (transmissible mink encephalopathy passaged through a bovid [2]); retina and brainstem samples obtained from 15 TSE-inoculated sheep (scrapie [n = 13] or transmissible mink encephalopathy passaged through a bovid [7] or classical BSE [4]); and negative control tissue samples obtained from 2 sheep and 2 cattle that were not inoculated with TSEs.

Procedures—Tissue samples were homogenized and analyzed for detection of abnormally folded disease-associated prion protein with a commercially available EIA and 2 confirmatory assays (western blot analysis or immunohistochemical analysis).

Results—Retina sample EIA results were in agreement with results of brainstem sample EIA or confirmatory assay results for negative control animals and TSE-inoculated animals with clinical signs of disease. However, TSE-inoculated animals with positive confirmatory assay results that did not have clinical signs of disease had negative retina sample EIA results. Retina sample EIA results were in agreement with brainstem sample immunohistochemical results for 4 TSE-inoculated sheep with negative retropharyngeal lymph node EIA results.

Conclusions and Clinical Relevance—Results of this study suggested that retina samples may be useful for rapid EIA screening of animals with neurologic signs to detect TSEs. (Am J Vet Res 2014;75:268–272)