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How to diagnose lumbosacral disease

Luisa De Risio
DVM, MRCVS, PhD, Dip ECVN, RCVS Recognised Specialist in Veterinary Neurology
Neurology/Neurosurgery Service, Animal Health Trust, UK

Lumbosacral disease, also termed lumbosacral stenosis, degenerative lumbosacral stenosis, lumbosacral spondylopathy, spondylosisthesis, lumbosacral malformation-malarticulation, is characterised by narrowing of the vertebral canal and/or the intervertebral foramina in the lumbosacral area with compression of the nerve roots that form the cauda equina (L6-7+ S1-3+ coccygeal segments) and/or their related vasculature. Cauda equina compression may result from a number of abnormalities including:

- degeneration and protrusion of the intervertebral disk between the last lumbar vertebra and the sacrum,
- osteophytes, thickening, joint capsule proliferation, and subluxation of the articular processes,
- thickening and in-folding of the normally taut interarcuate ligament,
- epidural fibrosis,
- thickened lamina and pedicles
- instability and misalignment between the last lumbar vertebra and the sacrum

Lumbosacral osteochondrosis, a developmental disturbance of the end plate of either the sacrum or L7 vertebra, with subsequent separation of an osteochondral flap, has been reported as a cause of lumbosacral stenosis in mature dogs. This condition is often associated with disk disease, consequently, compressive lesions result from the flaps alone or in combination with disk material. Acquired degenerative lumbosacral stenosis occurs most commonly in large breed dogs, and particularly in working dogs. German Shepherds are especially at risk for this degenerative disorder, possibly because of the presence of destabilizing transitional lumbosacral vertebral anomalies that predispose to premature disk degeneration. Clinical signs are noted usually when dogs are mature to middle-aged (e.g., 5 to 8 years), possibly associated with age-related soft tissue and bony changes, along with altered spinal mechanics, resulting in cauda equina compression. Males appear to be at higher risk than females. In dogs with lumbosacral osteochondrosis, the mean age has been reported to be 6.3 years. German Shepherds (56%), Boxers (11%) and Rottweilers (9%) were overrepresented, and the male: female ratio was 4:1.

Dogs with lumbosacral stenosis usually show varying signs of a lumbosacral syndrome depending on the level and extent of the lesion. Owners often note that affected dogs have difficulty rising or climbing stairs, and are reluctant to perform extensive physical activity. Clinical signs include heparalgies (the most commonly reported sign) during direct palpation (especially downward pressure) of the lumbosacral area or during lumbosacral hyperextension, unilateral or bilateral pelvic limb ataxia, paresis or lameness, proprioceptive deficits, decreased withdrawal reflex, tail paresis, hypotonia of anal sphincter with fecal incontinence, and urinary incontinence. In some cases paraesthesia manifested as self-mutilation of pelvic limbs, tail, perineum, and genitalia may be noted. Exercise-induced lameness, termed neurogenic intermittent claudication, may occur when exercise-induced dilatation of radicular vessels causes compression of adjacent nerve roots in a stenotic region, e.g., intervertebral foramen or lateral recess of the caudal L7 vertebral foramen narrowed by a degenerative process. The clinical suspicion of degenerative lumbosacral stenosis can be confirmed with diagnostic imaging however even the most advanced diagnostic imaging techniques may not always provide a definitive answer.

Survey radiographs need to be performed with the animal deeply sedated or under general anaesthesia, properly positioned and preferably with an empty colon. Survey radiographs may show indirect evidence of degenerative lumbosacral stenosis including spondylosis deformans, disk space narrowing, and end-plate sclerosis. However, none of these abnormalities are specific, and they may occur in clinically normal dogs. Survey radiographs may rule out lumbosacral fracture/luxation, osseous neoplasia, intradiscal osteomyelitis associated with discospondylitis, or identify predisposing factors to degenerative lumbosacral stenosis such as osteochondrosis and transitional vertebrae. In one study, over 30% of German Shepherds with clinical signs of cauda equina compression had radiographic abnormalities compatible with osteochondrosis of the sacral end plate. In another study, transitional vertebrae were found in nearly 40% of German Shepherds with degenerative lumbosacral stenosis and in 11% without. The greatest limitation of survey radiography is the inability to assess compression of neural tissue. Stress radiography, such as dynamic flexion/extension studies, may accentuate the lumbosacral instability. One study evaluated the LS angle and degree of subluxation of the sacrum in relation to L7 as seen on survey radiographs in 52 normal dogs and 32 normal dogs with LS spondylosis (of which 24 had neurological deficits). The conclusion was that such measurements were not helpful in the diagnosis of this disease.
Contrast-enhanced radiography

Epidurography and discography may provide useful information mostly regarding LS disc degeneration and protrusion. In one study, combined survey radiography and discography-epidurography were correctly positive in 16 of 18 dogs (89%). Alone, epidurography has been reported to be diagnostic in 78%-93% of dogs confirmed surgically.

