Spinal Cord and Peripheral Nerve Abnormalities of the Ruminant

Amanda K. Hartnack, DVM, MS, BA

KEYWORDS

• Peripheral nerve injury • Spinal cord injury • Spinal cord trauma • Paresis • Paralysis • Parasitic

KEY POINTS

- Disorders of the spinal cord in ruminants are most often associated with infectious or traumatic causes, including vertebral body abscess or vertebral fracture, and are commonly associated with a grave prognosis.
- Parasitic migration may result in spinal cord damage and is most often associated with *Hypoderma bovis* and *Parelaphostrongylus tenuis*.
- Peripheral nerve abnormalities are commonly traumatic in nature, with the radial nerve being commonly damaged in the forelimb and the sciatic or obturator commonly associated with calving injury in the hind limb.

Disorders of the spinal cord and peripheral nerves in ruminants are most commonly associated with infectious or traumatic causes, with clinical signs varying depending on the severity and location of the lesion.

Differential diagnoses for animals with signs of spinal cord damage include vertebral body abscess or osteomyelitis, spinal abscess, spinal trauma, parasitic migration, neoplasia, or congenital vertebral or spinal cord abnormality.

SPINAL CORD: INFECTIOUS

Vertebral body infection and epidural spinal abscesses occur regularly in ruminants, occurring in both young and adult animals. These conditions are seen more commonly in animals less than 12 months of age than in adult animals. Vertebral body osteomyelitis generally occurs following hematogenous spread of bacteria from infectious processes distant from the vertebral bodies. These disease processes may include

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Food Animal Surgery, Department of Large Animal Clinical Sciences, Texas A&M University, 4475 TAMU, College Station, TX 77843, USA
E-mail address: ahartnack@cvm.tamu.edu

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pulmonary or umbilical infections in calves, bacteremia secondary to septicemia in calves, or localized abscesses.[1,2] In lambs, abscesses or cauda equina syndrome secondary to ascending infection may be associated with tail docking.

Clinical signs may appear acutely as in the case of a pathologic fracture or insidiously with extension of osteomyelitis. Abscesses may be located in the vertebral body, intervertebral disk space, or paravertebral. Because of the association with other diseases, such as pneumonia, affected animals may have a history of disease or ill thrift.

Diagnosis is based on a combination of history and clinical signs, with radiographic imaging often providing a definitive diagnosis. Clinical signs, of course, depend on the site of the compressive lesion. In about 50% of cases, more than one vertebral body is affected; lesions seem to be distributed between cervical, thoracic, and lumbar regions.[3] Other imaging techniques that may be helpful in the diagnosis include computed tomography (CT), MRI, and myelography.

Abnormalities on a complete blood count or serum chemistry may include elevations in fibrinogen, globulin, and white blood cell counts, all consistent with a chronic infection. Although a cerebrospinal fluid (CSF) tap may be helpful in ruling out other diseases, findings are often nonspecific. CSF may be normal or may reveal a pleocytosis (mononuclear or neutrophilic).[4] Uncommonly, the abscess is penetrated while performing a CSF tap, resulting in aspiration of purulent material.

Necropsy examination may reveal gross signs of spinal cord compression, and histologic examination of the spinal cord reveals pressure necrosis and Wallerian degeneration as well as localized meningitis.[3]

Because of the poor prognosis, treatment is rarely attempted. However, laminectomy has been reported as a successful treatment of an epidural abscess in a calf.[5] In most situations, prevention of the condition is emphasized. Prevention strategies include ensuring adequate passive transfer in neonates and excellent hygiene to prevent other predisposing conditions, such as pneumonia or umbilical infection.

TRAUMA

In both young and adult ruminants, spinal cord trauma is most commonly associated with vertebral fractures, though the cause of these fractures is different between the two groups. Spinal cord trauma may also occur in the absence of a vertebral body fracture due to soft tissue swelling adjacent to the spinal cord or from direct injury to the cord.

Although vertebral fractures are rare, they generally involve the vertebral body and are often associated with severe neurologic signs. Signs, as with all spinal cord lesions, depend on the location and severity of injury. In adults, these fractures may be secondary to direct trauma, such as riding injuries and restraint for processing.[6–8] More commonly, however, vertebral fractures are seen in neonates and are generally associated with assisted delivery during dystocia.[9–11] Spinal cord compression may also occur secondary to fracture callus formation, resulting in a potentially insidious onset of signs. Pathologic fractures of the vertebrae in ruminants have been associated with osteomyelitis or nutritional imbalances, such as calcium, phosphorus, vitamin D, and copper.[12–16] In both calves and small ruminants, predator attacks may also be a cause of spinal cord trauma.

Diagnosis of vertebral fracture is based on clinical signs, history of trauma (if known), and radiographic confirmation. Rectal examination in adult cattle may reveal a step lesion if a vertebral fracture is present. If a nutritional cause is suspected, radiographic appearance of the skeleton, feed analysis, and supporting laboratory work can be