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)
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 neuronal 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 studies 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
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 end at L1-2 and lumbar intervertebral disk herniation results in compression of the nerve roots of the cauda equina. Humans and dogs with spinal cord compression have more severe sequelae and a worse prognosis than those with nerve root compression. In addition, spontaneous reduction in the size of herniated intervertebral disk material over time has been detected in studies\(^1\) of humans. Other investigators\(^2\) examined 48 humans with acute sciatica treated conservatively. In that study, herniations of intervertebral disk material were classified as small (n = 13), medium (20), or large (15) on the basis of evaluation of CT images. Follow-up CT indicated 9 of the hernias had decreased in size by at least 25%, 8 by 50% to 75%, and 31 by 75% to 100%. Interestingly, large herniations had a greater tendency to decrease in size than small herniations in that study.\(^3\) Other investigators\(^4\) performed MRI for 37 humans with large protruded lumbar intervertebral disks who were treated conservatively. All analyzed protruded intervertebral disks had a reduction in volume during the study;\(^5\) 87% had a ≥ 50% reduction in volume. Conservative treatment to await reduction in the volume of herniated disks has also been effectively used for humans with thoracic intervertebral disk herniations causing spinal cord compression who had mild neurologic deficits.\(^6\) This was similar to the treatment for the dog of the present report. Although results of other studies\(^7,8\) of ambulatory and nonambulatory dogs with thoracolumbar disk herniations indicate successful functional outcomes following conservative treatments, follow-up imaging was not performed. Therefore, information regarding changes in herniated disk material and spinal cord compression in such dogs was not determined. Recovery of function was attributed to healing of a ruptured fibrous annulus, a decrease in inflammation over time, and restoration of spinal cord function by reversal of spinal cord damage and mechanisms of neuroplasticity.\(^9\)

Results of repeated MRI examinations performed after conservative treatment of dogs with intervertebral disk-associated cervical spondylomyelopathy (ie, Hansen type 2 intervertebral disk disease) indicate protruding disk material does not decrease in size.\(^10,11\) Those findings are similar to findings for humans with subligamentous intervertebral disk protrusion. Subligamentous disk protrusions in humans have histologic features similar to those for Hansen type 2 intervertebral disk disease in dogs.\(^12\) Therefore, 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,\(^13\) 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.\(^14\) Macrophages and neovascularization may be important in resorption of herniated intervertebral disk material.\(^15\) 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\(^16,17\) 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.\(^18\) The Hansen type 1 disk protrusion 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\(^19\) 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%,\(^20,21\) and results of other studies\(^9,21\) indicate disk material that resorbs more effectively than such material in subligamentous extension of herniated intervertebral disk material. 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


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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] 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 and 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)