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## Diagnosis and treatment of CVSM in horses

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Neurologic examination reveals normal cranial nerve function. Symmetric ataxia, paresis, dysmetria, and spasticity will be present in all four limbs, usually more noticeable in the pelvic limbs than in the thoracic limbs. In horses with significant degenerative joint disease of the articular processes, lateral compression of the spinal cord may lead to asymmetry of the clinical signs. Thoracic limb deficits may be worse than pelvic limb deficits and in this uncommon situation it is more often the weakness and stumbling rather than ataxia that is more evident in the thoracic limbs. In a standing horse conscious proprioceptive deficits may be present such as an abnormal wide based stance, abnormal limb placement, and delayed positioning reflexes. Ataxia and paresis can be noted at a walk during which the horse may demonstrate truncal sway, circumduction of the pelvic limbs, toe-dragging, and stumbling. A presumptive clinical diagnosis is obtained by a combination of a detailed history from the owners or trainers, the signalment of the animal, and the recognition of ataxia with a neuroanatomical localization caudal to the foramen magnum on a neurologic examination.

Hematologic and serum biochemical parameters are generally unremarkable in horses with CVSM. Cerebrospinal fluid (CSF) analysis is normal in the majority of cases, but CSF analysis remains an important ancillary diagnostic tool in the evaluation of equine neurologic disorders. Lateral radiographs of the cervical vertebrae, obtained in the standing horse, should reveal bony malformations of the cervical vertebrae. The five characteristic bony malformations of the cervical vertebrae in horses with CVSM are “flare” of the caudal vertebral epiphysis of the vertebral body, abnormal ossification of the articular processes, malalignment between adjacent vertebrae, extension of the dorsal laminae, and degenerative joint disease of the articular processes. Degenerative joint disease characterized by osteochondrosis and/or osteoarthritis of the articular processes is the most commonly identified lesion on cervical vertebral radiographs in horses affected with CVSM. The sagittal ratio may be determined for initial assessment of the vertebral canal diameter. It is essential that direct lateral radiographs are obtained. A ratio of less than 50% at C4, C5, or C6 or a ratio of less than 52% at C7, is associated with a high likelihood (likelihood ratio: 26.1 – 41.5) of having cervical stenotic myelopathy. Myelography is required to confirm diagnosis of focal spinal cord compression and to identify the location and number of lesions, particularly if surgical treatment is pursued. Radiographs are taken in the neutral, flexed, and extended positions of the neck. Criteria for evaluating equine myelographic radiographs are well published but remain the source of much debate and difficulty for veterinarians. Currently, complete attenuation of the ventral contrast column with 50% attenuation of the dorsal contrast column is used as myelographic evidence of compression. At postmortem examination the vertebral column, bony abnormalities and malformations such as those detected by radiography may be present.

Medical therapy in horses with CVSM is aimed at reducing cell swelling and edema formation with subsequent reduction of the compression on the spinal cord. In the immediate period following an acute onset of neurologic disease, treatment with anti-inflammatory drugs, such as non-steroidal anti-inflammatory drugs and dimethyl sulfoxide are most commonly used. Corticosteroids are indicated in horses with acute brain and spinal cord trauma; however, its use is controversial due to the potential negative side effects and the fact that corticosteroids are contraindicated in cases of EPM, unless simultaneous treatment for EPM is initiated. Depending on the type of CVSM and the age of the horse, different therapeutic options exist. In horses less than one year of age changes in management, including restricted exercise and diet, are recommended. The "paced growth" program, of which the efficacy has been demonstrated in young horses with early clinical or radiographic signs of CVSM, includes stall rest and a diet that is aimed at reducing protein and carbohydrate intake and, thus, reducing growth and allowing the vertebral canal to "catch up". The three most important nutritional factors appear to be excessive dietary digestible energy, excessive dietary phosphorus, and dietary copper deficiency. The growth retardation obtained by this diet should be confined to selected individuals and is professionally supervised. In young horses supplementation with vitamin E / selenium is recommended as well. In adult horses the options for medical therapy are restricted to stabilizing a horse with acute neurologic deterioration and injecting the articular joints in an attempt to reduce soft tissue swelling and stabilize or prevent further bony proliferation.

The aim of surgical treatment is to stop the repetitive trauma to the spinal cord, which is caused by narrowing of the vertebral canal, and thereby, to allow the inflammation in and around the spinal cord to resolve. Surgical treatment of CVSM is controversial, mainly due to concerns regarding safety of the horse after surgery, and potential heritability of the disease. Ventral interbody fusion through the use of a stainless steel "basket" is currently the most commonly used surgery for CVSM. The prognosis of horses following surgical treatment depends on the age of the horse, the grade of neurologic deficits that were present prior to surgery, the time the horse has demonstrated neurologic disease for, the number of compressed sites, the severity of the lesions, and the post-operative complications encountered. Following surgery an improvement of 1-2 out of 5 grades is expected. Although some affected horses improve more than 3 grades, thus we recommend surgery in horses that are at most moderately ataxic (grade 3 out of 5).

Whether horses are treated medically, surgically or not treated (i.e. just turned out), the response and the prognosis depend on the age of the horse, the severity of the neurologic deficits, the duration of neurologic signs, and what level of performance is expected from the horse. Without treatment the prognosis in all types of CVSM is poor, as there is continued damage to the cervical spinal cord with an increasing chance of severe cord damage. Myelography remains the best ante mortem test yet evaluation of myelograms remains difficult for even the most experienced clinician. Use of newer techniques such as computed tomography and MRI are gaining popularity and will be used in the future. Ventral interbody fusion has proven an effective surgical procedure, yet, complete recovery does not occur in all horses, and risks

associated with post-operative performance must be carefully considered by owners.

Horses with severe spinal ataxia are readily recognised