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HISTORY AND CLINICAL SIGNS

The clinical signs of spinal cord compression are usually insidious in onset although owners sometimes report a traumatic incident prior to their recognising any ataxia. Such traumatic incidents may occur because of mild or previously unrecognised neurological deficits (for example occasional tripping) that results in a fall. Horses with cervical spinal cord compression generally have neurological deficits that are recognisable in all limbs characterized by symmetrical weakness, ataxia, and spasticity. In most instances, the pelvic limbs are more severely affected than the thoracic limbs likely due to the more superficial location of pelvic limb tracts in the white matter of the spinal cord. At rest, severely affected horses may have a base-wide stance and delayed responses to proprioceptive positioning, whereas at the walk, weakness may be manifest by stumbling and toe dragging: horses with prolonged clinical signs of cervical spinal cord compression may therefore have hooves or shoes that are chipped, worn, or squared at the toe. Ataxia (a sign associated with defective proprioception) is evident as truncal sway at a walk, inconsistent and erratic foot placement and by circumduction and pivoting on the inside pelvic limb during circling. Moderate to severely affected horses sometimes have lacerations on the heel bulbs and medial aspects of the thoracic limbs from overreaching and interference. Spasticity, characterized by a stiff-legged gait and exaggerated movements, may be observed in moderately affected horses, especially in the thoracic limbs or in the pelvic limbs when stepping over curbs or polls. When prompted to back, horses may stand base-wide, lean backward and drag the thoracic limbs. Occasionally, signs associated with the thoracic limbs may be more severe than those in the pelvic limbs, particularly in horses with caudal cervical lesions, likely due to involvement of local spinal cord grey matter.

A grading scale (0-5) is often used to score horses with signs of spinal ataxia and weakness: 0: normal; 1: very mild deficits detectable only with complex movements (e.g. walking with head elevated, on an incline, or when circling); 2: mild-moderate deficits that are detectable at the walk; 3: marked deficits obvious at the walk; 4: severe deficits that result in difficulty remaining standing; (5: recumbent). Some clinicians favor an approach where individual limbs are scored separately for signs of ataxia and weakness, with a global score being used to summarise the total neurological deficit. Such an approach is helpful when evaluating disease progression and response to treatments.

The following neurological disorders should be considered potential differential diagnoses and may produce signs similar to or indistinguishable from CSM: equine protozoal myeloencephalitis (EPM), equine degenerative myeloencephalopathy (EDM), equine herpes virus I myelitis, occipito-atlantoaxial malformation, spinal cord trauma, vertebral fracture, vertebral abscess or neoplasia, and verminous myelitis.

Horses with traumatic cervical vertebral disorders usually exhibit pain during manipula-
tion or palpation of the neck, and the disorder may sometimes be differentiated from CSM by standing radiographic examination. Occipito-atlantoaxial malformation (see Chapter 55) occurs primarily in Arabian horses and is diagnosed definitively by radiographic examination (see Fig. 55-4, B). Equine degenerative myeloencephalopathy is diagnosed by exclusion (unremarkable cerebrospinal fluid cytological examination, negative immunoblot analysis for Sarcocystis neurona, and negative radiographic and myelographic examination).

The veterinarian may suspect EDM based on the age (usually less than 18 months) and during neurological examination (hyporeflexia; and similar degrees of ataxia in thoracic and pelvic limbs), but definitive diagnosis is only achieved by post-mortem examination. Although several breeds have been reported with the disease, EDM appears to have a familial predisposition in Standardbred horses.

Horses with equine herpes virus I myelitis may have urinary incontinence, poor tail tone and pelvic limb lower motor neuron weakness. Signs associated with cranial nerve involvement may occasionally be observed. In EHV1 myelitis, CSF evaluation typically reveals xanthochromia and albuminocytological dissociation (high protein, normal cell count); a rising EHV1 serum antibody titer, virus isolation and PCR diagnosis all may be used to provide supportive evidence of herpes virus I myelitis. In areas where EPM is endemic (such as North and South America) or in horses exported from these regions, distinguishing between EPM and CSM can be hard. Asymmetrical ataxia, focal sweating and focal muscle atrophy should direct diagnostic efforts toward EPM, however symmetrical spinal ataxia does not preclude a diagnosis of EPM. EPM-affected horses with symmetrical ataxia are differentiated from those with CSM on the basis of standing radiographic evaluation, CSF immunoblot analysis for S. neurona, and in some circumstances, myelographic evaluation (see comments on equine myelography below). Immunoblot analysis of CSF is frequently positive however in horses affected by CSM if they are in a geographic area with a high seroprevalence of EPM.

Therefore differentiation of these two conditions should not be determined on the basis of CSF analysis alone. Cytological analysis of CSF is usually unremarkable in horses with CSM, although mild xanthochromia or slightly increased protein concentration may be observed in affected horses especially if signs have developed acutely, perhaps precipitated by trauma.

