What Is Your Diagnosis?

In collaboration with the American College of Veterinary Radiology

Figure 1—Standing right-left lateral radiographic image of the articulation of the sixth cervical through third thoracic vertebrae of a 3-year-old 522-kg Thoroughbred filly with moderately severe ataxia (grade 4/5, modified Mayhew ataxia scale). The filly's head is toward the left, and the image was obtained with a digital radiographic system set at 90 kVp and 64 mA (800 mA) with a 45-inch focal distance.

History

A 3-year-old 522-kg Thoroughbred filly was referred following the development of acute-onset ataxia in all 4 limbs. On presentation, the filly displayed signs of appropriate mentation and normal behavior. Results of cranial nerve evaluation were unremarkable. On gait evaluation, the filly exhibited moderately severe tetra-ataxia and paresis with a tendency to buckle and collapse in the forelimbs. Foot placement was consistently irregular in all 4 limbs, and the filly showed markedly delayed protraction and spastic circumduction when turning. The filly was assigned a grade 4 out of 5 on the modified Mayhew ataxia scale, where 0 is normal with no discernable ataxia and 5 is recumbent, with the forelimbs more severely affected than the hind limbs.

Sarah F. Colmer, VMD¹; Timothy Manzi, VMD¹; Kathryn Wulster Bills, VMD¹; Susan J. Bender, VMD PhD²; Amy L. Johnson, DVM^{1*}

¹Department of Clinical Studies—New Bolton Center, School of Veterinary Medicine, University of Pennsylvania, Kennett Square, PA

²Department of Pathobiology—New Bolton Center, School of Veterinary Medicine, University of Pennsylvania, Kennett Square, PA

*Corresponding author: Dr. Johnson (amyjohn@vet.upenn.edu)

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The filly's short stride combined with trembling and weakness in the forelimbs was most consistent with lower motor neuron paresis. In contrast, the filly's hind limb deficits included a long stride, spasticity, and postural deficits, consistent with upper motor neuron paresis. Therefore, the most likely neurolocalization was a caudal cervical myelopathy, specifically in the region of the cervical intumescence (C6–T2). Given the horse's signalment, history, and our patient population, the 3 most likely causes of neurologic disease included cervical vertebral stenotic myelopathy (CVSM), traumatic injury, and equine protozoal myeloencephalitis (EPM). Standing right-left lateral radiography of the caudal cervical vertebral column was performed (**Figure 1**).

Formulate differential diagnoses, then continue reading.

Radiographic Findings and Interpretation

Radiography of the caudal cervical vertebral column revealed marked, smooth expansion of the C7 vertebral canal with subsequent concave dorsal and ventral margins (**Figure 2**). No lesions consistent with CVSM were identified, including articular process osteoarthritis, overriding lamina, canal stenosis, and vertebral end-plate flaring; articular process joints were unremarkable from C2–C3 to C7–T1; and all intra- and intervertebral minimum sagittal diameter ratios were within reference limits.

Differential diagnoses for the smooth expansion of the vertebral canal at C7 included congenital variation of unknown clinical consequence or change associated with a slow-growing mass in this region such as a neoplasm, granuloma, cyst, or hematoma with secondary pressure atrophy and modeling of the surrounding bone. A radiographic artifact was considered less likely.

Treatment and Outcome

Cerebrospinal fluid (CSF) centesis at the lumbosacral space was performed and yielded straw-colored fluid with a clinically normal nucleated cell count (1 cell/ μ L; reference range, 0 to 5 cells/ μ L) and a markedly high total protein concentration (342 mg/dL; reference range, 40 to 90 mg/dL). This albuminocytologic dissociation was a nonspecific indicator of a less common neurologic disease, as this finding is

Figure 2—Same image as in Figure 1. There is marked widening of the C7 vertebral canal (arrows), where the dorsal lamina is smoothly expanded dorsally and the dorsal margin of the vertebral body appears to deviate ventrally toward the caudal aspect of C7, consistent with changes secondary to a presumptive slow-growing mass.

