

What Is the Evidence?

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Problem

A 9-year-old spayed female Miniature Pinscher was evaluated at the University of Illinois Small Animal Clinic because of a 1-month history of progressive weakness of all 4 limbs. At that time, physical examination revealed a body condition score of 5/9 (ideal) and the dog had non-ambulatory tetraparesis. A neurologic examination revealed an absence of conscious proprioception in all 4 limbs. A pain response was elicited during flexion, extension, and lateral manipulation of the dog's neck. All other physical and neurologic findings were unremarkable. A tentative diagnosis of compressive cervical intervertebral disk disease was made. To confirm this diagnosis and devise an optimal treatment plan, diagnostic imaging was necessary.

The owners were willing to pursue any necessary diagnostic testing and treatment for their pet; finances were not an issue. Their expectations included the best patient care with the least amount of pain and complications. Diagnostic imaging methods available at the University of Illinois for evaluation of the cervical aspect of the spinal cord consisted of survey radiography, myelography, computed tomography (CT), and low-field magnetic resonance imaging (MRI).

Formulation of the Clinical Question

The problem identified was a potential disk compression of the cervical spinal cord. The desired outcome was accurate identification of the site of suspected spinal cord compression. Ability to assess the extent of the extrusion of intervertebral disk material was also needed. This diagnostic information was considered of high importance for planning a surgical procedure for spinal cord decompression and was therefore critical for a successful outcome.

Clinical Question

For the diagnosis of cervical intervertebral disk disease in dogs, which imaging method is most accurate in identifying the location and assessing the extent of a lesion?

Evidentiary Search Strategy

To make a well-informed decision, an evidence-based approach was used. A targeted literature search,

directed by the supervising clinician, was used to obtain recent and relevant articles for evaluation.

The PubMed database was searched on July 16, 2009, with the full term canine cervical intervertebral disk disease and diagnosis. A 20-minute search yielded 30 reports; however, none of these reports included information on all of the imaging methods in question. Therefore, a broader search was performed with the abbreviated term canine intervertebral disk disease, resulting in the identification of 135 items in the English language, including 21 literature reviews. Titles were used first, followed by abstracts, to narrow the search focus by eliminating review articles and case series reports and including only studies in which diagnostic test performance was evaluated by direct comparison between 2 tests, deriving the sensitivity and specificity of a given test relative to a criterion-reference (gold) standard, or comparing testing process-associated complications between tests.

Review of the Evidence

Retrospective and prospective observational studies regarding the accuracy and potential complications of the various imaging methods were identified. The articles that fit the inclusion criteria and were consequently chosen to be assessed consisted of a retrospective study¹ in which the relative sensitivity of CT and myelography was assessed, a prospective study² in which the accuracy of survey radiography was evaluated, and a prospective study³ in which the accuracy of MRI was determined.

Results of the study² regarding survey radiography suggested that its use alone is an inaccurate method for identifying the location of intervertebral disk material extrusion or disk protrusion in the cervical aspect of the vertebral column.

The study¹ of the relative sensitivity of CT and myelography revealed comparable sensitivities between the 2 imaging methods for locating the site of disk herniation. Myelography allowed for imaging of the entire spinal cord. In comparison, CT was less invasive, had fewer adverse effects, was performed more quickly than when myelographic contrast material was used, and was more sensitive at detecting lesions in chronically affected dogs. However, adverse effects were associated more with dogs receiving myelography as the sole imaging method as well as in combination with CT than those that had CT alone.

The study³ regarding MRI revealed that this imaging method yielded complete agreement regarding identification of the affected intervertebral space determined as confirmed during surgery. In addition, MRI allowed correct identification of lesion lateralization and craniocaudal distribution and produced enhanced soft tissue images, compared with those of CT.

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Given the aforementioned evidence, what decision would you make?

Clinical Decision and Outcome

Given the aforementioned findings, survey radiography was deemed the least useful method as a sole means for diagnosis of intervertebral disk disease because of its inaccuracy in this respect, even though complications associated with this imaging method are rare.² Computed tomography, myelography, and MRI appeared to be better diagnostic imaging methods for locating the site of disk herniation in dogs with suspected intervertebral disk disease. However, myelography reportedly has the most potential harmful adverse effects when used as the primary imaging method as well as when used in conjunction with CT.¹ Because of the relative benefits and safety of MRI, this imaging method was recommended to the dog's owner for identification of the site and extent of the suspected spinal lesion.

Magnetic resonance imaging revealed dehydrated intervertebral disk material from C3 through C7. Moderate spinal cord compression was evident at C3-4 (disk material was located ventrally), C4-5 (disk material was located ventrally, on the left side), and C6-7 (disk material was located ventrally). Once the diagnosis was made, the dog underwent ventral slot decompression, allowing for surgical removal of the compressive spinal lesions and decompression of the spinal cord. After surgery, the dog was moved to the intensive care unit to recover, where it received IV administration of crystalloid fluids, opioids (0.2 mg of hydromorphone/kg [0.09 mg/lb] or 5 mg of tramadol/kg [2.3 mg/lb]), and an NSAID (2.2 mg of carprofen/kg [1 mg/lb]). One day after surgery, the dog was able to continue urinating on its own and was able to support its weight on all 4 limbs for a short period. It was transferred to the orthopedic

ward for continued monitoring. Six days after surgery, the dog was able to ambulate on its own with no support but was slightly ataxic. It was discharged from the hospital 10 days after surgery.

Discussion

For the dog in this report, an evidence-based approach to diagnostic test selection was used in which research evidence, the dog's history, and the owner's values were considered. There are many imaging methods available for the diagnosis of intervertebral disk disease. However, when determining the best diagnostic test, the context in which the selection is being made must be considered. For example, a patient at risk for anesthetic complications may not be a good candidate for low-field MRI because of the amount of time the dog would need to be anesthetized, even though MRI may provide the most information. As another example, a patient that is prone to seizures would be a poor candidate for myelography because of the complications associated with contrast medium administration. The dog reported here had no additional health concerns that might have changed the imaging method chosen.

References

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2. Somerville ME, Anderson SM, Gill PJ, et al. Accuracy of localization of cervical intervertebral disk extrusion or protrusion using survey radiography in dogs. *J Am Anim Hosp Assoc* 2001;37:563-572.
3. Naudé SH, Lambrechts NE, Wagner WM, et al. Association of preoperative magnetic resonance imaging findings with surgical features in Dachshunds with thoracolumbar intervertebral disk extrusion. *J Am Vet Med Assoc* 2008;232:702-708.