DIAGNOSTIC TESTING

Plain radiography of the cervical vertebrae can be used to assess the likelihood of cervical stenotic myelopathy in horses with spinal ataxia (Moore et al. 1994), but accurate assessment requires a precise lateral radiograph, (Rush 1998) ensuring that the ventral prominences of the transverse processes are perfectly overlying each other. Radiographic obliquity results in indistinct margins of the ventral aspect of the vertebral canal, and results in erroneous values for objective measurements. A thorough understanding of the 3 dimensional anatomy of the cervical vertebrae aids in interpretation (Withers et al. 2009). Cervical radiographs should be evaluated subjectively and objectively. Subjective interpretation is based on examining for presence of five characteristic malformations of the cervical vertebrae that include (1) flare of the caudal epiphysis of the vertebral body; (2) abnormal ossification of the articular processes; (3) subluxation / misalignment between adjacent vertebrae; (4) extension of the vertebral caudal dorsal lamina and (5) osteoarthritis of the articular processes. Estimating the significance of lesions identified through subjective interpretation can be hard and is based on the clinician’s experience and interpreting the balance of probability. For example, osteoarthritis of (especially the caudal) vertebral articular processes is recognised commonly in normal horses (Whitwell and Dyson 1987). Hence recognition of characteristic vertebral malformations is considered supportive in diagnosis at best.(Papageorges et al. 1987). Oblique radiographs are helpful in certain circumstances (Withers et al. 2009).
Objective assessment of vertebral canal diameter is more accurate than subjective evaluation of vertebral malformation for identifying young horses affected by CSM but may lead to false negative diagnoses in older horses (Levine et al. 2007). Both inter- and intra-vertebral measurements are used. The sensitivity and specificity of the intra-vertebral sagittal ratio method is approximately 90% for vertebral sites between the third and seventh cervical vertebrae (Moore et al. 1994). In most normal horses, the sagittal ratio exceeds 52% from the third to sixth cervical vertebrae and 56% at the seventh cervical vertebrae in horses greater than 320 kg. The positive predictive value of such measurements is probably higher, and the negative predictive value lower, in ataxic horses from countries where conflicting diagnoses (such as EPM) are not routinely encountered (i.e. false positives are less likely, but false negatives are more likely because the underlying prevalence of CSM in ataxic horses is higher). Similarly, the positive and negative predictive values of objective cervical radiography measurements in the absence of ataxia (for example during prepurchase radiography) have not been evaluated, but false positives are likely to be more, and false negatives, less common, since the prevalence of CSM in this population will be much lower. Some clinicians advocate use of ratiometric measurements that take into account the distance between adjacent vertebrae (inter-vertebral ratios) based on the rationale that most compressive lesions occur between, rather than within, the vertebrae (Hahn et al. 2008). Particularly high quality radiographs are usually required for such measurements, but analysis suggests that this approach may be helpful in differentiating CSM from other conditions (Van Biervliet 2007). Further comparison of both methods in a large group of horses is needed based on a gold standard diagnosis established at post mortem examination, since myelography is problematic (see discussion below), although available post mortem material may be skewed towards severely affected horses, since these animals may more often be euthanased.

Plain radiography is often considered sufficient to make a presumptive diagnosis of cervical compression without the need for further tests. In countries where EPM or other conflicting differential diagnoses are possibilities, many clinicians favour myelography for diagnosis. Unfortunately, for most inter-vertebral sites, myelography results in a high number of false positive and false negative results (van Biervliet et al. 2004). Myelography remains however a prerequisite if surgical intervention is considered a viable option on the basis of severity of signs and the owner’s wishes and expectations. This is because plain standing radiography does not definitively pinpoint the actual site of the compressive lesion(s) (Moore et al. 1994). Note that neck flexion and extension while under anesthesia are contraindicated if there is evidence for compression on the initial neutral views. Ventrodorsal projections may be attempted in small or young animals, especially in the cranial neck, and may demonstrate an assymetric compressive lesion that might otherwise account for some false negative diagnoses in larger horses.

A variety of techniques has been used for interpreting equine myelograms. It is common for the ventral dye column to be lost, but for there to be no or minimal change to the width of the dorsal dye column in normal horses; consequently, often at inter-vertebral sites between C2 and C6, diagnosis of compression is made on the basis of a 50% or greater decrease in the sagittal width of the dorsal and ventral contrast columns in comparison with the column width at the immediate cranial or caudal mid-vertebral site. At C6-C7, a reduction of more than 20% of the dural diameter measured in the mid body region is best used to diagnose compression, since this measurement has a relatively high sensitivity and specificity. Clinicians may favor use of different “cut off” values for exclusion or inclusion of diagnosis based on the consequence of the derived decision (i.e. possible euthanasia or surgery). In a similar manner to interpreting plain radiographs, the positive predictive value for myelography is likely higher in ataxic horses from countries without many conflicting differential diagnoses because the prevalence...
ience of true vertebral compression in ataxic horses is relatively higher. Additional techniques that have been used or proposed for evaluating horses with compressive myelopathy include electromyography of the cervical musculature (examining for presence of signs of local muscle denervation caused by grey matter or peripheral nerve disease), (Wijnberg et al. 2004), transtentorial magnetic stimulation (Nollet et al. 2004) and kinematic gait analysis,(Keegan et al. 2004) but such techniques require further validation before their widespread use is recommended. Ante-mortem diagnosis of CSM therefore has inherent problems and limitations, of which the clinician should be aware, but a combination of tests and methodologies taken in the context of the signalment, history and comprehensive physical and neurological examinations likely optimises accurate diagnosis.

REFERENCES