Figure 3—Right-left lateral postmortem myelographic image of caudal cervical vertebrae of the horse described in Figure 1, showing cessation of the dorsal contrast medium column at mid-C7 (arrows), suggestive of an intradural extra-medullary or possibly intramedullary mass. The filly's head is toward the left.

atypical for CVSM and EPM. The magnitude of the high protein concentration, combined with radiographic findings, suggested a compressive intracanal mass at C7. The filly tested negative on paired serum and CSF antibody testing for Lyme neuroborreliosis and EPM. Due to the poor prognosis associated with the acute, severe nature of the filly's clinical signs and lack of therapeutic options, the owner elected euthanasia.

With owner consent, postmortem myelography was performed just after euthanasia and revealed abrupt cessation of the dorsal and ventral contrast columns at the level of cranial C7 (**Figure 3**). A thin,

ill-defined positive-contrast rim with a concave margin was superimposed with the canal at this level, suggestive of a golf-tee sign. Differential diagnoses for localization of the mass included intradural extra-medullary versus intramedullary lesions. The caudal location limited the ability to acquire orthogonal projections to refine the lesion location. Postmortem CT was not pursued due to limitations of site equipment but would have likely allowed for more specific localization of the lesion.

Necropsy was performed, and parasagittal sectioning of the cervical vertebral column revealed a smooth, multilobulated, dark yellow, intradural mass (approx 6 X 4 X 2.5 cm) within the C7 vertebral canal that encompassed the left C8 nerve root and the spinal cord. Microscopically, the mass was comprised of a proliferation of thin spindle cells with elongate nuclei and scant cytoplasm embedded in a loose matrix of disorganized collagen bundles and wispy mucinous material. These findings were consistent with a peripheral nerve sheath tumor (probable neurofibroma) arising from the left C8 nerve root.

Comments

The changes in the contour and sagittal diameter of the vertebral canal at the level of C7 identified on the lateral radiographic image could have been overlooked. Given the neurolocalization to the cervical intumescence, critical evaluation of the radiographs enabled detection of these subtle changes. Although mild changes can be present in the general human population,¹ the observed widening of the canal within the vertebral body often occurs by way of increased intracanal pressure secondary to an expansile mass and is known as a “posterior vertebral scalloping sign.”²

Previously documented neoplasms of the vertebral column leading to spinal cord compression in horses include lymphoma, melanoma, fibrosarcoma, myeloma, and hemangiosarcoma.³ A peripheral nerve sheath tumor (neurofibroma, granular cell variant) has also been reported as a cause of spinal cord compression in a horse.⁴ Regardless of final diagnosis, masses within the vertebral canal often lead to high healthcare expenses and diminished quality of life for affected patients across species, and surgical and medical interventions to treat these masses are often futile and fraught with complications. Thus, euthanasia was elected in this case.

Postmortem myelography was academically pursued, as aberrations in the contrast column can potentially give spatial information about mass location, which guides prioritization of differential diagnoses.⁵ Extradural masses typically result in a filling defect with a broad base that tapers toward the lesion and smooth deviation of the contrast column toward the spinal cord. Intradural-extra-medullary masses widen the subarachnoid space adjacent to the mass, creating a golf-tee sign with contrast “hugging” or

outlining the defect. Intramedullary masses cause circumferential tapering of the contrast columns and displacement of the contrast columns toward the margins of the vertebral canal. The distribution of contrast media evident on postmortem myelography had characteristics of both intramedullary and intradural-extramedullary lesions. An extradural lesion was definitively ruled out. The combination of characteristics is likely due to the large size of the mass and lack of contrast filling caudal to the mass, which limited complete evaluation. The mass was ultimately diagnosed postmortem as an intradural nerve sheath tumor with extramedullary characteristics. The cervical radiographs in this case were crucial to the prioritization of an intravertebral neoplasm on our differential list and prognostication for the horse described in this case.

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