Epidurography is easier to perform than myelography and has less morbidity. The disadvantage is that filling of the epidural space may be incomplete because this space is poorly defined, contains fat and has multiple lateral openings. Flexed and extended views of the LS joint during epidurography may accentuate a compressive lesion. Concomitant filling of the vertebral venous sinuses or the paravertebral venous system may occur in normal dogs but is more common in those with LS disease.

Myelography allows evaluation of the spinal cord cranial to the LS region and thus may help to rule out other diseases, however it may be of limited value in the evaluation of the cauda equina in those dogs in which the dural sac is physiologically elevated from the vertebral canal floor and ends before the lumbosacral junction.

It has been reported that 85% of normal dogs and 80% of dogs with degenerative lumbosacral stenosis had a dural sac that ended at the level of the sacrum and that myelography with the LS joint in neutral, flexed and extended positions was successful in the diagnosis of LS disease. In another study, 77% of 30 dogs had a dural sac that ended within the sacrum. A normal myelographic study does not rule out lumbosacral disease.

Computed Tomography (CT) and Magnetic Resonance Imaging (MRI)

Computed tomography and MRI are probably the diagnostic procedures of choice. Their main advantage is the possibility to evaluate structures that cannot be visualised completely with conventional radiography such as the lateral recesses, intervertebral foramen and articular processes. It is important to scan from L4 vertebra to the sacrum not to miss any lesions affecting the spinal cord segments L6-7-S1-3, and to place the patient in the scanner a standard position.

A neutral or flexed position of the LS joint reduces compression compared to an extended position. CT provides bone detail superior to that seen with MRI and soft tissue contrast superior to that of conventional radiography. It allows visualisation of individual nerve roots because of the contrast provided by the epidural fat.

However loss of epidural fat may not be of clinical significance in older animals as it has been described in the lumbosacral joint older dogs without clinical disease. Reformattting can be used to create dorsal and sagittal images and facet subluxation may be visible using bone window images or 3D reconstructions. In a study evaluating canine lumbosacral stenosis using intravenous contrast-enhanced CT, the positive predictive values for compressive soft tissues involving the dorsal canal, ventral canal and lateral recesses were 83%, 100%, and 81% respectively.

MRI can clearly reveal soft tissue, such as cauda equina, epidural fat, and intervertebral disk, at the lumbosacral region without use of contrast medium. MRI is also considered to give better information about the condition of the intervertebral disc (e.g., the hydration status of the nucleus pulposus) in dogs with degenerative lumbar spine diseases, than radiography or CT.

However, no correlation was found between severity of the clinical signs and the severity of cauda equina compression as assessed by MRI in one study. In humans, it has been proposed that MR imaging can lead to over-diagnosis of disc disease because many people without back pain have disc bulges or protrusions on MR imagining.

As MR imaging is used more frequently now in veterinary medicine, inconsistency between disc abnormalities and clinical signs must be considered, and the diagnosis should always be based upon clinical acumen in addition to the imaging. Electrophysiology is useful to confirm a lower motor neuron disease. Electromyography (EMG) may reveal spontaneous activity in lumbosacral paraspinal muscles, pelvic limbs, coccygeal muscles, and anal sphincter. However these findings do not specify the etiology and may be absent in patients with LS disease. One study found that EMG was accurate in predicting the presence or absence of cauda equina compression in all cases. Another study found that some dogs with LS disease (particularly those presented with only pain) had normal findings on EMG. Dogs with mild disease can have a largely neurapraxic lesion that does not produce denervation.

The main advantage of EMG is to reduce the number of false positive diagnosis of LS disease associated with MRI evidence of nerve root disorder. CSF analysis may be useful to rule out infectious/inflammatory disorders of the peripheral and central nervous system (e.g. cauda equina neuritis, polyradiculoneuritis).
References and suggested reading


